Successful Female Farmers in Natural Resource Management

A Human-Ecological Case Study in East-Africa

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Cover photograph: Woman engaged in cultivation activities on her terraced field in Machakos District, Kenya

«Kinamama, tusonge mbele, hatuwezi kurudi nyuma.»

«Women, let us move forward, we cannot go backwards.»

Motto and song of a women's group in Lubaga, Shinyanga District, Tanzania

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Abbreviations & Acronyms

AEZ	**agro-ecological zone**
AGEE	**Arbeitsgemeinschaft Entwicklungsethnologie e. V.**
AIC	**African Inland Church**
F&BD	**Forestry & Beekeeping Division**
BMZ	**Bundesministerium für Wirtschaftliche Zusammenarbeit**
CBDN	**Caritas Netherlands - Kenya**
CCB	**community capacity building**
CCs	**Catchment Committees**
CGIAR	**Consultative Group on International Agricultural Research**
C-MAD	**Community Mobilization against Desertification**
CNIE	**Committee of the National Institute for the Environment**
com.	**Communal**
DCDA	**District Community Development Asisstant**
DGIS	**Directorate General for International Cooperation**
DivSCO	**Divisional Soil Conservation Officer**
DPT(s)	**Divisional Planning Team**
DSU	**Development Studies Unit**
EAC	**East African Community**
FAO	**The Food and Agriculture Organization of the United Nations**
FES	**Friedrich-Ebert-Stiftung**
FEW	**Frontline Extension Worker**
fhh(s)	**female-headed household(s)**
FSR	**farming systems research**
GAD	**Gender and Development**
GDP	**gross domestic product**
GFAR	**Global Forum on Agricultural Research**
GoK	**Government of Kenya**
GOT	**Government of the United Republic of Tanzania**
ha	**hectare(s)**
HASHI	**Hifadhi Ardhi Shinyanga**
H/MPA(s)	**high/mid potential area(s)**
HPA(s)	**high potential area(s)**
HPI	**Heifer Project International**
ICRAF	**International Centre for Research in Agroforestry**
IFOAM	**International Federation of Organic Agriculture Movements**
IFPRI	**International Food Policy Research Institute**
ILO	**International Labour Office**
IMF	**International Monetary Fund**
IRACC	**Information Research and Communication Centre**
ITLC	**International-Territorial Language Committee for the East-African Dependencies**
KARI	**Kenyan Agriculture Research Institution**
KEFRI	**Kenya Forestry Research Institute**
KIHATA	**Tanzanian Society for Organic Farming**

KIOF	**Kenyan Institute for Organic Farming**
Kisw.	**Kiswahili**
ksh/m	**Kenyan Shilling per month**
ksh/w	**Kenyan Shilling per week**
ksh/y	**Kenyan Shilling per year**
KWAP	**Kenya Woodfuel and Agroforestry Programme**
KWDP	**Kenya Woodfuel Development Programme**
LAMP	**Land Management Programme**
LDCs	**least developed countries**
LPA(s)	**low potential area(s)**
m a.s.l.	**meters above sea level**
MBZ	**Ministerie van Buitenlandse Zaken**
mhh(s)	**male-headed household(s)**
MOALDM	**Ministry of Agriculture, Land and Development Division, Soil and Water Conservation Branch**
MoALDM	**Kenyan Ministry of Agriculture, Livestock Development & Marketing**
MPTs	**multipurpose trees**
MSEs	**micro- and small enterprises**
NARP	**National Agricultural Research Project**
NEDA	**Netherlands Development Assistance**
NGO(s)	**Non-Governmental Organization(s)**
NORAD	**Norwegian Agency for Development Cooperation**
NSWCP	**National Soil and Water Conservation Programme**
NRM	**Natural Resource Management**
OA	**Organic Agriculture**
PCT	**Project Co-ordinating Team**
PMTs	**Priority Medicinal Trees**
PRA(s)	**Participatory Rural Appraisal**
PRIDE	**Promotion of Rural Initiatives and Development Enterprise Tanzania**
PSWCM	**physical soil and water conservation measures**
RRA	**Rapid Rural Appraisal**
RSCU	**Regional Soil Conservation Unit**
SACDEP	**Sustainable Agriculture Community Development Programme**
SADC	**Southern African Development Community**
SALT	**sloping agricultural land technology**
SAP	**Structural Adjustment Policy**
SCAPA	**Soil Conservation and Agroforestry Programme, Arusha**
SCAs	**Soil Conservation Assistants**
SCC(s)	**Soil Conservation Committee(s)**
scm(s)	**Soil Conservation Measures**
SEDA	**Small Enterprises Development Agency**
SHISCAP	**Shinyanga Soil Conservation and Afforestation Programme**
SIDA	**Swedish International Development Agency**
SIDO	**Small Industries Development Organization**
SMF	**Shinyanga Mazingira Fund**
snrm	**sustainable natural resource management**

SWCB	**Soil and Water Conservation Branch**
TARDT	**Tanzania Agroforestry Research and Dissemination Team**
TCIs	**tree-crop interfaces**
TESCO	**Tanzanian Environment and Soil Conservation Organisation**
TFR	**Traditional Forest Reserves**
TGNP	**Tanzania Gender Networking Programme**
Tsh	**Tanzanian Shilling**
Tsh/m	**Tanzanian Shilling per month**
Tsh/w	**Tanzanian Shilling per week**
Tsh/y	**Tanzanian Shilling per year**
T-SLMNRP	**Tanzania-Sweden Local Management of Natural Resources Programme**
T&V	**Train & Visit**
UNEP	**United Nations Environmental Programme**
UNICEF	**United Nations Children's Fund**
URT	**The United Republic of Tanzania**
VEC	**Village Environmental Committee**
Veos	**Village Extension Officers**
VSCC	**Village Soil Conservation Committee**
WED	**Women, Environment and Development**
WID	**Women in Development**
WWF	**World Wildlife Fund for Nature**
y	**year**
z-g	**zero-grazing**

Prologue

> "Appropriate research and development can lead to a better understanding of the opportunities existing in a given natural resource management system, which implies a greater understanding of improvement opportunities."
>
> E. BARROW in his book on local participation in tree management in Africa (1996: 195).

Regarding the serious loss of natural resources world wide, action is urgently needed. In the East-African countries Kenya and Tanzania we find the situation of an increasing pressure on land while at the same time natural resources are continuously decreasing due to human misuse, being the result of a close interrelationship between rapid demographic growth, poverty, historical aspects as well as recent political and economic (global) influences and other factors.

The statement above demonstrates the role of research within this context. Collection of reliable data and more detailed local level studies to understand the interaction between food production systems and natural resources are increasingly needed (BINNS 1997: 405). This study pays special attention to successful female farmer's strategies in three project areas in East-Africa, looking in detail at the crucial aspect of interrelations between gender and natural resources. Furthermore, this study aims to contribute to and catalyse the development of understanding of the interrelation of factors and processes in the context of natural resource management as well as the necessity of the incorporation of key persons in project activities. It also focuses on project approaches and activities as well as related capabilities and constraints.

Assessment and analysis of farmer's strategies within their particular ecological, socio-economic, cultural and political environment of the so-called 'developing countries' under a thorough consideration of gender aspects is a prerequisite for the enhancement of project measures and by this the success of project interventions. Only by knowing the indigenous potential, adoption rates of project inputs, etc. in a respective project area appropriate strategies and measures on a long-term basis can be developed. This not only induces micro dimensions of change, but will result in positive ecological and socio-economic effects extending beyond the local level.

By carrying out a comparative analysis of case studies, group activities, project documents as well as project staff's and expert's views on different levels, success indicators for project interventions are identified and recommendations for the betterment of strategies are given to increase success and sustainability of project activities (see also Fig. 2). Moreover, crucial aspects like education, income, marketing, the role of culture and traditions, indigenous knowledge, etc. have been included within the analysis as well.

Fig. 2: Field workers and farmers in a discussion with the researcher

The research is based on a multimethod approach with main focus on case studies and participant observation. This approach was not only regarded as a challenge, but as a necessity as new methods of field research have to be verified and consolidated. Still, participatory approaches show a weak institutionalisation within the system (see also BECKER 2000). Evaluations based on specific farming-system analyses, combining different methods, tools and materials, contribute valuable data and additional information for the development and improvement of solution strategies within the context of a sustainable management of natural resources. Participant observation, as the most sensitive and participative method of data collection, provides specific and reliable data since it is based on mutual understanding. However, the greatest challenge of this approach is sensitivity; of course, extent and degree of sensitivity are dependent on the personality of the researcher. The author has collected experiences in this field during several stays in the East-African countries Kenya and Tanzania since more than ten years. Nevertheless, as the period of data collection in the field is the most important part of empirical research processes, attention will be paid to it in a separate chapter; the same goes for the methods applied.

Still, natural and social science (both are part of geography) are standing separately next to each other without having forged links in a sustainable way. Accordingly, we still find the phenomenon that agricultural research is carried out in a natural science mode (BECKER 2000), although experiences of the past decades have shown the necessity of not only inter- but *transdisciplinarity* and complexity within research and development planning to fully address interconnections among different disciplines involved (see e.g. HUXLEY 1999: 33). Consequently, this study is based on a trans- and multidisciplinary, multifaceted and multidimensional approach (see also SHAO et al. 1992: 51); it is, in fact, the attempt to demonstrate that it is possible – and a necessity - to fruitfully combine various disciplines.

The study is divided into 13 chapters. In the first four chapters information is given on methodical aspects as well as on general key data. Chapter 1 outlines the approach, thus methodology, methods and materials chosen. Chapter 2 gives an overview of the current problems within the so-called 'developing countries' with emphasis on Kenya and Tanzania as background to the study. Chapter 3 describes the project areas and concepts. In chapter 4 general farm-related data are presented. While in chapter 5 farmer's strategies and measures related to a sustainable management of natural resources are elucidated, empowerment-related aspects are described in chapter 6. In chapter 7 effects of the different measures carried out are summarised. Chapter 8 encompasses farm-types generated out of the farm-data, profiles of farmer groups and portraits of two female farmers. In chapter 9 success-indicators for the different farmer groups and the projects are identified as well as problems and constraints. Expert's views on special subjects dealt with in the study are documented and analysed at the end of this chapter. Chapter 10 tells the personal field experiences and some aspects as to the method. In chapter 11 recommendations are outlined, functioning as a guideline for the projects analysed as well as for projects working in the frame of a sustainable management of natural resources in general. Finally, a synthesis is given in chapter 12. Chapter 13 is dedicated to references.

Acknowledgements

> "I believe and hope that there is an emerging worldview, more holistic, pluralist, and egalitarian, that is essentially participative."
>
> P. REASON, American sociologist within the context of participative inquiry in qualitative research (1994: 324).

This study is dedicated to all the people who try to create awareness for a sensitive handling of natural resources in order to achieve a harmonic co-existence of mankind within our natural environment. The statement above summarises the aspects which I regard as prerequisites to achieve this goal. By demonstrating locally and externally induced strategies this study wants to give perspectives and to encourage action.

Within this context I would like to mention my grandparents Julius and Helene who taught me about the various interrelations between nature and human beings. Their exceptional and well-maintained home garden contained a huge variety of trees, crops and flowers in different spatial arrangements. Actually, they were the first to teach me about environmentally sound land-use practices like agroforestry and organic farming.

This knowledge came in useful to me many times during my field research, and I met many people having the same spirit. *Miti ni uhai* – trees are life – this motto of a school in Ufala, Shinyanga District, Tanzania can be used to describe the various joint and individual activities of the villagers for their environment by which I was so deeply impressed.

Fig. 1: The Village Environment Committee of Ufala

Special thanks are dedicated to the farmers for their hospitality, helpfulness, patience and for providing the information which made this research possible, to the project staff of my three host organisations, the *National Soil and Water Conservation Programme* in Machakos and Nairobi, Kenya; the *Soil Conservation and Agroforestry Programme* in Arusha, Tanzania and the joint project of *Hifadhi Ardhi Shinyanga / International Centre for Research in Agroforestry* in Shinyanga, Tanzania as well as to diverse experts working with institutions in various countries for their support and engagement; the same goes for my supervisors for their valuable comments and general assistance. Furthermore, I am very grateful to the *Friedrich-Ebert-Foundation* who provided the financial basis for this project.

As it would go too far to mention all people by name I would like to generally express my gratefulness and appreciation to all the ones who made this research possible through providing physical and psychological support.

Abstract

"What are the characteristics of successful female farm managers and successful farming husband-wife-teams and which role do they play within the context of projects for a sustainable management of natural resources?" These were the main questions to be answered in the frame of this study. Field research has been carried out in three project areas in Tanzania and Kenya from October to November 1998 (pre-phase), October 1999 to February 2000 and from October to December 2000. Strategies of 18 successful, partly female-headed smallholder farms within the context of natural resources management have been assessed, analysed and illustrated. Interactions between the diverse activities as well as their effects on the families' economic situation, their social environment and on the ecological conditions have been elucidated under special consideration of gender aspects. Data have been collected during (overnight) farm stays which lasted between four and seven days on each farm. A multimethod approach has been applied with main focus on participant observation. The farm stays have been supplemented by participation in women's/mixed groups, farm visits and additional informal discussions with farmers, participation in training, farmer field days, etc. as well as interviews with experts and project staff. An approach as transdisciplinary and integral as possible has been chosen.

Several success indicators for the female (and male) farmers have been identified. General problems and weaknesses under consideration of other farmers, self-help groups, project documents and experts have been assessed. Interrelations between the different aspects involved have been elucidated. Based on these various outcomes central recommendations for project work have been formulated.

Altogether, the study shows that farmer's strategies are manifold and that the different ecological sound activities have not only resulted in the stabilisation and improvement of the ecological situation, but of socio-cultural and economic conditions, too. Successful female farmers have been found to be knowledge careers and multiplicators. Also, they take over a decisive role within project activities as they function as important mediators between projects and people, especially marginal groups like resource-poor farmers and female-headed households. This directly results in a better quality of life of the people in the project area in general.

One of the most interesting and promising outcomes of the study is the revelation of similar positive effects of engaged and innovative husbands through various activities.

Meanwhile, it is widely accepted that projects ought to address gender in order to be successful and sustainable. Strengthening the position of successful female farm managers and farming couples within projects through e.g. their integration into gender workshops, training on resource management, study tours, etc. will enhance the success of project strategies for a sustainable management and conservation of natural resources and be an important step forward to achieve overall aims like food security and poverty alleviation. Furthermore, knowing success indicators as well as general weaknesses helps to improve and speed up the process of problem identification and solution determination.

Zusammenfassung

Die vorliegende Studie ist das Ergebnis einer insgesamt neunmonatigen Feldforschung, bei der 18 erfolgreiche, z. T. von Frauen geleitete kleinbäuerliche Höfe in drei Projektgebieten in Kenia und Tansania unter Berücksichtigung verschiedener Aspekte und Ebenen untersucht wurden. Neben der Erfassung der die Höfe betreffenden Daten werden die einzelnen durchgeführten Maßnahmen im Bereich des nachhaltigen Managements natürlicher Ressourcen dargestellt. Deren wechselseitige Verflechtungen und Auswirkungen auf die Lebenssituation der Familien werden ebenfalls untersucht. Des weiteren wird der Einfluss der erfolgreichen Bäuerinnen auf ihr soziales Umfeld beleuchtet. Da eines der Hauptanliegen die Evaluierung von Gründen für den Erfolg ist, wird eine Analyse zur Definierung von Erfolgsindikatoren durchgeführt. In diesem Zusammenhang werden auch die Ehemänner berücksichtigt. Weiterhin findet eine Analyse der Projektansätze und -aktivitäten unter spezieller Berücksichtigung von Problemen und Hindernissen statt. Allgemeine Aussagen der Farmer und Farmerinnen, von Mitgliedern von Selbsthilfegruppen, anderen Kleinbauern und -bäuerinnen und in Projektdokumenten hinsichtlich von Problemen und Hindernissen werden gesammelt und eruiert; hierbei werden auch die Aussagen von Experten und Expertinnen eingebunden. Die Gesamtanalyse führt zu allgemeinen Empfehlungen als Richtlinie zur Verbesserung von Projekterfolgen. Ein zentraler Bereich dieser Studie ist die Evaluierung neuer und kombinierter Feldmethoden.

Die Studie basiert auf einem qualitativen Ansatz, der durch die Methode der partizipativen Beobachtung umgesetzt wird. Ihr liegt das Prinzip zugrunde, dass Daten unter möglichst natürlichen Bedingungen, also durch eine höchstmögliche Eingliederung in die tägliche Lebens- und Arbeitswelt der an der Studie teilnehmenden Personen, erhoben werden. Dies galt als Voraussetzung für die erfolgreiche Umsetzung der Untersuchungsziele sowie für eine detaillierte und verlässliche Datenerhebung. Da dies nur durch Teilnahme an allen Aktivitäten unter Anwendung des Prinzips des ‚learning-by-doing' erreicht werden kann, wurden auf jedem Hof zwischen vier und sieben Tage und Nächte verbracht. Neben engem Kontakt zu den Bäuerinnen kam es ebenfalls zu einem regen Austausch mit anderen Familienmitgliedern, insbesondere den Kindern und Ehemännern. Weiterhin wurden Freunde, Nachbarn und Gruppenmitglieder kontaktiert sowie Gruppentreffen, Studienfahrten und Trainingsmaßnahmen besucht. Zusätzlich fanden Diskussionsrunden mit den Projektangestellten statt. Weiterhin wurden schriftliche ExpertInneninterviews durchgeführt und Farmskizzen angefertigt. Ansatz und Ziele sowie angewandte Methoden und verwendete Materialien werden im ersten Kapitel beschrieben.

Auswahlkriterien für die Projekte waren die Propagierung und Implementierung von Maßnahmen zur Verbesserung der Lebensbedingungen der ländlichen Bevölkerung im Bereich des nachhaltigen Managements natürlicher Ressourcen; entsprechende Maßnahmen sollten vor dem Hintergrund eines geschlechts- und regionalspezifi-

schen sowie eines partizipativen Ansatzes umgesetzt werden. Unter den ausgewählten kleinbäuerlichen Anwesen (sechs pro Projekt) sollten mindestens zwei und höchstens drei Höfe von Frauen geleitet werden, um Aspekte im Zusammenhang mit dem Familienstand untersuchen zu können. Zwecks Integration naturräumlicher Aspekte sollten die Höfe auf unterschiedliche agro-ökologische Zonen verteilt sein (geringes und mittleres bzw. hohes ökologisches Potenzial). Letztlich sollten alle Kleinbäuerinnen zumindest Mitglied in einer Frauengruppe sein, um sowohl Einflüsse der Frauen auf die Gruppen als auch verschiedene Einflüsse der Gruppen auf ihre Umgebung im allgemeinen eruieren zu können.

Oberstes Auswahlkriterium für die kleinbäuerlichen Familien war die erfolgreiche Implementierung und Instandhaltung von Maßnahmen im Bereich des Managements natürlicher Ressourcen (biologische und physikalische Maßnahmen, Maßnahmen zum Wasser- und Energiemanagement).

Kapitel 2 beleuchtet den Hintergrund der Studie, indem ein kurzer Abriss über die Gesamtsituation und Problematik unter besonderer Berücksichtigung der Länder Kenia und Tansania gegeben wird. In Kapitel 3 werden die Untersuchungsgebiete sowie die Projektkonzepte und -ziele vorgestellt.

Kapitel 4 vermittelt Basisdaten zu naturräumlichen, soziokulturellen und landwirtschaftlichen Aspekten. Die durchschnittliche Haushaltsgröße liegt bei fünf bis sechs Personen, die durchschnittliche Fläche unter Bearbeitung beträgt acht Acres. Alle Bäuerinnen haben zumindest die Grundschule besucht. Angepflanzte Wälder und Naturwälder finden sich verstärkt auf den kenianischen Höfen, während spezielle Weideareale nur auf den tansanischen Höfen zu finden sind. Mais, Bohnen, Amarant, Kassava, Stangenkohl, Tomaten, Süßkartoffeln, Kuherbsen und Zwiebeln werden am häufigsten angebaut; Mais, Bohnen, Kassava und Tomaten werden am häufigsten vermarktet. Viehhaltung umfasst hauptsächlich Hühner, Rinder und Ziegen.

In einem nächsten Schritt folgen eine Bestandsaufnahme, Beschreibung und Tiefenanalyse der von den Bäuerinnen und ihren Familien durchgeführten Maßnahmen und Aktivitäten. Zur besseren Übersicht werden in Kapitel 5 Maßnahmen im Bereich des nachhaltigen Managements natürlicher Ressourcen behandelt und in Kapitel 6 Maßnahmen und Aktivitäten unter dem Aspekt der Ermächtigung diskutiert.

Auffällig ist zum einen die Vielfalt der durchgeführten Maßnahmen: Es finden sich physikalische Maßnahmen, Baumpflanzungen in verschiedenen räumlichen Anordnungen und Interaktionen mit Ackerfrüchten und Vieh, natürliche Baumregenerierung, Bodenverbesserungsmaßnahmen aus dem Bereich des organischen Landbaus, Stallhaltung, Futterpflanzenanbau sowie Maßnahmen zum Wasser- und Energiemanagement (u. a. Wassertanks und verbesserte Kochherde). Die von den Farmerinnen und Gruppen ausgeführten Tätigkeiten sind angepasst an die jeweiligen örtlichen Verhältnisse; folglich spiegeln individuelle und gemeinschaftliche Aktivitäten die unterschiedlichen soziokulturellen, ökonomischen und naturräumlichen Be-

dingungen sowie deren Verflechtungen auf den verschiedenen Ebenen (Hofeinheit, Gemeinde, Region, Land). Auch können bestimmte Muster, basierend auf Übereinstimmungen und Differenzen, anhand spezifischer Indikatoren, auf die in späteren Kapiteln eingegangen werden wird, herausgearbeitet werden.

Insgesamt wurden 152 verschiedene Baum- und Straucharten identifiziert – 85 indigene und 67 exotische Arten. Hierbei ist die Diversität an indigenen Frucht- und Nicht-Fruchtbaumarten im SCAPA-Projektgebiet am niedrigsten, die der exotischen Frucht- und Nicht-Fruchtbaumarten ist am niedrigsten im Projektgebiet von HASHI-ICRAF. Insgesamt findet sich auf den kenianischen Höfen die höchste Diversität an Baumarten. Es muss als kritisch angesehen werden, dass auf fast jedem Hof die Anzahl exotischer Arten die der einheimischen Arten überschreitet. Die häufigste Form der Baumpflanzung ist die verstreute und willkürliche Verteilung über die Ländereien. Hauptnutzungsaspekt einheimischer Arten ist Feuerholz, interessanterweise gefolgt von Medizin; Hauptnutzungsaspekt exotischer Arten sind Früchte, gefolgt von Bodenkonservierung. 14 Gruppen und die Hälfte aller Farmen betreiben Baumschulen. Bevorzugte Arten sind die Silbereiche (*Grevillea robusta*) und *Leucaena*-Arten wie die wilde Tamarinde sowie die Fruchtbaumarten Avocado, Orange und Guave.

Auf zehn Höfen wird zumindest teilweise Stallhaltung praktiziert; auf 15 Höfen finden sich spezielle Anpflanzungen zur Futterversorgung (*fodder banks*). Die Hälfte der Bäuerinnen gab an, dass sich die Arbeitsbelastung durch Stallhaltung erhöht hat, doch betonten die meisten die Notwendigkeit der Maßnahme und ihre Vorteile. Auf allen Höfen werden verschiedene Formen organischen Landbaus betrieben; acht Farmerinnen – keine im Projektgebiet von HASHI-ICRAF – verwenden zusätzlich Kunstdünger.

Die größte Vielfalt an Maßnahmen insgesamt findet sich auf den kenianischen Farmen.

Unter dem Begriff Ermächtigung finden sich drei Kategorien, unterteilt in ökonomische, soziokulturelle und politische sowie ökologische Aspekte.

Innerhalb der Kategorie mit ökonomischen Faktoren werden Aktivitäten zur Einkommensbeschaffung der Bäuerinnen und ihrer Ehemänner beschrieben und analysiert; auch Vermarktungsaspekte von Farmprodukten werden hier berücksichtigt. Fast zwei Drittel aller Farmen sind in außerlandwirtschaftliche Erwerbstätigkeiten involviert; unter ihnen befinden sich jedoch nur drei von alleinstehenden Frauen geleitete Höfe. Entscheidend für das Gesamteinkommen ist die Erwerbstätigkeit der Ehemänner. Alle Haushalte sind mehr oder weniger auf den Verkauf von landwirtschaftlichen Produkten angewiesen, insbesondere die von alleinstehenden Frauen geführten Haushalte. Der Verkauf findet generell auf lokalen Märkten statt; einige Höfe verkaufen ihre Produkte zudem an Zwischenhändler. Ein allgemeines Problem sind die niedrigen Preise. Alle Höfe liegen in mehr oder weniger unmittelbarer Nähe zu einer

Hauptstraße, doch nur fünf Straßen sind asphaltiert, so dass es während der Regenzeit zu Transportschwierigkeiten kommt.

Die Projekte unterstützen keine Aktivitäten im Zusammenhang mit Kreditwesen. Fünf Bäuerinnen und fünf Gruppen haben Kredite bei anderen Projekten in der Region beantragt bzw. bereits erhalten. Angemerkte Probleme sind Rückzahlungsschwierigkeiten, lange Wartezeiten bis Zuteilung und ausbleibende Rückmeldungen.

Aspekte, die sich auf den Lebensstandard und die Arbeitsverteilungsmuster beziehen, zeigen einen direkten Zusammenhang mit der ökonomischen Situation der kleinbäuerlichen Familien.

Bildung, als ein Aspekt innerhalb der Kategorie mit soziokulturellen und politischen Faktoren, wird von allen Bäuerinnen als zentrales Element für Ermächtigung angesehen. Sind aufgrund eigener Erfahrungen zu der Überzeugung gelangt, dass Bildung der Schlüssel ist zur Gleichheit zwischen den Geschlechtern und zu besseren Lebensbedingungen im Allgemeinen. Folglich zeigen sie ein hohes Engagement im Bildungsbereich, nicht nur die eigene Person betreffend, sondern auch bezogen auf die Kinder, Gruppenmitglieder, etc. Die Bedeutung von Bildung nimmt zu, u. a. an der Tatsache erkennbar, dass mehr als ein Drittel der Mütter der Bäuerinnen nicht zur Schule gegangen ist, während die Kinder auf fast der Hälfte aller Höfe weiterführende Schulen besuchen bzw. diese bereits abgeschlossen haben. Es passt in diesen Zusammenhang, dass alle Frauen eine Reduzierung der Kinderzahl pro Haushalt auf ca. zwei Kinder für notwendig erachten, denn eine gute Schulbildung ist die Voraussetzung für bessere Lebensbedingungen; eine gute Schulbildung ist jedoch teuer.

Die Gruppen führen eine Vielzahl gemeinschaftlicher Tätigkeiten aus. Die am häufigsten genannten Probleme waren Wasser, Vermarktung, Zeitmangel – u. a. aufgrund mangelnder Unterstützung seitens der Ehemänner – sowie Krankheiten und Schädlingsbefall.

Des weiteren wurden Mitbestimmung bei die Hofeinheit betreffenden Entscheidungen einschließlich der Landbesitzstrukturen und das öffentliche Mitspracherecht wurden unter spezieller Berücksichtigung des Einflusses von kulturellen Werten und Normen analysiert; diese sind wiederum eng verknüpft mit Geschlechteraspekten. Generell werden die verschiedenen Aspekte unterschiedlich beurteilt, was u. a. mit dem persönlichen Blickwinkel zusammenhängt, d. h., ob die Frauen ihr Augenmerk eher auf Freiheiten oder Beschränkungen richten. Hinsichtlich der Stellung der Kleinbäuerinnen innerhalb der Gemeinde wurden überwiegend positive Erfahrungen wie Unterstützung, Nachahmung und freundliches Entgegenkommen und nur wenige negative Erfahrungen wie Neid genannt.

In einer Problemanalyse wurde die Position der Männer im Gesamtkontext berücksichtigt, da wiederholt von verschiedensten Seiten Probleme bezüglich der Ge-

schlechterrollen erwähnt wurden. Den Männern wird z. B. verstärkt vorgeworfen, sich nicht um ihre Familien zu kümmern. Lösungsvorschläge seitens der FarmerInnen beziehen sich auf die Involvierung des Gemeinderats und die Durchführung von Seminaren zu Geschlechterverhältnissen.

Zwecks Eruierung des lokalen Wissens wurden Daten zu Landnutzung, Medizinalpflanzen, traditionellen Anbaufrüchten und zu natürlichen Pestiziden erhoben und analysiert. Die Analyse zeigt, dass sowohl die Frauen als auch ihre Ehemänner und andere Familienmitglieder auf diesen Gebieten über ein teilweise sehr hohes Wissen verfügen. In diesem Zusammenhang wurden das Management primärer und sekundärer Waldprodukte, traditioneller Waldreservate und Aberglauben in Verbindung mit Bäumen und Wäldern berücksichtigt. Die Kleinbauern und -bäuerinnen betrachten Wissen über Medizinalpflanzen als überaus wichtig und sind der Meinung, dass dieses Wissen der Bevölkerung in Trainingskursen und Seminaren, z. B. durchgeführt von den Projekten, vermittelt werden sollte. Das weitverbreitete Wissen um und die Nutzung von Medizinalpflanzen hat den Vorteil, dass die Bevölkerung nicht auf teure – und oftmals schwer erhältliche – Medizin angewiesen ist. Medizin aus Kräutern und verholzenden Pflanzen hat in der Regel keine Nebenwirkungen, ist kostengünstig und fördert die Unabhängigkeit der Gemeinden von auswärtiger Medizinalversorgung.

Hinsichtlich der Naturwahrnehmung durch die Kleinbauern und -bäuerinnen kann zusammenfassend festgestellt werden, dass Natur an sich allgemein Wert geschätzt und aus verschiedenen Gründen für wichtig erachtet wird. Die Verbreitung von Wildtieren sollte sich jedoch auf separate und möglichst umzäunte Gebiete und Nationalparks beschränken. Nationalparke und Schutzgebiete werden als wichtig zur Wissensvermittlung über Naturerbe und/oder als wichtige Geldeinnahmequelle durch Touristen angesehen.

Der letzte Abschnitt beleuchtet projektbezogene Aspekte wie Ansatz, Umsetzung und Probleme. Im Allgemeinen sind die Kleinbäuerinnen und Gruppenmitglieder mit den Projektaktivitäten zufrieden. Jedoch fordern insbesondere die kenianischen Frauen einen engeren Kontakt zum Feldpersonal der Projekte. Insgesamt ist Weiterbildung in verschiedenen Bereichen erwünscht.

Eine Analyse der Auswirkungen der einzelnen Maßnahmen und Aktivitäten wird auf verschiedenen Ebenen und hinsichtlich verschiedener Aspekte in Kapitel 7 durchgeführt (siehe auch Fig. 3). Im Bereich ökologischer und ökonomischer Effekte wurden die Nahrungsmittelversorgung, Einkommenssituation sowie Wasser- und Energieversorgung stabilisiert und verbessert. Teilweise konnten starke Erosionsschäden wie Gullys behoben oder auf eine Ausdehnung von weniger als 5 % der Nutzfläche reduziert werden. Die einzige noch anhaltende Form der Bodenerosion ist Flächen- und Rillenerosion. Das weitreichende Engagement der Farmerfamilien im Bereich nachhaltiger Landnutzung hat teilweise zu einer erheblichen Zunahme der

Biodiversität auf den Farmen und in der Umgebung geführt; Degradationsprozesse wurden eingedämmt. Insgesamt korreliert der Grad der Verbesserung mit der Interaktion verschiedener Faktoren wie z. B. Finanzen und Zeitreserven, die wiederum die Verfügbarkeit von Arbeitskraft bestimmen. Letztgenannter Faktor ist wiederum verknüpft mit dem Ehestand. In dieser Form können eine Vielzahl untereinander verknüpfter Faktoren aufgezeigt werden.

Bezüglich genereller Effekte auf der soziokulturellen und politischen Ebene werden Verbesserung der sozialen Stellung der Farmerinnen, Reduzierung der Kinderzahl und Verbesserung des Ausbildungsniveaus diskutiert. Des weiteren werden gesondert die verschiedenen Einflüsse der Frauen und Gruppenmitglieder auf den verschiedenen Ebenen beleuchtet. Diese zeigen nicht nur positive Auswirkungen hinsichtlich ökologischer und ökonomischer Aspekte, sondern auch bezüglich soziokultureller und politischer Faktoren. Die Frauen sind Wissensträgerinnen und fungieren als Schlüsselpersonen zur Vernetzung der Projekte mit der Zielgruppe an sich, speziell mit verletzlichen Gruppen wie ressourcenschwachen Farmern und Farmerinnen oder Frauenhaushalten. Zudem geben sie physikalische (Arbeitskraft, medizinische Versorgung, Unterschlupf), finanzielle (Geld, Arbeit) und materielle Hilfe (Gegenstände, Essen, Feuerholz etc.) und verfügen über Organisationstalent sowie Führungsqualitäten (Gruppenstrukturen, allgemein Sprachrohr für andere).

Interessanterweise haben die engagierten und innovativen (Ehe)männer einen ähnlich positiven Einfluss. Offensichtlich nehmen sie eine Schlüsselposition in Bezug auf Strategien zum Management natürlicher Ressourcen, den generellen Lebensstandard der Familien sowie hinsichtlich weiblicher Ermächtigungsprozesse ein.

In Kapitel 8 werden zunächst vier verschiedene Farmtypen, unterschieden nach Hangneigung und agro-ökologischer Zone, vorgestellt. Nachfolgend werden Profile verschiedener Gruppen von Farmerinnen (verheiratete Frauen, alleinstehende Frauen, Leiterinnen von Frauengruppen) erstellt, da angenommen wird, dass eine Verbindung zwischen den Unterschieden in Ehestand oder sozialer Stellung und dem Erfolgsgrad des Farmmanagements besteht; zudem geht es um die Untersuchung von in der Literatur aufgeworfenen Annahmen zum Zusammenhang zwischen sozialer Stellung des Ehemannes, des ökonomischen Potenzials und der Führungsposition der Ehefrau in Gruppen einerseits und ihres Gesamterfolges andererseits. Weiterhin findet eine spezielle Berücksichtigung der Ehemänner statt. Tatsächlich können grundlegende Unterschiede festgestellt werden: Generell befinden sich die verheirateten Frauen, insbesondere in Kenia, in Hinblick auf Schul- und Berufsausbildung oder außerlandwirtschaftliches Einkommen in einer besseren Situation als die alleinstehenden Frauen in Tansania. In Bezug auf die Leiterinnen von Frauengruppen unterstützen die Analyseergebnisse allgemeine Aussagen in der Literatur: Es besteht ein direkter Zusammenhang zwischen der Position als Gruppenleiterin und den Indikatoren Schulbildung, Berufsausbildung, soziale Stellung des Ehemannes/der Eltern in Beruf und Gesellschaft sowie Ehestand. Die ideologische, phy-

sische und finanzielle Unterstützung durch den Ehemann ist von entscheidender Bedeutung für den Grad des Erfolgs der Frauen. Es muss jedoch eingeschränkt werden, dass viele Frauen bereits vor der Heirat auf dem Gebiet der allgemeinen Verbesserung der Lebensbedingungen ihrer sozialen Umwelt aktiv waren, so dass der Erfolg nicht generell auf den alleinigen Einfluss der Ehemänner zurückgeführt werden darf. Persönlichkeitsstrukturen spielen hier eine wichtige Rolle und müssen unbedingt in die Herleitung von Erfolgszusammenhängen mit einbezogen werden.

Hinsichtlich der Ehemänner sind nicht nur Art der Berufstätigkeit und soziale Stellung, sondern u. a. auch das elterliche Engagement in Maßnahmen zur nachhaltigen Nutzung natürlicher Ressourcen, Landbesitzverhältnisse sowie die soziale Stellung der Ehefrauen von Bedeutung. Letztgenannter Indikator verdeutlicht, dass Wechselwirkungen zwischen den Ehepartnern bestehen, die sich positiv verstärken können.

Da ein wichtiges Anliegen der Arbeit die Erfassung der Gründe für den Erfolg der Kleinbäuerinnen sowie die Identifizierung von unterschiedlichen Erfolgsebenen oder ~typen darstellt, wird eine Aufstellung sog. ‚Erfolgsindikatoren', unterteilt nach ökonomischen, soziokulturellen und politischen sowie ökologischen Indikatoren, gegeben. Eine Betrachtung auf der Farmebene zeigt, dass Indikatoren von Farm zu Farm variieren und dass Farmen anhand von Übereinstimmungen und Ähnlichkeiten gruppiert werden können. In einer nachfolgenden Analyse werden die Indikatoren auf einer generalisierenden Ebene nach den Aspekten Land/AEZ/Projektgebiet und hinsichtlich verschiedener Untergruppen wie verheiratete Frauen, alleinstehende Frauen, Leiterinnen von Frauengruppen und Ehemänner untersucht. Die Analyse auf Farmebene sowie auf generalisierender Ebene zeigt, dass einige Indikatoren von großer Bedeutung sind und andere von nur geringer oder ohne Relevanz. Somit können diese Indikatoren gleichzeitig zur Aufdeckung von problematischen und vernachlässigten Aspekten herangezogen werden.

Verglichen mit den anderen Kategorien ist in der ökologischen Kategorie kaum ein Indikator von geringer bzw. ohne Bedeutung; dies wird als direkte Auswirkung der Projektinterventionen interpretiert, aufgrund derer der Grad an Bewusstsein für ressourcenschonende und -konservierende Maßnahmen und deren Umsetzung erhöht wurde. Einige ökonomische Indikatoren zeigen bezüglich des Grads an Wohlstand bei einigen Untergruppen nur eine geringe bzw. keine Relevanz. Dies liegt u. a. daran, dass sich Erfolg im Farm-Management nicht notwendigerweise in einer Erhöhung des Lebensstandards spiegelt, sondern zunächst nur erkennbar ist an der Stabilisierung von Aspekten zur Deckung von Grundbedürfnissen. Der gleiche Langzeiteffekt gilt auch für z. B. soziokulturelle Faktoren wie Partizipation an Entscheidungsprozessen.

Indikatoren, die generell eine hohe Relevanz verzeichnen, sind das Engagement der Farmerinnen in Wissensvermittlung im Bereich des Managements natürlicher Ressourcen, ihre Ansicht zu der Bedeutung von Engagement in Gruppen zur Förderung

von Ermächtigung und das elterliche Engagement in Maßnahmen zur nachhaltigen Nutzung natürlicher Ressourcen. Allgemein sind Engagement und die Ergreifung von Initiativen zur Umsetzung von Ideen zentrale Kräfte für Veränderung, abgesehen von Unterschieden aufgrund spezifischer Umstände und der Persönlichkeit. Engagement, speziell auch vor dem Hintergrund von Tätigkeiten im Sinne und für die Gemeinschaft, spiegelt sich zudem in der sozialen Stellung wider; dies kann anhand der Analyse zu den Einflüssen der Frauen und Gruppen auf ihre Umgebung im Allgemeinen aufgezeigt werden. Personen mit diesen Eigenschaften werden nicht nur als Leiter und Leiterinnen sowie Vorbilder akzeptiert, sondern oftmals von der Gemeinschaft in Führungspositionen gewählt.

Insgesamt verdeutlicht die Analyse, dass Erfolg vom Zusammenspiel verschiedenster Faktorenkonstellationen abhängt, die entsprechend der örtlichen Gegebenheiten als auch hinsichtlich Ehestand, sozialer Stellung oder Staat variieren. Es ist auffällig, dass die erfolgreichsten Frauen diejenigen sind, die sich in Führungspositionen befinden und verheiratet sind; zudem sind insgesamt die kenianischen Frauen erfolgreicher. Andererseits befinden sich die alleinstehenden Frauen in der unvorteilhaftesten Situation, auch wenn sie insgesamt zur Gruppe der erfolgreichen Farmerinnen gehören; dies geht oftmals einher mit ungünstigen naturräumlichen Bedingungen. Im Durchschnitt verzeichnen die Höfe im Projektgebiet von HASHI-ICRAF den geringsten Erfolg, die Farmen in Kenia erreichen im Durchschnitt die höchste Erfolgsebene. Entscheidend für die Gesamtsituation auf allen Ebenen, insbesondere für die ökonomische Situation und hinsichtlich der Verfügbarkeit von Arbeitskraft, ist die Unterstützung des Ehemannes. Im Allgemeinen können es sich die alleinstehenden Frauen z. B. nicht leisten, Arbeitskräfte einzustellen und werden somit oftmals nur von ihren Kindern unterstützt.

Der Erfolg der Projekte steht in engem Zusammenhang mit einem an die lokalen Gegebenheiten ausgerichteten, geschlechtsspezifischen, partizipativen sowie inter-/transdisziplinären Ansatz; hinzu kommen die Berücksichtigung indigenen Wissens und indigener Institutionen sowie eine Vernetzung und Zusammenarbeit mit der Zielgruppe, anderen Projekten, Forschungsinstitutionen, Geldgebern und politischen Entscheidungsträgern. Die Integrierung von kulturellen Werten und Traditionen der Bevölkerung als Instrument zur Wissensvermittlung ist ebenfalls von entscheidender Bedeutung, was insbesondere der Ansatz von HASHI-ICRAF verdeutlicht.

Probleme und Hindernisse allgemeiner Art sowie im Zusammenhang mit den Projekten werden ebenfalls analysiert; hierbei finden zusätzlich Ansichten von Experten und Expertinnen Beachtung. Insgesamt zeigt sich je nach Häufigkeit der Nennung eine unterschiedliche Bedeutung der Probleme: so werden einige negative Faktoren von Farmern und Farmerinnen in allen drei Projektgebieten und auch in allen Projektdokumenten genannt, andere sind nur von regionaler Bedeutung oder werden nur von den Farmern und Farmerinnen bzw. nur in den Dokumenten erwähnt. Die verschiedenen Ergebnisse der einzelnen Analysen werden in Kapitel 10 zu Em-

pfehlungen zur Verbesserung der Projekterfolge zusammengeführt; diese können auch als Richtlinien für andere Projekte, die in einem ähnlichen Kontext arbeiten, verwendet werden.

Es ist noch immer ungewöhnlich, Reflektionen über Felderfahrungen in Studien zu integrieren, die sich mit dem Management natürlicher Ressourcen befassen. Die Integration dieses Aspekts wird jedoch als sehr wichtig angesehen, da dies dem Leser hilft, die Umstände, unter denen die Datenerhebung stattfand, besser zu verstehen und mit den vielschichtigen Einflüssen in Beziehung zu setzen: Feldforschung im entwicklungsgeographischen Kontext findet oftmals in einer fremden Umgebung mit anderen soziokulturellen und naturräumlichen Gegebenheiten statt, die den Prozess der Datenermittlung beeinflussen. Entsprechend betrachtet Kapitel 11 die verschiedenen Einflussfaktoren, die hinter der reinen Datenerhebung stehen. Auch wird in diesem Kapitel die Feldforschungsmethode beleuchtet.

Im abschließenden Kapitel 12 werden Verbindungen zwischen einzelnen Ergebnissen verdeutlicht sowie übergreifende Aspekte genannt, in die die Projektaktivitäten eingebettet sind und die einen entscheidenden Einfluss hierauf ausüben, so z.B. der Landwirtschaftssektor, die gesetzliche Einbindung von Geschlechteraspekten, staatliche Strukturen, Weltmarkt oder Globalisierung. Es wird aufgezeigt, dass Maßnahmen zum nachhaltigen Management natürlicher Ressourcen von den jeweiligen örtlichen Gegebenheiten bestimmt werden; der Erfolgsgrad der hier untersuchten Bäuerinnen ist insgesamt abhängig von verschiedenen, miteinander verflochtenen ökonomischen, soziokulturellen, politischen und naturräumlichen Faktoren. Entsprechend lassen sich verschiedene Erfolgsebenen/~typen herauskristallisieren. Generell befinden sich die verheirateten Frauen in Führungspositionen in einer besseren Gesamtsituation als die alleinstehenden Frauen ohne leitende Positionen. Weiterhin üben erfolgreiche Farmerinnen und Farmer einen positiven Einfluss auf verschiedenen Ebenen auf ihre naturräumliche und soziale Umwelt aus und nehmen eine vermittelnde Stellung zwischen den Projekten und anderen, oftmals ressourcenschwachen Mitgliedern der Zielgruppe ein. Eine Berücksichtigung der generellen Empfehlungen sowie die Einbindung von innovativen und engagierten Farmerinnen und Farmern in Projektaktivitäten wird nicht nur zur Verbesserung des Erfolgsgrades von Projektinterventionen führen, sondern direkt zur Verbesserung der allgemeinen Lebenssituation der beteiligten Bevölkerung in der Projektregion beitragen. Es ist wahrscheinlich, dass positive Einflüsse selbst die regionale und nationale bzw. internationale Ebene durchdringen.

Fig. 3b illustriert Untersuchungskonzept und Struktur der Arbeit.

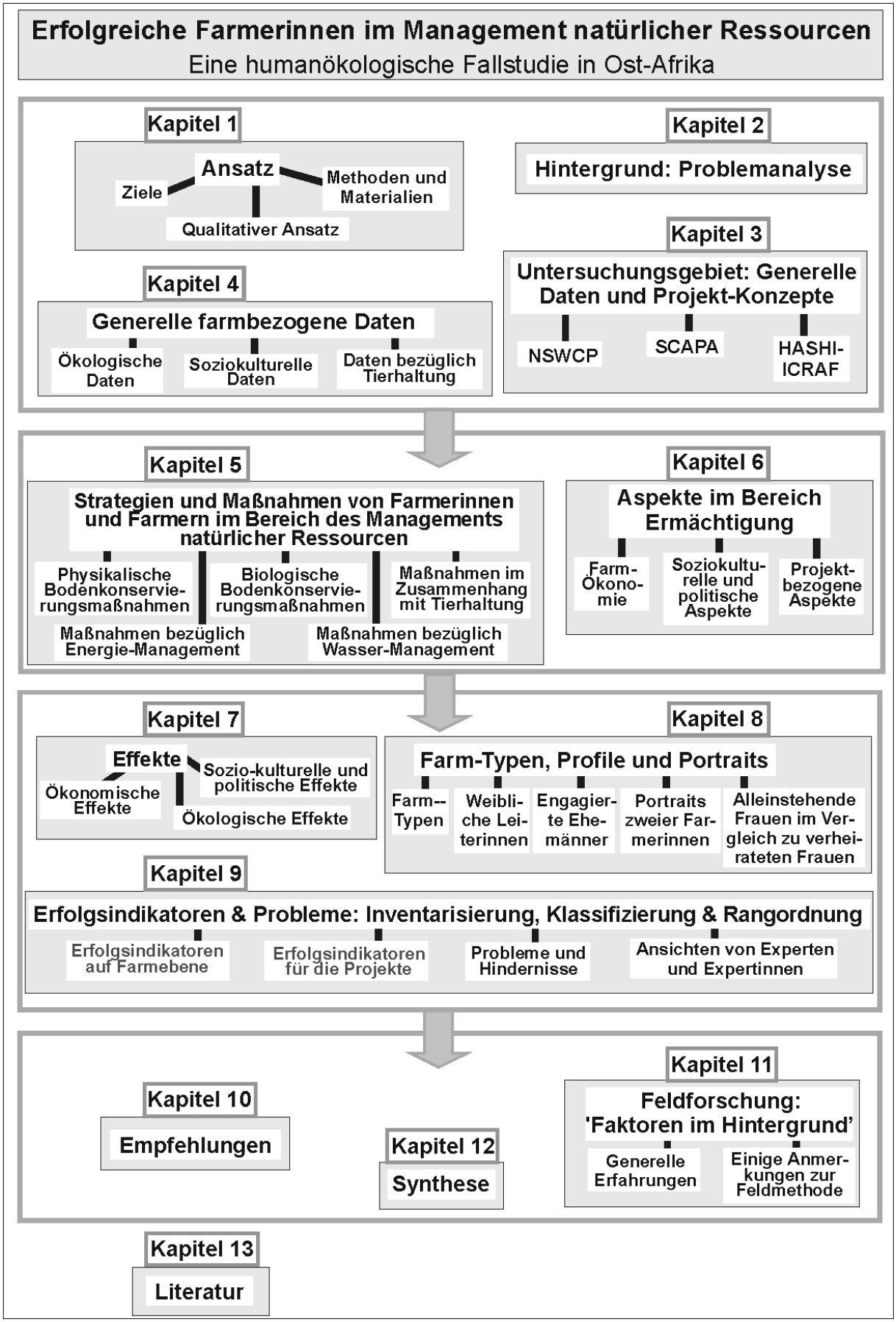

Fig. 3b: Untersuchungskonzept und Struktur der Arbeit

1 Approach: research design

> "Participatory learning and action research approaches at the grassroots combined with strategic research through comparative case studies are indispensable if International Agricultural Research is to achieve an impact in risk prone and diverse environments."
>
> PROBST et al. in their abstract on the development of a framework for participatory research approaches (2000: 186)

As the approach forms the basis for each study conducted aspects related to objectives, qualitative approach as well as methods and materials chosen are elucidated in this first chapter, embracing report on preliminary work and preparations, selection criteria and research questions as well as data collection and -analysis.

1.1 Objectives

"Women, let us move forward, we cannot go backwards." This motto and song of a women's group in Lubaga, Shinyanga District, Tanzania has been chosen also as motto for this study as it expresses motivation and power of women who take action to change disadvantageous situations as to livelihood conditions. This study elucidates various aspects related to farmer's livelihood strategies by means of 18 successful[1], partly female-headed small-scale farms in two project areas[2] in Tanzania and one in Kenya.

The different activities carried out by the successful (female) farmers within the context of natural resource management and related activities are assessed, analysed and illustrated. Interactions between these activities and their effects on the ecological conditions as well as on the quality of life of the selected families and their social environment regarding socio-cultural and economic aspects are demonstrated under special consideration of gender[3] aspects. Within this context, trickle-

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[1] The term ‚'successful' in combination with farmers or farmer's strategies refers to the aspect that the farmers respectively their strategies and activities are able to create or enhance ecological, economic and social stability in a general sense (for further details see chapter 1.3.2; see also JUTZI & BECKER 1995: 144).

[2] Initially, it has been planned to integrate another project in Kenya (*Community Mobilizaton Against Desertification* - C-MAD, Rongo, western Kenya), but due to several problems - amongst others the danger of an outbreak of the deadly virus disease *Ebola* in Kenya - the last field period had to be stopped. Nevertheless, some data and experiences can be included since I have paid a visit to this project and several farms in 1998.

[3] In the Anglo-American linguistic area the term ‚gender' refers to the historical-social aspect of feminity and masculinity and the relationship between men and women, in opposite to 'sex' as referring to the biological aspect (DSU 1995: 5; ANDORFER 1995: 52; NEDA 1997: 1). The way of defining gender is correlated to the historically grown system of social production within a society. Thus, gender roles are not based on the 'biological phenomenon' but on social structures (DAVISON 1988: 4-5; BRYCESON 1995: 38; BMZ 2000: 218; see also BOSERUP 1986: 15; BLUME 1998: 46).

down effects of the female farmers on their social environment are of particular interest. Additional data are collected through farm visits, informal meetings and discussions with members of women's/mixed groups, farmers and project staff, through farm sketches and interviews with experts. Furthermore, project concepts are evaluated pertaining to their approach and implemented measures. Moreover, field experiences are elucidated and made transparent for the reader. This study is conducted to contribute to an enhanced identification, evaluation and validation of project's and farmer's activities in the frame of the improvement of smallholder farming systems in general. The aims in detail are to

- compare farmer's strategies for a sustainable management of natural resources and the improvement of livelihood conditions after having carried out an inventory and classification of the measures and technologies applied,
- elucidate changes of the ecological, economic and socio-cultural living conditions of the female farmers and their families as well as their social environment, e.g. women's group members, neighbours, etc. due to the different activities,
- carry out a comparative analysis of female- and male-headed farms with special emphasis on the part of men within the development context,
- reveal 'spin-off'-, 'trickle-down'- and 'multiplicator-effects' of successful (female) farmers as well as women's- and mixed groups in the context of natural resources management,
- bring out local knowledge, traditional techniques and solution strategies of farmers, groups, schools, etc.: this study tries to enlighten and detect promising local strategies and show indigenous wisdom to overcome problems and constraints,
- identify success indicators being responsible for the success of the female farmers researched and which – at the same time – function as indicators for weaknesses. They can be used by the projects as a guideline to speed up the process of problem and solution identification,
- develop a farm typology distinguished by farm-related criteria,
- make an impact assessment of and evaluate the selected projects concerning theoretical and practical aspects (approach & measures),[4]

Gender roles are opposed to continuous changes through historical trends and ecological conditions, social structures, cultural definitions and economic interdependencies; hence, gender roles can be changed (DAVISON 1988: 5, DANKELMAN & DAVIDSON 1988: 8; DSU 1995: 6; BMZ 2000: 218). This also refers to lines of origin and genetic structures (BRYCESON 1995: 48-49). Consequently, the definition of man and woman in a respective historical period contributes to the gender-related division of labour in a given society, reflecting structures which can be of advantage and functional for all participants (DAVISON 1988: 4): „This differentiation is a source both of division and connection, exchange and cooperation between men and women in their combined efforts to meet household survival needs. [...] reproductive or household-maintenance activities are largely the responsibility of women"(MOFFAT 1992: 12).

[4] Besides the well-described positive aspects in project monitoring reports in general, it is widely known that, for instance, some soil conservation measures mean additional work for the farmers, especially when it comes down to female-managed households (see e.g. CHAVANGI 1998: 12).

- evolve a concept/catalogue with recommendations for the improvement of existing strategies and concepts respectively for the implementation of new projects,
- develop, examine and use new respectively improved methods of field-research, especially with regard to the qualitative approach based upon the method of participant observation, the integration of field experiences and the claim of a transdisciplinary and integral approach,
- contribute to knowledge exchange on two levels:

a) inter-cultural exchange and mutual understanding through interaction between researcher and target group (see also Fig. 4): ”Neither rural people nor outside scientists can know in advance what the others know. It is by talking, travelling, asking, listening, observing and doing things together that they can most effectively learn from one another” (CHAMBERS 1983: 246). It is part of the participatory-oriented approach that persons contacted have the possibility to ask questions and by this receive e.g. background information on the research, the researcher, etc., contrarily to a one-sided approach of ‘just collecting data from informants’ (see e.g. KRAMER et al. 1979: 27; DHAMOTHARAN & BECKER 2000: 4). Furthermore, this study attempts to give voice to the people on which research is carried out and to develop a participatory bridge between the researcher and the researched in order to empower them and their social organisations (OLESEN 1994: 167; STANSFIELD 1994: 176, 183).

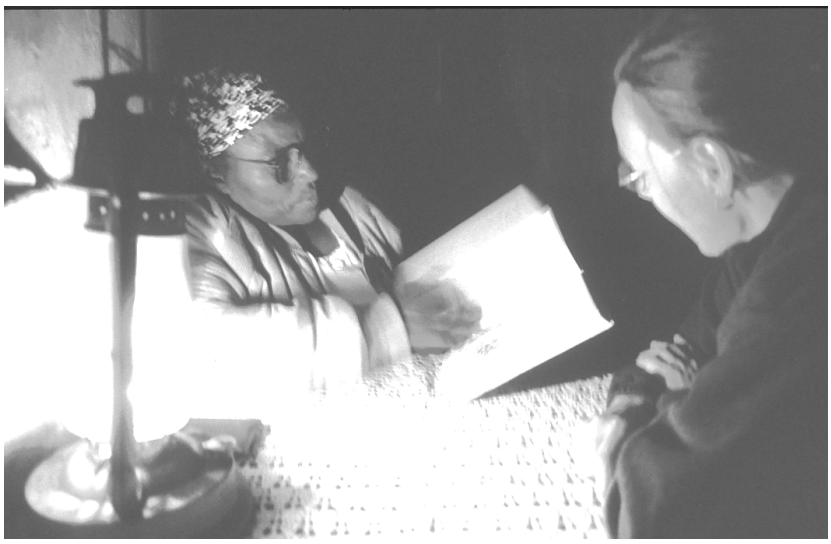

Fig. 4: Participant observation not only implies the aspect of collecting data through a close interaction between the participants and the researcher, but also intends to contribute to mutual understanding

b) Assessment of different projects and the involvement of different groups of ‘knowledge-holders’ (farmers, project staff, external experts); this step is fundamental for the achievement of innovations and improvements. The outcomes of this research are meant to be useful for practitioners and policy-makers in general: „Systematic knowledge generated by research is an important and necessary component in decision-making process. Further, it is fair to note that there is seldom enough research-based information available in the policy arena“ (RIST 1994: 547).

This study complements ongoing work of the selected projects; SCAPA and HASHI-ICRAF even have called for research to support problem analysis and development of solution strategies; e.g., HASHI-ICRAF mentioned the very little expertise in social sciences and the need for collaboration with M.Sc. and Ph.D.

students (URT 1998: 43). The study contributes to the overall goal of the National Forest Policy of Tanzania which is to "[…] enhance […] the sustainable development of Tanzania and the conservation of her national resources, for the benefit of present and future generations" (URT 1998: 1). Furthermore, this research concentrates on (traditional) land use characterisation and evaluation as well as assessment and documentation of socio-economic impacts of project activities to provide the necessary information needed for technology development which belongs to the major project activities (see e.g. OTSYINA et al. 1998: 75; URT 1998: 42). Moreover, the report will be distributed to different projects, organisations and institutions with the intention that the farmers of Tanzania and Kenya and their natural environment directly benefit from this research, also with regard to the critic on the maldistribution of processed knowledge products (see e.g. STANSFIELD 1994: 176). Over and above that, the study's results are not only of relevance to the selected (project) areas but are likely to be applicable to other parts of Kenya and Tanzania, Africa or even comparable regions in other parts of the tropics ('external validity' - see BORTZ & DÖRING 1995: 52-53; SILVERMAN 2000: 263). The essence can be summarised with DE GROOT et al. (1992: 9): "If any single lesson stands out from experience to date, it is the necessity of basing [...] efforts on learning from the field - from other projects, from successive iterations of project activities and, most importantly, from the local people who are intended to participate in, and benefit from, such projects."

This study wants to elucidate ongoing (and proposed) activities and contribute to networking to avoid duplication of effort; these aims shall be reached also by promoting and encouraging efforts on new research methods in order to understand local, regional and global implications of land use. Data, models, techniques and insights obtained through own research as well as activities at larger scales (projects, institutions, etc.) are made available for further research and the implementation of solution strategies.

Experiences of the past decades have shown the necessity of transdisciplinarity and complex concepts within research and development planning to fully address interconnections among the different aspects involved (ROCHELEAU et al. 1988, BARROW 1996). Meanwhile, international centres on agricultural research like the CGIAR slowly show a changing attitude towards this theme (BECKER 2000). Consequently, also this study is based on an transdisciplinary and integral approach as natural resource management is a complex subject; therefore, as many viewpoints and factors as possible have been integrated: various issues are taken into account and addressed under consideration of socio-cultural, ecological, economic and political aspects on different levels (local, regional, international) for the assessment of problems and potentials in the field of sustainable natural resources management (see also chapter 1.3.4.2). BRADLY (1991: 292) explains: "A more expansive or holistic orientation ranges more widely, encompassing concerns that may not necessarily be of immediate or technical relevance, but that may have more profound significance for the development programme as it subsequently unfolds."

Several studies have shown that solution strategies for sustainable land management need an analysis integrating as many facets as possible (see e.g. WASWA et al. 2000: 181-189). After the authors, sustainability depends on the ability of people to perform effective integrated research and the subsequent implementation of recommendations and policies (ibid.: 187). After MANSHARD & MÄCKEL (1995: 23, 30), especially differentiated small-scale analyses need to take geo-ecological as well as socio-economic, cultural, political and historical aspects into consideration. Especially, traditions and their development during time e.g. through external impacts, can have a profound influence on development processes and the effective implementation of project measures (see e.g. SHISCAP 1992: 1). "Technical change can rapidly occur, cultural change is a much slower process (ibid.: 2). In order to master this complexity, four dimensions of analysis can be distinguished: theoretical-analytical, empirical-descriptive, normative-political and institutional. The thought of STANSFIELD (1994: 185) that "[…] qualitative methods epistomology [should] be grounded in holistic rather than fragmented and dichotomized notions of human beings" is tried to be incorporated as basis for the research approach. HUXLEY (1999: 18) concludes that improvements in land management are likely to come about only through a multidisciplinary, integrated approach. Working in this way encourages us to appreciate and accommodate other points of view and to contribute to a holistic solution that is more likely to support and sustain the wellbeing of the people whose existence and livelihood crucially depends on good land management (see also SHAO et al. 1992: xii).

This study is the attempt of a new approach with respect to empirical field research studies on natural resource management since it

- is based on case studies and applies the method of participant observation; by this it contributes to inter-cultural exchange and interaction,
- has a transdisciplinary and integral approach, thus, tries to combine research on and analysis of ecological, economic, socio-cultural and political issues on different levels,
- focuses on transparency, which means
  - sharing results with all partners involved,
  - additionally to the common practice of the mere presentation of data to elucidate and make transparent field experiences,
- contributes to knowledge exchange through a) examining and comparing different projects and b) distribution of the study to a wide range of institutions to support sharing of results and exchange of ideas and by this to contribute to the enhancement of success.

Such kind of research is badly needed, not only for to receive additional data on a qualitative basis to widen the quality of data integrated in plans for the improvement of concepts (see e.g. CHAVANGI 1998: 72), but also in the context of inter-cultural exchange as against to a one-sided data collection (see a. o. TÜTING 1990, BLISS

1990, 1994). Information on these aspects are until today hardly to be found in the context of research on natural resource management. It is time to make a trial.

This study focuses on a multiple-method approach; methods, material and themes will be described in chapter 1.3.

1.2 Qualitative approach

> "Qualitative research is oriented towards analysing concrete cases in their temporal or local particularity, and starting from people's expressions and activities in their local contexts."
>
> U. FLICK in his book on qualitative research (1998: 13)

In general, a qualitative approach for the assessment of most of the data has been chosen because quantitative techniques like interviews, experiments or statistics are inappropriate to the basic research aims and questions as "they exclude the observation of behaviour in everyday situations" (SILVERMAN 2000: 7). CHAVANGI (1998: 72) underlines that in some cases, participatory learning approaches and techniques are recommended, rather than e.g. conventional questionnaire survey methods. STRAUß (1994: 28) mentions: „Auf jeden Fall sind qualitative Analyseverfahren mehr als nur nützlich: sie sind oft unentbehrlich." A qualitative approach, thus working with case studies, serves the possibility to collect more detailed and specific data on specific subjects like female-headed households, ecological conditions, (indigenous) resource management systems, etc.[5] Besides this, the complex and process-oriented elements of this research cannot be assessed through normative data collection (only); instead/additionally, flexible and situation-adequate methods are needed. Subject of analysis forms the social individual being whose behaviour and acting has to be understood; phenomena and motivations cannot be described and explained by quantitative-empirical methods, based on a natural science model (see also LAMNEK 1995: 10, 14). Many questions to be answered are of a qualitative nature: "Indicators are easy to define when they are objectively verifiable measures of facts and events [...]. It is more difficult if the context is more qualitative [...]"(BARROW 1996: 211).

The research approach helps to find causal relationships since it integrates an analysis of „[...] local processes underlying a temporal series of events and states, showing how these led to specific outcomes [...]. In effect, we get inside the black box; we can understand not just that a particular thing happened, but how and why it happened" (HUBERMAN & MILES 1994: 434).

[5] For instance, within the context of IFOAM, a study which started in 1996, is carried out on sustainability in Africa, Asia and Latin America on the basis of a comparative analysis of different (organic, conventional and traditional) farms (see WITTE 1998).

This study is based on the belief that viewpoints of selected actors have to be recorded in order to understand interaction, processes and changes and find answers as to special issues like problems and potentials within natural resource management (see also STRAUß 1994: 30). SILVERMAN (2000: 83) mentions: "[...] we need to recognize that case studies, limited to a particular set of interactions, still allow one to examine how particular sayings and doings are embedded in particular patterns of social organization."

A description of qualitative research, its pros and cons, will be given in the following.

Qualitative research is difficult to define since this term embraces partly very heterogeneous approaches; thus, it is not based on a unified theoretical and methodological concept (LAMNEK 1995: 39, 41-42; FLICK 1998: 7, 16).[6] DENZIN & LINCOLN (1994a: 4) note that "[…] qualitative research, as a set of practices, embraces within its own multiple disciplinary histories constant tensions and contradictions over the project itself, including its methods and the forms its findings and interpretations take." As FLICK (1998: 7) outlines, the variety of different approaches within qualitative research is due to different lines which developed in the history partly in parallel and in sequence.

After PUNCH (1994: 84) "Qualitative research covers a spectrum of techniques – but central are observation, interviewing, and documentary analysis – and these may be used in a broad range of disciplines." Not only questions about 'what' are of interest, but of 'how', too (LAMNEK 1995: 130). The central aspect is that objects are studied in their complexity and entirety within their everyday context; practices and interactions of subjects in everyday life are the fields of study (FLICK 1998: 5). Generally, qualitative research emphasises the approach to reality via subjective interpretation and interpretative processes (FLICK 1991: 213); the socially constructed nature of reality, the intimate relationship between the researcher and what is studied as well as the situational constraints shaping inquiry are underlined (DENZIN & LINCOLN 1994a: 4). Primarily, patterns of action and interpretation, applying to the collective, are of interest ('the constitution process of reality - LAMNEK 1994: 18-19, 23-25). Qualitative research regards data collection as a process of social interaction and communication between researcher and participant; production of information determined by the situation (and not being normative) has to be incorporated in the interpretation. Qualitative research sees itself as hypotheses-generating method, implying that the

[6] NELSON et al. (1992: 4) define qualitative research as follows: "Qualitative research is an interdisciplinary, transdisciplinary, and sometimes counterdisciplinary field. It crosscuts the humanities and the social and physical sciences. […] It is multiparadigmatic in focus. Its practicioners are sensitive to the value of the multimethod approach. They are committed to the naturalistic perspective, and to the interpretive understanding of human experience. At the same time, the field is inherently political and shaped by multiple ethical and political positions.

Qualitative research embraces two tensions at the same time. On the one hand, it is drawn to a broad, interpretive, postmodern, feminist, and critical sensibility. On the other hand, it is drawn to more narrowly defined positivist, postpositivist, humanistic, and naturalistic conceptions of human experience and its analysis."

researcher should be as open as possible to new development and dimensions ('principle of openness'; see also BECKER & GEER 1979:162; FLICK 1998: 5-6). Consequently, whether findings are grounded in empirical material and whether research methods have been appropriately selected and applied to the object under study are central criteria in qualitative research (FLICK 1998: 5). Furthermore, part of the process of knowledge production is the reflection of the researcher on the research (ibid. 4; LAMNEK 1995: 25-26); self-reflection and self-critic, exploration and inspection are imperative to come to an as unbiased attitude as possible (LAMNEK 1995: 48, 66).[7] DENZIN & LINCOLN (1994b: 199) summarise the skills of qualitative researchers as follows: "Qualitative researchers self-consciously draw upon their own experiences as a resource in their inquiries. They always think reflectively, historically and biographically. They seek strategies of empirical inquiry that will allow them to make connections among lived experience, larger social and cultural structures, and the here and now. These connections are forged out the empirical materials that are gathered in any given investigation."

Critics about the hidden dangers of a qualitative approach are manifold like on the factors reliability, validity (adequacy/credibility) and objectivity of data, ('anecdotalism'), being unscientific or only exploratory, entirely personal (since often only relying on one person's portrayal), unreliable (through problems of subjectivity and objectivity), impressionistic and full of bias (HONIGMANN 1983: 82-83; DENZIN & LINCOLN 1994a: 4-5; PUNCH 1994: 84; OLESEN 1994: 165; JANESICK 1994: 215; SILVERMAN 2000: 9-11, 91, 175-189).[8] On the other hand, the value of qualitative research in e.g. bringing out detailed data on special issues is being stressed (see e.g. ROBSON & FOSTER 1989: 124). It is said to "[...] provide a 'deeper' understanding of social phenomena than would be obtained from purely quantitative data" (SILVERMAN 2000: 8; see also LAMNEK 1995: 4).[9] OLESEN (1994: 165) explains that from a viewpoint of

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[7] „*Exploration* bedeutet die Untersuchung eines fremden Lebensbereiches im Rahmen einer flexiblen und reflexiven Vorgehensweise, indem Ergebnisse über Einzeldaten und deren Zusammenhänge sowie die methodischen Schritte zu ihrer Gewinnung und Überprüfung ständig reflektiert und im Laufe des Untersuchungsprozesses korrigiert werden können. [...] Die Exploration erfordert vom Wissenschaftler das Bemühen um ein vorurteilsfreies und sensibles Sich-Einlassen sowie die Bereitschaft, eigene zu überprüfen und ggf. abzuändern" (LAMNEK 1995: 48).

„Die *Inspektion* [...] ist eine analysierende Tätigkeit, die die Exploration überlagert" (LAMNEK 1995: 49). [Inspektion ist eine] [...] intensive, konzentrierte Prüfung des empirischen Gehalts aller beliebigen analytischen Elemente, die zum Zwecke der Analyse benutzt werden, wie auch eine entsprechende Prüfung der empirischen Beschaffenheit der Beziehungen zwischen solchen Elementen (BLUMER 1973: 126).

[8] JANESICK (1994: 215) criticises the preoccupation about selecting and defending methods as *methodolatry*, a slavish attachment and devotion to method and an obsession with the trinity validity, reliability, and generalisability. According to her, this is just another way to move away from understanding the actual experience of participants in the research project. She advises that the researcher in the final stage of writing up should immediately focus on the substance of the findings.

[9] Criticisms on and positive aspects of quantitative and qualitative research can be found in SILVERMAN (2000: 5-11), CUBA & LINCOLN (1994: 105-117) and LAMNEK (1995: 6-30). The opinion of SILVERMAN (2000: 12) that "[...] doing qualitative research should offer no protection from the rigorous, critical standards that should be applied to any enterprise concerned to sort 'fact' from 'fancy'" is supported.

qualitative feminist research the term 'bias' is not only misplaced but, to the contrary, can be used as a resource evoked to guide data collection or creation as well as for understanding own interpretations and behaviour in the research field, if the researcher is sufficiently reflexive about her project. Furthermore, intersubjectivity between researcher and participant and mutual creation of data is assumed; also the factor experience has to be seen critically (OLESEN 1994: 166-168).

This also includes that the researched are not regarded as research-objects' but as active, competent and equal partners of interaction within the research process; they are 'experts' concerning the research questions (LAMNEK 1995: 15). As to objectivity it simply can be stated that objectivity does not exist (see also chapter 11.1). Every answer given and every action taken reflects the interpretation and definition of the reality by the subject/actor. The view on reality depends on the perspective taken, and a change of perspective changes what is defined as 'real' (see also LAMNEK 1995: 23-24, 198-199). FLICK (1998: 6) even goes further: "The subjectivities of the researcher *and* of those being studied are part of the research process."

It has to be emphasised that polarisation or dichotomism of qualitative respectively quantitative research methods ('oberflächliche Fliegenbeinzählerei versus essayistisches, vorwissenschaftliches Vorgehen' - see LAMNEK 1995: 41) is regarded as a dangerous phenomenon since it prevents learning from another and is only a contribution to the increase of an absolutely unnecessary gap (see also GLASER & STRAUß 1975: 17; FLICK 1998: 40; SILVERMAN 2000: 11-12). Like HAMMERSLEY (1992: 163) expressed, our decisions on which methods to choose should not depend "[...] on ideological commitment to one methodological approach paradigm or another." Instead, "[…] the object under study is the determining factor for choosing a method and not the other way round" (FLICK 1998: 5).

Meanwhile, it is widely accepted that no method or theory has a privileged place or can make a universal and general claim to authoritative knowledge (see DENZIN & LINCOLN 1994a: 2). On the contrary, a combined use of both paradigms is possible and recommended (LAMNEK 1995: 41; ZELDITCH 1983: 168). Qualitative data can form a valuable supplement to data collected through a quantitative approach and vice versa as to widen the quality of data integrated in plans for the improvement of concepts. The assessment has to be as precise and detailed as possible; the more and detailed the data the better solution strategies can be evolved (see e.g. CHAVANGI 1998: 72). Consequently, attention should be paid to the intellectual integration of the two traditions in the interest of the improvement of research strategies (SIEBER 1983: 188). The author concludes (ibid.: 187): "The integration of research techniques within a single project opens up enormous opportunities for mutual advantages in each of three major phases – design, data collection and analysis."

One of the decisive benefits and strengths of a qualitative research design is that it often allows for far greater flexibility due to its explorative approach than most quan-

titative research designs which can improve generalisability/extrapolation of findings (LAMNEK 1995: 27-29; FLICK 1998: 5; SILVERMAN 2000: 108, 110-111): „Ein sehr zentrales und in jeder Phase der Forschung zu berücksichtigendes Prinzip ist die grundsätzliche Offenheit und Flexibilität, um die sozialen Akteure in deren Sicht und in deren natürlicher Lebenswelt zu erfahren“ (LAMNEK 1995: 196).

Several ways have been applied to overcome problems of criticism as to reliability of methods chosen and validity of conclusions made after SILVERMAN (2000: 175-189):

- triangulation
- respondent validation
- application of principle of refutability
- application of comparative method
- comprehensive data treatment
- inclusion of deviant-case analysis
- use of appropriate tabulations “[...] to survey the whole corpus of data ordinarily. [...] the reader has a chance to gain a sense of the flavour of the data as a whole. In turn, researchers are able to test and to revise their generalizations [...]” (SILVERMAN 2000: 185)

HONIGMANN (1983: 83) reports that restudies of the ‘same’ culture have shown that the studies fulfil to the current standards of ethnographic reliability. On the question ‘why does it work’ the author writes: “A general answer holds that a common culture is reflected in practically every person, event and artefact belonging to a common system. […] It is with such consistencies and comparable aspects abstracted from the sample that we build up an integrated picture of the culture. […] If the system is composed of subgroups, then such subgroups are sampled for whatever information they can contribute concerning the whole system.” This statement also refers to the debate on selection criteria in chapter 1.3.2.

There is also a general and legitimate critic on the fact that traditionally, research is carried out by researchers of a traditional dominant status (white, usually male). Consequently, there is a plight for an incorporation of indigenous researchers since “[…] those researchers emerging from the life worlds of their “subjects” can be adequate interpreters of such experience” (STANSFIELD 1994: 176). The author (ibid.) argues that autobiographies, culture as well as historical contexts of the researcher matter since they determine what a researcher sees or does not see, as well as his/her ability to analyse data and disseminate knowledge adequately. He further sets out (ibid.: 180) that white women have been and still continue to be underprivileged and discriminated in comparison with white males in structures and processes of knowledge production, but that “[…] they have always enjoyed more political weight and access privileges than have women of color and people of color in general.” Concerning the critic of ethnocentricm, STANSFIELD (ibid.: 176-177) mentions: “The tendency, for Western researchers to impose even their most enlightened cultural constructs on Others rather than creating indigenized theories and methods to grasp the ontological essences of people of color is […] legendary. When it comes

to qualitative research as an academic enterprise cutting across disciplines, the sociocultural and politic hegemony of Eurocentric interests and ontology is quite obvious." The author concludes that the socialisation processes in populations of colour have not been understood properly (ibid. 181). White researchers should re-identify their roles as not only being knowledge creators but having the responsibility to forge links between the so-called 'Western' and 'developing countries' through

- knowledge dissemination in their home countries as well as distributing their knowledge products to as many people, institutions etc. working in this field as possible, especially in the countries where research has been carried out and
- trying to support indigenous researchers to engage in their own interrogative efforts through different forms of participatory action, evaluation research, linking them up with institutions in the so-called 'Western countries', fund-raising, etc.

1.3 Methods and materials

> "[...] methods, are specific research techniques. These include quantitative techniques, like statistical correlations, as well as techniques like observation, interviewing and audio recording."
>
> D. SILVERMAN in his book on qualitative research (2000: 79)

In a summary, the following steps have been undertaken (see also JANESICK 1994: 211-212):

- outlining of questions
- contacting institutions, experts, project leaders, ministries, etc.
- selection of site and participants
- selection of appropriate research strategies
- theoretical background
- timeline for the study
- access and entry to the site; agreement with participants

1.3.1 Preliminary work and preparations

During my childhood I have spend a lot of time on the farm of my grandparents who maintained an integrative and sustainable land management system with trees, crops, flowers and animals. Furthermore, between the age of 3 and 17 me and my parents used to spend almost every weekend and every holiday between April and approx. mid of October in a tent, amongst others in my grandparent's garden. Later, I tended my own vegetable garden and small tree nursery and gathered experiences on organic farming and tree nursing on other farms as well. This means that I am not only familiar with integrative land management strategies like agroforestry but I am used to ‚simple' life, too (no electricity, water from a well, earth closet, cooking with fire, etc.).

A precondition for carrying out this field research is knowledge about the lingua franca Kiswahili for being able to communicate with the people since relying on an interpreter means becoming "[...] vulnerable to an added layer of meanings, biases and interpretations that may lead to disastrous misunderstandings" (FONTANA & FREY 1994: 367; see also SHAO et al. 1992: 23). Besides this, it would not have been possible to integrate an interpreter. Within this approach the "[…] main instrument of […] investigation is the researcher, who has to learn the social language, live among the people and participate in their activities […]" (BURGESS 1983a: 1).

Furthermore, I can fall back upon the experience of several (long-time) research stays in both countries. Additionally, I stayed in several families in various parts of Tanzania before and gained experience in this field since 1991. Thus, I am familiar with the socio-cultural, economic, ecological and political circumstances, furthermore, several personal contacts exist in both countries.

A fundamental part of the preparations was made up by a review and survey of literature related to natural resources management, gender, field methods, development strategies, etc. Most of the secondary literature was obtained from libraries of different universities, documentation centres, ministries, development agencies, national and international organisations and project offices. The literature includes international specialist literature, theses, project documents, reports, etc.

A literature review and survey is important to become familiar with the subject, with what has been done already and with the 'state of the art' (MORSE 1994: 221); furthermore, it functioned as a basis to stimulate theoretical sensitivity like checking out concepts, etc. against own ideas, to provide secondary sources of data, to help to draw up the different questionnaires, to direct theoretical sampling, for theorisation and conceptionalisation used in writing up the study, and as supplementary validation (see also SHAO et al. 1992: 16; SILVERMAN 2000: 191-200 [after STRAUß & CORBIN 1990: 50-3]).

The next step to be taken was to outline a research concept and to contact different projects for the selection of host organisations for to carry out research. In October/ November 1998 (partly, visits have been repeated) the following pre-selected projects in Kenya and Tanzania have been visited:

- C-MAD (*Community Mobilization against Desertification*), Rongo/Kenya, (1998, 1999, 2000)
- SACDEP (*Sustainable Agriculture Community Development Programme*), Thika/ Kenya, (1998)
- KARI/NARP II (*Kenya Agricultural Research Institute / National Agricultural Research Project II*), Maseno/Kenya, (1998)
- FSR Lake Zone (*Lake Zone Farming Systems Research*), Mwanza/Tanzania, (1998)
- NWSCP (*National Water, Soil & Conservation -Project*), Kisumu/Kenya, (1998)

- KIHATA (*Tanzanian Society of Organic Farming*), Morogoro/Tanzania, (1998)
- TESCO (*Tanzanian Environment and Soil Conservation Organisation*), Morogoro/ Kenya, (1998)
- CBDN (*Caritas Netherlands - Kenya/VPO Programme*), Nairobi/Kenya, (1998, 1999, 2000)

The following projects have been visited also before taking the doctor's degree respectively during the field research period:

- CARE International, Nairobi/Kenya, (2000)
- Welthungerhilfe (German Agro Action), Nairobi/Kenya, (2000)
- SECAP (*Soil Erosion and Agroforestry Project*), Lushoto/Tanzania, (1991, 1995)
- SCP (*Selous Conservation Programme*), Dar-es-Salaam/Tanzania, (1991)

In the frame of these visits (since 1998) discussions on project issues, own research aims and related subjects have been held with project staff. Material (project documents, research reports, newsletters, etc.) has been screened and collected. Furthermore, a huge number of farms has been visited together with extension officers; short interviews have been held with farmers as a pretest for the question guidelines. Moreover, several group meetings (mixed groups, women's groups, conservation committees) have been attended and discussions held with the group members. Additionally, training and workshops on gender and agroforestry, improved cooking stoves and tree management have been attended. After the field visits short presentations of impressions and conclusions drawn have been presented on project meetings, partly attended also by local or even national policy-makers. Visits have been paid to different representatives and experts (in Kenya, Tanzania, Germany, the Netherlands, Norway and Sweden) from ministries, universities, research institutions (e.g. ICRAF), international development aid agencies (SIDA, NORAD, GTZ) and political organisations (e.g. FES-offices in Nairobi and Dar-es-Salaam).

The previsit has been conducted to collect first impressions and data on the natural environment as well as on economic, socio-cultural and institutional aspects. It has also been undertaken to become familiar with the field, the organisations, the planning of the concrete research in the field and for defining my role as observer, participant and researcher. Furthermore, the pretest was necessary for the finding of hypotheses as well as for the revision of the question guideline respectively questionnaire (see also FRIEDRICHS & LÜDTKE 1973: 52).

The data collected during these visits have been evaluated and been brought into the design of a question guideline and questionnaire used in the field.

Subsequently, the responsible governmental institutions have been contacted on account of a research permit for both Kenya and Tanzania.

After these preparations, the concrete field research started, divided into two field periods: the first research has been carried out between October 1999 and February

2000, the second between October and December 2000. The field research periods started with contacting various authorities like governmental institutions (ministries, district- and village offices → e.g. District Commissioner, village elders, etc.), for self-introduction, official reasons like obtaining research permits and other necessary documents as well as for the collection of information.

Field meetings and discussions have been held with project staff and women's/mixed groups for the detailed planning of the farm stays, logistic aspects, etc. Afterwards, families for the farm stays have been selected before the phase of on-farm data collection started while living with the particular families. During the whole field research period there was contact to project staff and extension officers from the ministries. Also, group meetings and local authority meetings have been attended.

1.3.2 Selection criteria → research questions and sampling

> "In short, sampling in field research involves the selection of a research site, time, people and events."
>
> R. G. BURGESS in his field manual (1983d: 76)

First of all, there is a reason for concentrating on local successful management strategies in Africa: Still, the view on Africa – not only amongst the youth – is full of biases and clichés/stereotypes so that a lot of educational work has to be done (see e.g. FES 2001: 50). This view is kept alive through mass-media reports who almost exclusively focus on poverty, genocide, natural hazards, diseases and other problems or – in contrast – only on the beauty of the nature and indigenous people, still resembling the romantic view on the 'wild within their wilderness' as representing pure innocence. Hardly can reports be found trying to spread a more balanced view on Africa. The simple daily life has its constraints, of course, but its potentials, too. Solution strategies for livelihood and natural environment improvement are manifold and have to be brought to the public in the so-called 'Western countries' to create awareness and – more important – to demonstrate that there is hope and that there are activities going on. The people not just sit down in agony without the intention to change their situation.

I decided to work in East-Africa due to own skills and experiences linked to that region: I have already spoken Kiswahili – a prerequisite for such kind of research - and have almost spend a year in Tanzania and Kenya, a. o. within the context of a university excursion, before starting my fieldwork. Not at least, I have written my thesis (Magistra Artium) about women's roles within projects for a sustainable conservation of natural resources in Tanzania and wanted to get closer to the subject by choosing a broader approach. I have decided to select two countries in a comparable ecologi-

cal and socio-cultural region[10] – and I have chosen Tanzania and Kenya simply because I believe that the more experience one has got in a chosen country/area the better one can cope with the situation; choosing two countries enables a comparison of regions across political borders and by this to assess and analyse similarities as well as differences with regard to environmental (and economic, socio-cultural and political) aspects; the selection of in total three projects makes it possible to compare different approaches in different regions, supporting knowledge exchange. The projects selected are governmental projects supported by foreign donors; one project works close together with an international research institution. It was the intention to include also a non-governmental project, but due to the Ebola outbreak in Uganda in October 2000 I had to cancel the fieldwork in that project since it was close to the Ugandan border.

The selection criteria show the underlying idea of *comparison* within this research approach. Comparison allows to look at a subject from a broader perspective. This supports problem and potential identification and the outlining of recommendations and solution strategies. The two main selection criteria for the projects are:

- They are based upon a participatory approach sensitive to gender issues.
- Integration and propagation of environmental sound technologies like biological (agroforestry, organic farming, etc.) and physical (terraces, dams, etc.) soil and water conservation measures.

Strictly speaking, the first point integrates two themes: participation and gender. The importance of gender has been described in chapter 2. Problems of the exact definition of participation have been elucidated widely (see e.g. BLUME 1998). BARROW (1996: 189-190; see also p. 197; STÅHL 1992: 5) describes the meaning of participation as follows: “Involving people in their own development has serious implications for research at all levels. Real participation means active involvement of people at all levels of planning, decision-making and implementation for development and research.“ The failure to develop capacities of individual land users for problem solving is the root cause to the failure of strategies. Only participatory approaches are able to detect farmer’s divergent priorities and to diagnose and prioritise e.g. land degradation problems. External actors (donors, projects, governments, etc.) ideally only act as facilitators of the ensuing people driven development processes and pro-

[10] Since November 1999 Kenya and Tanzania are together with Uganda initiators of the *East African Community* (EAC) for the strengthening of the East-African cooperation on the regional level with the aim of political and economic integration. Furthermore, Tanzania is member of the *Southern African Development Community* (SADC) since 1992, a confederation with the aim of creating a common market (BMZ 2000: 303). After the 1998 estimation, Tanzania belongs to the 48 *least developed countries* (LDC) (BMZ 2000: 294-296) and is one of the *Heavily Indebted Poor Countries* (HIPCs)(BMZ 2000: 236). Kenya is since 1998, due to different factors like corruption, ethnic conflicts, decline of tourism and natural hazards within the state of an economic and budgetary crisis (BMZ 2000: 93).

grammes (WASWA et al. 2000: 181, 185-186; see also PENDER et al. 2001: 118).[11] The search for better systems for indigenous participation and cooperative management of resources is urgently to be increased (BINNS 1997: 405).

The last criterion has been integrated because the study focuses on problems and potentials of a sustainable management of natural resources.

A multiple case approach has been chosen since „[...] looking at multiple actors in multiple settings enhances generalisability; the key processes, constructs, and explanations in play can be tested in several different configurations. And each configuration can be considered a replication of the process or question under study“ (HUBERMAN & MILES 1994: 435). The danger that these „[...] multiple cases will be analyzed at high levels of inference, aggregating out the local webs of causality and ending with a smoothed set of generalizations that may not apply to any single case“ (ibid.) has been taken into account. Like the authors say, the tension is that of reconciling the uniqueness of an individual case with the need to understand universal, generic processes being at work across cases. But, although each case has its own history, it is embedded in a wider context, and there are general principles influencing its development (ibid.). They can only be found through comparing and analysing different cases under consideration of other actors and through applying a multiple methods approach.

The approach of farming systems research (FSR) which addresses the whole complexity of the production system started in the mid 1960s and has at least, despite criticism like being time and labour intensive, successfully promoted the idea of a multi-disciplinary approach. Later on, shifts occurred, putting more emphasis on social aspects like indigenous knowledge, reproduction, etc. (BRADLEY 1991: 290-296). The author summarises (ibid.: 294): “FSR is a complex and rigidly-adhered-to set of methods, which are applied whatever the circumstances. In effect FSR represents a broad and flexible approach to agricultural research, but with some consistent perspectives and elements.” T’HART (1992: 9) describes FSR as follows: “Within FSR the farm is seen as a complex system of crops, animals and people, and FSR tries to understand the problems on the different levels. FSR looks at the strategies of farmers and at their motives behind the strategies. Furthermore, it tries to understand the management of farmers. FSR is farmer-based, which means it is or should be based on experience, knowledge and problems of farmers” (see also HYUNA 1989: 9-10).

The decision to carry out a farming system analysis, thus working with rural households, derives from the fact that we can only understand mechanisms of adaptation, adoption and rejection of project measures if we go down to the level of implementation: the farm unit. Like BARROW (1996: 190) asks: “After all, who possesses all the

[11] WASWA et al. (2000: 187) conclude that to come to sustainable land management in rural agroecosystems problems, needs and priorities need to be targeted through community capacity building (CCB).

detailed local knowledge of species, uses and niches? Who knows the application of research technologies in terms of labour, gender and fit? Who decides whether a technology is adopted, adapted or rejected?" HUXLEY (1999: 33) notes: "A macro-diagnosis and design can be pursued at different scale levels, but it is best operated at that of the individual farm." An analysis on farm-level is the only way to detect and understand 'reasons behind', and many different reasons can be involved such as strong risk aversion, revealed by a study on Benin (BRÜNTRUP 2000; see also BAUM 1995: 43-44), mistrust in own capabilities to react on processes regarded as natural, preference on short-term benefits like immediate improvement of productivity or simply lack of time and labour force (STÅHL 1992: 6; BAUM 1995: 41-42; HUXLEY 1999: 38, 82, 285). There have even factors been named like farmers' ignorance or laziness' – as a study shows for Ethiopia (BOGALE 2000); HUXLEY (1999: 33) warns: "We have to be certain that *our* knowledge about the possible benefits are not outweighed by factors that only the farmer knows about." The study tries to shed light on this biased view and to contribute to a more detailed view through carrying out an analysis on a broader scale. Decisions against or pro an innovation may be based on aspects that change with time, both as farm families and other paramount factors change like population growth (HUXLEY 1999: 31). Since the taking-over or refuse of innovations is determined by individual decisions, the problem of acceptance is correlated to the micro-level (BAUM 1995: 37). Therefore, a thorough understanding of the target smallholders is imperative (see also HATIBU & MTENGA 1996: 1; RUGIMBANA & NYANGA 1996: 1). Socio-economic and socio-cultural aspects have to be considered on farm-, family- and group-level.

Indigenous knowledge about, for instance, medicinal plants, land-use systems, etc. has to be integrated as well: a high potential of research is to assess data on this aspect and by this to contribute to knowledge collection and distribution, which could be useful for e.g. projects and policy-makers. For instance, knowledge on local strategies for sound environmental management and its integration in project concepts is one of the most determining factors for project's success or failure, but there are not enough feasibility studies carried out on this subject (see also SHAO et al. 1992: 155).

Rural communities might have similar land use systems, but can have a completely different impact on resources due to ethnicity and culture. Experiences have shown that soil conservation in Eastern Africa is to focus on thorough investigations of the local conditions and is to go to scale on small-holdings. The challenge is to make conservation profitable at the farm level so as to obtain sustainable people's participation: management strategies must result in higher yields and better incomes. Since geographical and ecological conditions show much variation between regions, districts and even within the same locality, strategies on sustainable agriculture have to be site/location-specific, taking local ecology and socio-economy as points of departure. To draw up a strategy, an extensionist-researcher alliance is needed, as the

local farmers are usually the sole experts on ecology and production conditions in their locality (STÅHL 1992: 3-6; MANSHARD & MÄCKEL 1995: 34; see also BLISS 1999: 79; WILSON 2001: 167). HUXLEY (1999: 38) mentions: "A considerable expansion of farmer-devised and farmer-managed investigations […] has the advantage that technical situations are explored within a context of social and economic reality. The farmer is always the final arbiter." WASWA et al. (2000: 185) talk about 'team-work among all stake holders including institutional integration'. In the Dresden Declaration the GFAR (2000: 164) wrote: "Priorities for the research agenda are set with a focus on farmers' perspectives, taking into account the multi-functionality and regional heterogeneity of farming systems" (see also Fig. 5).

Fig. 5: Farmers, extensionists and researchers in a dialogue during a workshop on agroforestry in Kisumu, western Kenya

Within this context, the shift from a commodity orientation towards an eco-socio-regional approach is imperative if the farmers' reality is to be assessed (BECKER 2000: 12). This study attempts to contribute to further methodology development and impact analyses necessitated (see also STÅHL 1992: 3), also with regard to the need of more agricultural research in Sub-Saharan Africa since in the past the main focus has been on the high-potential areas in Asia (WILSON 2001: 166).

The selection of the smallholdings for this study has been carried out by project members and/or the women's groups on the basis of a detailed description of selection criteria. It is important to note that the selection and final commit to the households has been dependent on the agreement of the families. The selection criteria are abstract in so far as they start from an idea of the participant's typicality and distribution (see also FLICK 1998: 63). The selection criteria for the farms are

- location in high/medium and low potential areas,
- implementation respectively improvement of biological and physical soil and water conservation measures in a successful way, thus with distinct positive effects as to ecological aspects (soil erosion, vegetation cover, etc.) as well as economic factors (crop yields, etc.),
- the female farmers are at least members of a women's/mixed group,

- at least two households per project (and three at the most) distributed on different zones are female-headed.[12]

I have selected 18 farms in total, thus six farms per project, and three farms each per zone for the reasons of comparability. Even in case of problems (the farm is found not to be representative, illness, etc.), I still would have remained with at least two comparable farms (see also chapter 2.2.3).

The selection of different zones enables a comparison of differences and correspondences between farms with respect to ecological aspects even across borders. As CROWLEY et al. (1996: 9) note: "Farming requires a set of resources, the precise mix of which varies by agroecological and socio-cultural zone."

Except in the LPA of HASHI-ICRAF all farmers live in different villages; this aspect enhances comparability of different sites; on the other hand, the integration of three cases living in the same village allows to draw attention to interrelations, trickle-down effects, whether this aspect raises similar problems and potentials, etc.

Especially the last two aspects are selected by 'judgement sampling' (HONIGMANN 1983: 80). The second criterion raises the question why successful (female) farmers have been selected: research within a time limit and based on participant observation needs to focus on essential aspects and therefore needs a precise, consequent and a well thought out basis. Consequently, it makes sense to choose a similar context - actually, a selective but representative part of the reality of the research field. The hypothesis was that farmers would respond differently to new technologies and opportunities a. o. depending upon the resources already at their disposal (see also CROWLEY et al. 1996: 1-2). Generally, studies concentrate on restraints and weak aspects, consequently focussing on weak groups like the poor. Why not turning attention to strong groups to find out the reasons for their strengths and by this indicators for success - and failure? Within this context, the integration of open-minded and successful women in project activities might be a powerful means to speed-up the process of the enhancement and stabilisation of natural resource management as women are known to be agents within this whole complex (SHAO et al. 1992: 13). According to the authors (ibid.: 13-14), the degree of success of being "[…] at the centre of environmental management and control depends on issues of ownership (land, trees, income), customs and cultural taboos, legal restrictions, attitude of men towards women and gender relations, division of labour, participation of women in the formulation, implementation and evolution of environmental policies (and even other policies) and participation in leadership [which] have to be problem-

[12] NYCANDER (1998: 18) notes: For comparative purposes, data shall also be collected from households within the catchments that are male-headed [...]." VEDELD & LARSEN (1998: 23) write: „A focus on female headed households may be a means to identify vulnerable households but is not in itself a means to identify and discuss differences between female headed and male headed households as well as relationships and systems of redistribution within and beyond the household."

atised at all levels of developmental decision making processes." These aspects will be elucidated in the frame of this study.

"Some of the programme areas have been identified as ideal sites for intensive interaction between farmers, research scientists, extension staff, policy makers at the national, regional and international level interested in successful cases of technology transfer" (NYAKI 1998: executive summary). As can be seen by this statement it is a common practice of projects to incorporate successful female and male farmers as figureheads and for advertisement, but comparative analyses of successful farmers, identifying success indicators as well as hindrances and problem factors, have rarely been carried out until now. Successful rural households may share tasks and rewards in ways which are not easily understood by outsiders (see also HUXLEY 1999: 26). HASHI-ICRAF works with folk catalysts (para-professionals and school teachers) "[…] to manage empowerment processes and enhance the multiplicator effect within and beyond the concentration area" (URT 1998: 55). *"Do successful (female) farmers function as folk catalysts as well?"* This study tries to fill in the gap and to contribute to new ideas, findings and solution strategies. Starting point for the building up of the research structure were the following questions:

- *„How can projects in the context of a sustainable*[13] *management of natural resources, claiming to be aware of criteria like participation, gender, etc., be optimised to ensure an equitable distribution of benefits, how can the rate of success be improved?*
- *"Which parts of the programme work well and which need improvement (strategic points)? How effective is the programme with respect to the organisation's goals and with respect to the beneficiaries' needs?"*
- *"Which successful (female) farmer's and (women's) group's livelihood strategies/ activities do exist, what are their interrelations and what is their contribution to ecological, economic and social sustainability in the face of the speed of the degradation and destruction of natural resources and biodiversity?"*

Since it is the people in a project area - the target group - who determine success and failure of measures, the important step to be taken is to identify key persons

[13] The term sustainable' in the context of the management of natural resources refers to the aspect of the attainment and continued satisfaction of human needs for present and future generations - sustainable development - under maintenance or improvement of the environmental quality and the preservation as well as rehabilitation of natural resources, being technically appropriate, economically viable and socially acceptable (FAO 1989b, 1992; Wolff 1995: 59-60). In fact, the term 'sustainability' which has become a general catchword and central idea within the global political discussion on development aid since the Conference of the United Nations on Environment and Development in 1987 (Brundtland-Report) and a political basic concept on the World Summit in Rio de Janeiro in June 1992 (STEEN 1995: 81; BMZ 2000: 240) is an abstract and vague idea to be interpreted and instrumentalised in many ways for the respective interests. Only in combination with an object or concrete idea it becomes more shaped and clear (MAYDELL 1990: 80; Wolff 1995: 58). Accordingly, HUXLEY (1999: 281) demands that sustainability has to be defined in terms of a particular output goal. It has to be thought of as dynamic, not static, thus referring to a continuing process, that is, individual systems must respond to changing ecological, social and political factors. He suggests to consider sustainability from four aspects: production, efficiency, stability and resilience (s.p.).

(GUGGENHEIM & SPEARS 1991; CERNEA 1991; BLISS & GAESING 1992, WILLIAMS 1993; AUGUSTAT 1994; BLUME 1998). FRIEDRICHS & LÜDTKE (1971: 215) define key persons as persons in strategic favourable positions, around which events crystallise due to their instrumental or expressive meaning (authorities, opinion leaders, influential, informed, qualified and popular people). Using key informants means putting emphasis on qualitative criteria in data collection, but a great deal of valuable concrete quantitative data can be collected as well (TREMBLAY 1983: 98). Moreover, concentrating on and working with key persons who function as 'gatekeepers' supports the process of entering the setting (see also BURGESS 1983b: 16-17; HATIBU & MTENGA 1996: ii).

How is success defined within this approach? Looking at a group of people (village, working group, etc.) we can always find individuals who either start activities without intervention from outside or adapt/ adopt inventions and some do not (see also Fig. 6). As SHAO et al. (1992: 180) mention: "What we have noticed in our survey in Shinyanga Rural and Urban Districts is that there are villages, individuals and groups which have excelled in the management of the environment through their own initiatives. Some are faster, more innovative than others." *"Why are they more cooperative/innovative - more successful, thus, what are the reasons for their success?"* CROWLEY et al. (1996: 40) suggest: "History and opportunity, rather than ignorance, distinguish less successful farmers from more successful ones." Reasons behind are to be identified, too. These innovative individuals have been chosen as the target group of the present study (theoretical sampling - SILVERMAN 2000: 105-106) and have been called 'successful (female) farmers'. Starting point was to select (female) farmers who in general carry out soil conservation measures with visible positive effects on the farms, thus, the farmer's strategies are to contribute to the stabilisation or enhancement of the ecological situation. From here, investigations are to be made within the frame of this research on the effect of the techniques implemented on the economic and social conditions - on household level as well as on a broader scale (relatives, friends, neighbours, group members, etc.). As only

Fig. 6: Some farmers are more innovative than others (Source: ROCHELEAU et al. 1988: 57)

persons who are familiar with the farmer communities have enough experience to decide on this aspect, the decision on which farmer is successful has been made by the extension officers and project staff in general. Data collected during surveys and the officer's experience who know all 'their' farmers in detail have been included. It was *not* the intention to select the *most* successful farmers, but farmers who are successful in their special context, also to avoid subjective selection criteria. Thus, there are (intended!) variations within the homogenous group of successful farmers, due to different criteria determined in advance such as marital status or ecological situation as well as other differences like age, financial situation, status, etc. which are to be identified through the data analysis.

It was supposed that occurring problems among the selected group 'successful (female) farmers' are more transparent and can be understood and fathomed more easily in their reciprocal effects, speeding up the process of finding solution strategies. Problems, constraints and weaknesses faced by successful (female) farmers are likely to be faced also by poor farmers, although they might be more serious. Research on successful farmers and groups might shed light on poor farmers and their problems. In general, the detection of weak points with regard to a sustainable natural resource management on successfully managed (female-headed) farms helps to identify problems which may be relevant for a community as a whole or even a certain area/region, e.g. in finding out if certain groups have been disadvantaged in favour of others. The same counts for the positive facets: there exists a lot of data on poverty, while information on local adaptation and adoption strategies to crises, thus on local crises management of a single group of people, has been gathered only on a limited scale (MANSHARD & MÄCKEL 1995: 37). The aim of any intervention should be to create and ensure equity as a result among all groups.

The decision of the selection of successful (female) farmers was also determined by the criterion of accessibility, limited time and resources (see also FLICK 1998. 70). Furthermore, it was supposed that cultural and socio-economic differences between me and the families are not as big as they would be if I had chosen poor farmers, assuming that this factor speeds up the process of confidence-building and that the chance to adapt to each other is enhanced which helps to create an open-minded/communicative atmosphere. This again was assumed to form the basis for an easier social integration in and acceptance by the families and their social environment.

The risks of a decision for successful (female) farmers are taken into consideration:

- Bias and one-sided observation/perception arising from the selection of persons/ families through familiarity with a certain elite strata (supposing that successful farmers belong to an elite!) – only the positive effects are reflected with as a consequence that negative factors shift to the background so that things may be seen in relative terms and objectivity is coloured (HONIGMANN 1983: 80-81; GANS 1983: 60; SIEBER 1983: 184-185). Checking carefully validity and quality of information

given under consideration of the relevant criteria is a necessity (see e.g. FRIEDRICHS & LÜDTKE 1973: 35, 45-46). The fact that already empowered families have been selected has to be thoroughly considered to avoid overestimation of empowerment effects; underestimation, on the other hand, would have been the problem, if only suppressed women would have been chosen (SHARMA 2001: 199).

- The selected families (female farmers) might receive a lot of/more support from the project; problems and interests of the poor might shift to the background.

ADJOVI & ADEGBOLA (2000: 18) claim that "[…] farmers with different level of prosperity would have different levels of needs or problems and behaviour toward the adoption of proposed technologies." This study attempts to find out whether it is in fact only/mainly the level of financial resources which determines the level of adoption rates of project measures – consequently reflecting different levels of success – or whether other factors play a key role as well. Within this context, success is defined with regard to the respective (economic, socio-cultural and ecological) environment within a given area. This includes the consideration of different degrees of success between the farms. For their assessment, different indicators regarded as playing a (key)role within the context of success have been identified, and a matrix has been developed to which all farms have been assigned (see chapter 9.1).

As MASON (1996: 6, 14) suggested, I looked for the research puzzle (developmental, mechanical and causal) and found that I am trying to solve all three criteria, although with emphasis on the last two aspects:

- *"How and why did farmer X become 'successful'?"* (developmental puzzle)
- *"What does she do, what characterizes success?"* (mechanical puzzle)
- *"What influence does farmer X have on others?"* (causal puzzle)

Furthermore, the criterion that all female farmers should be at least a member of a women solidarity network/self-help group has been integrated since different aspects will be investigated like the so called 'multiplicator-effect' who is directly linked to individuals (see also SCHÄFER 2000: 120-121). First of all, women's groups serve an important social function within the community; groups help in tasks that require collective labour like agricultural activities, but also tackle collective problems such as helping each other in times of sickness, misfortune and hardship (BRADLEY 1991: 217). Various empirical studies mention the key position of women with leadership qualities as 'multiplicators', champions and important informal mediators/knowledge careers concerning knowledge dissemination (see e.g. AUGUSTAT 1994: 139, 141). KABUTHA et. al. (1991: 28) mentions: „Locally initiated plans required committed and skilled local leaders to follow-up on the recommended initiatives. [...] a [...] crucial quality of local leadership is the skill and commitment that leaders of half a dozen women's groups have brought to Mbusyani." DE GROOT et. al. (1992: 81) write: „A common thread through a number of the examples discussed has been that the impetus for change has come through a single local individual, familiar with the social and physical environment [...]."

"What are the trickle-down/spin-off-effects of these women within their groups?"[14] A literature review gives different opinions: After AUGUSTAT (1994: 133, 141) these women often show a high sense of responsibility for the women's/mixed group and a high ability to reflect on things (see also BLUME 2000: 6-7, 9). However, prosperous and well-educated women have better opportunities to participate in formal organisations and training and might control the groups (OOMEN 1992: 110; FORTMANN & ROCHELEAU 1985: 5).

This study wants to examine effects of local institutions', not only on their natural environment. As RAHNEMA (1995: 169) explains: "The insidious impact of the destruction of vernacular space are particularly dangerous at a time when many other alternatives need to be explored, taking into account both the incredible advance of certain autonomous and convivial technologies and the often very imaginative solutions that some grassroots movements are offering in terms of the regeneration of their people's life spaces." A success story can be told in the frame of a water management project in Jemen where small-scale farmers have organised themselves in groups to handle their problems of water scarcity. After VEENSTRA & MESSERSCHMIDT (2000: 4) this is the first time that a project succeeded in integrating the people in all parts of their own development in such a short period – two years only.

There is evidence that women solidarity networks and self-help groups fulfil several benefits like e.g. being stakeholders within the process of knowledge dissemination (see e.g. WACKER 1994).[15] "Women groups participatory initiatives have contributed tremendously to economic and social progress" (KINUTHIA 1993: 41).[16] The same author examines the importance of women's groups within the development context, not only on the local level: "Today in Kenya, the self-help movement can be almost wholly identified with women, through their well-organised mutual aid groups. [...] Women groups' enterprises and mutual aid system enable women to participate and become a part of activities far beyond their own individual resources and capabilities and thereby acquire some measure of security. By forming themselves into a movement in pursuit of better shelter and in this case better living, women groups are able to express themselves more effectively and to pool their limited resources" (KINUTHIA 1993: 39). SHAO et al. (1992: 96) mention that traditional women's groups are very popular and that the women in Shinyanga Rural District are well organised.

[14] Additionally several families (whether they are relatives, friends or neighbours to the host families) have been contacted who do not participate in groups, but who are successful, too (after estimation of project members, farmers and researcher). Thus, the assumption that maybe only members of (women's) groups might be successful, can be excluded.

[15] AUGUSTAT (1994: 137-138) mentions the positive aspect of the ‚imitation effect'.

[16] The common Swahili-name for self-help is *Harambee.* It literally means 'pulling together' and was introduced during the early days of independence in both countries as a form of self-help to communities. Nowadays, it has become a form of quasi-official taxation, and can prove a real burden on poor farmers since there is considerable social pressure to donate to a *harambee* fund (see also BRADLEY 1991: 80).

Various authors (FORTMANN & ROCHELEAU 1985: 269; CERNEA 1991: 359, 383-384; MARTIN 1994: 3; AUGUSTAT 1994: 155; BARROW 1996: 180) support the observation that groups function as forum for different interests and needs; they give strength concerning the expression of needs, which again positively effects decision-making processes. Groups also help to correct antisocial behaviour (BRADLEY 1991: 217). After KINUTHIA (1993: 39) „[...] [w]omen have the potential to change the nature and tempo of development, not only for their own welfare but also for the welfare of the community and society as a whole. And AUGUSTAT (1994: 140) comes to the conclusion that to be a '*mwanakikundi*' (group member) is for the women correlated with a communal spirit and an increase in value of their position within the village. They regard the groups as a chance to enhance their economic situation as well as to extent their personal knowledge for an easier management of everyday life. And CECELSKI (1985: 67) summarises: „Rural peasants' and women's organisations have been found to be the most effective means of securing poor rural people's participation in both the planning and the benefits of rural development." According to the authors there is a general need for carrying out research on these groups and to find ways to utilise them for environmental purposes.

"What are the trickle-down-/spin-off-effects of these groups and their respective leaders on their (social, economic, ecological and political) environment?" – also with regard to critics found in some literature, e.g. that "members of women's groups tend to belong to a higher resource echelon, meaning that the poorest farmers are not necessarily being reached" (WILLIAMS 1996: 8; see also OOMEN 1992: 110). Another critic has been formulated by MELICEK (1998: 86): „With regard to the conjecture that democracy is best served [...] by empowering those groups in rural society which have so far been marginalized one should also consider that group activities tend to suffer from inherent weaknesses such as moral hazard problems of free riding and the capture of benefits by an elite within the group."

Several meetings with women's/mixed groups have been attended and informal discussions and group interviews been carried out, especially for the purpose of triangulation, to get a deeper view on certain aspects, and for phenomenological purposes (FONTANA & FREY 1994: 364-365). Group discussions correspond to the way in which opinions are produced, expressed and exchanged in everyday life. The group becomes a tool for reconstructing individual opinions more appropriately. Furthermore, common processes of problem solving in the group can be analysed (FLICK 1998: 116).

As has been mentioned above, within the research sample not only farming couples but also female-headed households have been taken into consideration. In fact, female-headed households should form one of the focus points within development activities: In Kenya, for instance, 40 % of all households (and about one third of the rural households) are *de facto* managed by women, and this number is increasing. 80 % of these households are concerned to belong to the poor or very poor. Female-

headed households have not been given special attention in project approaches/ programmes as has been stated for NSWCP (CHAVANGI 1998: 12, 65, 71; NYCANDER 1998: 3). Thus, special data are needed to determine degree and effects of the involvement of these households in the respective programmes. Furthermore, concrete empirical data are needed to show the exact relation between the disadvantaged position of female farm managers in agriculture and poverty (van VUUREN 2000: 1; see also T'HART 1992: 8), also regarding the aspect that female-headed households are not necessarily in a disadvantaged position; e.g., they may be in a better position in respect of decision-making aspects (HYUNA 1989: 27). The author (ibid.: 26), for instance, reports about a divorced woman in the frame of her research in western Tanzania who does so well that she is considered as one of the successful women in the village. She argues that from the farming systems perspective these type of women are the genuine heads of household being in the position to make independent decisions and that they can be potential users of new technologies (see also OTSYINA 1998: 27). The author demands: "Their main characteristics must be studied in detail […] to find out how they can help others." Questions to be answered in the frame of this research are:

- *"What are the differences with regard to men-headed households, also concerning problems and potentials?"*
- *"What are the potentials of these women e.g. with regard to women's groups and knowledge dissemination – are they mediators for projects to reach the 'poorest of the poor' – mostly single women? What could be done to strengthen their position as to this context?"*[17]

It has to be mentioned that although women are the main focus of this study as they are generally in a disadvantaged situation (reasons are described in detail in chapter 2), a gender perspective has been taken. This means, women's needs, interests, roles and problems of participation within the context of the management of natural resources are defined in relation to those of men and are seen as a result of the configuration and constellation of forces within the socio-economic, ecological, political and cultural context (see a. o. SHAO et al. 1992: 14; VÅGENES 1998: 90). The integration of men was regarded as a must if an overview of the whole complex shall be obtained; it also serves the possibility for data validation (see also SHAO et al. 1992: 18). Since e.g. male- and female-headed households are compared, not only deficits (and potentials) of the female-headed households are recorded, but the influence of the male on various aspects is identified, too; in the following step, these data can be related to each other and be compared.

[17] With regard to labour as one of the limiting factors CHAVANGI (1998: 26-27) mentions: „Labour is such a limiting constraint to women farmers that they are unable to create time to attend activities such as field days, demonstrations and special training. This means that the women miss out on the important learning opportunities, resulting in a state of low level of knowledge and skills. [...] their knowledge base limits their effectiveness as farm managers."

One selection criterion was to have a sample within each project area that covers a more or less homogeneous culture and ethnic group; however, I included two households belonging to ethnic groups different from the three main ethnic groups covered by the sample since I found it valuable to pay attention to this aspect as well. Of course, the sample size is too small for being able to make general statements, but it still allows to get a broader view on specific facets.

Since the main attention of this study is to find out ways to enhance the success of projects in the field of a sustainable natural resources management, the field of the study is disclosed from its extremities (successful farmers) to arrive at an understanding of the field as a whole (see also FLICK 1998: 69).

The length of the stay on each farm was between four and seven days; this duration has been found out through own experiences to be an ideal period: if the researcher stays with one family for a short period only (like two or three days), problems like time pressure, lack of time for building-up confidence and getting used to each other as well as to the socio-cultural and ecological environment occur; attitudes, habits, etc. may change, so that the researcher is not participating in and observing a daily situation but an artificial one. On the other hand, if the chosen time period of stay is too long (more than one week), the researcher disturbs the daily activities of the families (e.g. lack of space). However, the duration cannot be fixed in advance, but depends on the respective circumstances and conditions.[18]

Informal meetings and discussions with farmers inclusive farm visits have been integrated. The persons to be researched were found through the family's contact, coincidence or snowball sampling (see also BURGESS 1983c: 77). These samples have been included to receive more information, to see the interaction of the farmers and to get a broader view on the farmers' problem analysis and solution strategies; furthermore, they are used for verification, to back up the information gathered on the particular farm (FRIEDRICHS & LÜDTKE 1973: 216; SIEBER 1983: 186-187; FONTANA & FREY 1994: 365-366; OTSYINA et al. 1998: 62) and to include deviant cases to avoid the danger of only having included cases which support my theory (SILVERMAN 2000: 107, see also SIEBER 1983: 185).

Training, workshops, project meetings, farmer field days, etc. have been joined and demonstration plots been visited, according to the project approaches and contacts. Potentials are to integrate the principle of 'learning by doing', to get a glimpse on subjects taught as well as on problems or critical facets. The selection was made by chance or even coincidence.

[18] Of course, after some time the people get used to the researcher and he/she are most likely to be integrated into the community. This experience has been made by the researcher during a stay within a family in December 1994/January 1995 in Mutuka/Mamire at the borders of the Tarangire National Park, Tanzania. However, the borders of feasibility will be reached applying this time schedule to the approach of staying with 18 families.

Furthermore, schools, churches, hospitals, markets and small (women's) projects (mills, water pumps, handicraft, gabion construction, etc.) have been visited and several worships been attended to get an overview of economic activities and socio-cultural aspects in a particular area.

On several project meetings summaries have been presented after field visits to inform project staff and policy-makers on general impressions and conclusions drawn.

Interviews have been conducted with project staff and representatives from (inter)national institutions, organisations and ministries. The selection of experts for standardised/structured interviews (mainly written questioning/survey) has been done by 'non-probability sampling' or 'judgement sampling' (see HONIGMANN 1983: 80). Aim was to analyse and compare expert's knowledge and views on specific issues (see also FLICK 1998: 92). This renders the possibility to include opinions and estimations from decision-making persons working on local, national and global level as an additional criterion for rating into the final analysis. Due to their position and background, they are likely to focus on different criteria and factors and may judge things from a different perspective.

I carried out fieldwork during two phases of four months each, because I wanted to have a cut in between, a. o. for data processing/editing, regeneration, restructuring, re-thinking, re-organising and to have time to reflect on things from outside; this is believed to be an important way to preserve viability of data and to control whether everything goes well. But I have to note that I chose this strategy because it applies to my personal research subject and to my personality. Another researcher might choose a different tactic and can give reasons why a fieldwork period should not be split or even be split more than once. I think, there exists no general rule, but the decision depends on the researcher as well as on the circumstances.

The time period chosen seemed to be ideal to me: the time is enough for data collection in the field and also fits into the personal time frame. As I said in the beginning of chapter 1.3.2 and laid out in chapter 11.1 I had to stop my second fieldwork after two months (during which I carried out research in one project area) because of the outbreak of Ebola. This shows that unpredictable situations can happen, and that one should be prepared as good as possible (plan B).

I decided to start research with the off-set of the rains in October/November to be able to incorporate the criterion of field preparation and other activities which are carried out during this season (see also SHAO et al. 1992: 21). I decided to chose the short rains due to logistic reasons and the personal time table.

A previsit to the projects and to other projects, institutions, etc. has been incorporated as well, mainly carried out between October and November 1998 (additionally, some projects have been visited also during the field research period). Main objective was to examine the projects which I had selected to function as host organisa-

tions and the research area (see chapter 1.3.1).

Concerning the language it can be noted that knowing Kiswahili was fully sufficient for the conduction of the research. Only in few situations I was confronted with a language barrier, and this was almost only in the HASHI-ICRAF project area where people did not or only speak little Kiswahili. In these cases other people functioned as 'transmitters' and interpreters. There was, however, no language barrier among me and the families I stayed with.

Inter-human and external problems as well as positive aspects having occurred during the field work have been revealed and will be discussed within a separate chapter. Important questions are *"What are the experiences of a researcher who works in this field? Which difficulties, but positive aspects, too, is he/she facing? What are the conclusions and suggestions out of this experience?"*

1.3.3 Data collection: multimethod approach

> "[…] field researchers may complement their observations by conversations, informal/unstructured interviews, formal interviews, by surveys and by collecting personal documents (written, oral and photographic evidence). […] effective field research depends upon the theoretical framework, the research problem, the researcher and the conditions in which field research takes place."
>
> R. G. BURGESS concerning field research and field experiences (1983a: 2; 1983b: 16)

Since transparency is regarded as important, in the following, an overview of instrumentation and data collection operations as well as analytic strategies followed are elucidated. It is agreed that explication should be carried out as far as possible so that interpretations and intersubjectivity of the research findings are comprehensible although it has to be noted that the demand for revealing every single step of the investigation and analysis process ('explication principle') generally cannot be fulfilled completely since it is mostly about implicit and unconscious knowledge (LAMNEK 1995: 26).

I chose a combination of different methods, after having carefully considered intention, etc. to properly address the various research questions, characteristics and aims (which are investigated on different levels) and thus to reflect the 'overall research strategy' (see SILVERMAN 2000: 100-101; see also LAMNEK 1995: 8). As FRIEDRICHS & LÜDTKE (1973: 91) note: "Die Entscheidung über die Art der sinnvollsten Methode hängt von der Konzeptionalisierung des Problems der Studie, seiner Umsetzung in Untersuchungsdimensionen und spezifizierte Forschungspläne ab [...]" (see also KINGMA 1996: 5).

It is the intention to collect data as verifiable as possible to allow abstraction of experiences from the respective subject (FRIEDRICHS & LÜDTKE 1973: 17). Explana-

tions shall be produced through extrapolation beyond the single cases which are generalisable in some way or which have a wider resonance (MASON 1996: 6; SILVERMAN 2000: 110). [19] Accordingly, the different methods chosen like combining qualitative and quantitative approaches for its complementary nature function as triangulation sources and modes of evidence with different biases and strengths (ROBSON & FOSTER 1989: 123; HUBERMAN & MILES 1994: 438; LAMNEK 1995: 6; SILVERMAN 2000: 103, 234). Therefore, participant observation has been used as complement to interviews (see FRIEDRICHS & LÜDTKE 1973: 94).

Choosing a multiple methods approach is meaningful as the data are drawn from different contexts; using different research techniques simply allows to examine their intersection without just working 'cumulative'. Also with regard to the gender aspect this approach makes sense: „The complexities and problems of women's lives, whatever the context, are sufficiently great that multiple approaches via qualitative research are required" (OLESEN 1994: 169). Taking under consideration the critics on working with different strategies and methods as 'simply aggregating data to come to a more complete picture' it is believed - within the context of this study - that (data/ theory/methodological/interdisciplinary) triangulation[20] improves the reliability of data collection, data analysis as well as resulting outcomes. Furthermore, it provides important additional data through enlarging the focus on the phenomenon under study, contributing to 'knowledge progress' (SILVERMAN 2000: 98-100, 177; see also BURGESS 1983f: 163; SIEBER 1983: 176-177, 181-182; JANESICK 1994: 214-215; MORSE 1994: 225; FONTANA & FREY 1994: 362; LAMNEK 1995: 250-257; FLICK 1998: 25). Furthermore, triangulation is the way to get to the finding „[...] by seeing or hearing multiple instances of it from different sources, using different methods, and by squaring the finding with others with which it should coincide" (HUBERMAN & MILES 1994: 438). Independent measures and sources of the same phenomenon have been multiplied (ibid.).[21] Concerning theoretical triangulation BURGESS (1983f: 166, after WESTIE 1957) argues "[…] that researchers should utilise all possible theoretical propositions as they exist together with all their contradictions and inadequacies."

Methods applied and materials used are:

- participant observation
- informal / semi-structured interviews
- informal group discussions
- training, farmer field days, etc.

[19] The question is: *how does the analysis relate to things beyond the material at hand?* (SILVERMAN 2000: 111; after ALASUUTARI 1995: 156-157)

[20] This method can also be called crystallisation since data can be looked at from far more than three sides: „[...] crystallization provides us with a deepened, complex, thoroughly partial, understanding of the topic" - RICHARDSON 1994: 522)

[21] Of course, even triangulation is not a guarantee for the correctness of the findings although the chance that two identical findings deriving from two different methods are wrong is very low. And even the practice of 'controlling questions' applied in quantitative interviews is no guarantee for the accuracy of answers (LAMNEK 1995: 252).

- mapping
- transect walks
- photographs
- documents
- standardised (written) expert interviews
- partly computer-assisted low-level methods of analysis → quantitative via metric variables like frequency counts, tabulations, calculations in percentages, classifications (see DENZIN & LINCOLN 1994a: 5; LAMNEK 1995; 4). Matrices and other arrays of the data have been applied to allow an analysis of the full data set in a condensed form and to see literally what is there (HUBERMAN & MILES 1994: 437)

To sum up, within my approach the model idiom is ethnomethodology which shares naturalism's attention to detail, but locates it in talk-in-interaction. The method chosen is participant) observation, accompanied by simple quantitative methods to find an overall pattern in the data (see also SILVERMAN 2000: 78-79).

1.3.3.1 Living with the families: participant observation

> "Participant observers "[…] need to share in the lives and activities of those whom they study and take roles which are effective in the setting under study. They need to learn the language that is used in the setting, to remember actions and speech and to gather data from a range of individuals in a range of social situations. In this respect, participant observers need to understand the skills that they require and the roles that they take in research settings."
>
> R. G. BURGESS in his field manual (1983c: 45).

Still, participatory approaches show a weak institutionalisation within the system, apart from the fact that we still find the phenomenon that agricultural research is carried out in a natural science mode (BECKER 2000). The challenge and potentials of participatory research has been outlined by the author (ibid.: 11): "However, experience shows that farmer participation and farmers' priorities can not adequately be dealt with through surveys, short visits or short participatory exercises. A real dialogue that enables better mutual understanding requires time, effort, appropriate methods for communication, a change of attitudes and behavior from lecturing and information extraction toward joint learning and researching, as well as some visible improvements for the farmers involved, which can only be assured in longer term interactions that have an impact at farmers' level. It is here, that research and development are inseparably linked."

The method of participant observation (or observing participation - see BORTZ & DÖRING 1995: 312) has been chosen since processes, complexity of actions of various persons within numerous situations and their correlation to groups and organisations shall be revealed and investigated (see also FRIEDRICHS & LÜDTKE 1973: 93; LAMNEK 1995: 40). Participant observation in qualitative research is fundamental

to the understanding of another culture (SILVERMAN 2000: 89). In qualitative social research research is regarded as communication; consequently, the 'research specific communicative situation' has to be brought as close as possible to the communicative regulations of daily life; this means, in interview or observation a communicative situation has to be created as natural as possible (LAMNEK 1995: 24). After GANS (1983: 60) participant observation is the most personal of all sociological research methods.

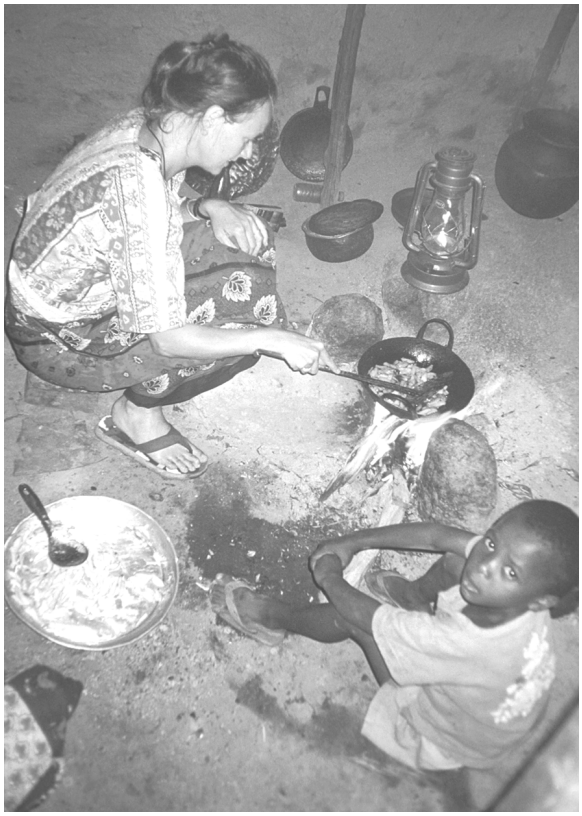

Fig. 7: Participant observation means living together with the people and participating in daily activities

Participant observation "[…] refers to a multitude of activities and roles: the term is only a loose and inaccurate label that covers the many varieties of participation and observation, and distinguishes them from formal interviewing or library research" (GANS 1983: 54; see also BEKKER & GEER 1983: 239). According to DENZIN (1970: 219; in FRIEDRICHS & LÜDTKE 1973: 92) participant observation is a field strategy which combines simultaneously analysis of documents, interviewing of actors and informants, direct participation and observation as well as introspection. Qualitative field research[22] is a process in which phases of theoretical preparation and assessment afterwards alter with phases of intense field work. It has to do with finding-out structural relations (FLICK 1991: 191). PUNCH (1994: 84) assumes "[…] that qualitative fieldwork employs participant observation as its central technique […]."[23] FISCHER (1981: 65) describes field research as research within the environment of a group through the researcher under conditions which are "natural", thus, which will not be changed for the sake of research; contrarily to all other methods, social action is researched at the place where it happens; real processes of interaction are assessed in its natural context (FRIEDRICHS & LÜDTKE 1973: 93, 95; see also BECKER & GEER 1983: 239; HUBER 1984: 131).[24] BURGESS (1983a: 1) summari-

[22] Field research is a. o. also referred to as ‚fieldwork', 'qualitative method' or 'case study method' (see BURGESS 1983: 1).

[23] "Was heißt Feldforschung: [...] Sozialforschung durch Teilnahme an den alltäglichen Lebenszusammenhängen der Beforschten. Grundlegende Methoden der Feldforschung sind teilnehmende Beobachtung und Gesprächsführung" (FLICK 1991: 189).

[24] SCHEUCH (1958: 210) describes observation as „die planmäßige Erfassung sinnlich wahrnehmbarer Tatbestände, wobei der Forscher dem Untersuchungsobjekt gegenüber eine rezeptive Haltung einnimmt. Durch diese rezeptive Haltung unterscheidet sich die Beobachtung sowohl vom Inter-

ses: "[…] field research involves observing and analysing real-life situations, of studying actions and activities as they occur (see also Fig. 7 above). The field researcher, therefore, relies upon learning firsthand about a people, and a culture." Furthermore, participant observation demands the participation of a (in the beginning) stranger in a role accepted by the participants of his 'observation field' (FRIEDRICHS & LÜDTKE 1973: 35-36). After PUNCH (1994: 84) this technique "[…] involves the researcher in prolonged immersion in the life of a group, community, or organization […]. […] Far more than with other styles of social research, then, this implies that the investigator engages in a close, if not intimate, relationship with those he or she observes. Crucial to that relationship is access and acceptance […]." It can be concluded that participant observation "[…] is not merely a method of conducting field research, but also a role that is used by the researcher" (BURGESS 1983c: 45).[25]

Furthermore, the applied method integrates relevant aspects of *action research* as the researcher participates for a longer period in the daily life, works with groups, and people's critics are integrated (see e.g. HORN 1979; FRIEDRICHS & LÜDTKE 1973: 97). Living together with the respective target group, working with them and by this sharing their daily life is the underlying idea of this approach (see e.g. HORN 1979; BORTZ & DÖRING 1995). With other words, active participation of the observer in events within the surrounding of the ones being 'researched' under integration of self-observation, observation of the others, interaction between researcher - and contact persons and by this removal of the separation of object and subject - forms the basis of this method (BORTZ & DÖRING 1995: 296-297).[26] Several advantages can be summarised:

- The decisive benefit is the close contact of the researcher to the respective family, a precondition for the familiarising process and for building up confidence - an essential precondition for the quantity and especially quality of data collected (see also DENZIN & LINCOLN 1994a: 5).
- Through this method, usually more detailed, specific and reliable information can be provided compared to a formal survey like a conventional interview, because usually, less suspicion will be caused and less resistance will be generated (see a.o. AUGUSTAT 1994: 169; BORTZ & DÖRING 1995: 240, 245; BARROW 1996: 219;

view wie auch vom Experiment, indem nämlich darauf verzichtet wird, durch verbale und andere Reize die erwünschten Reaktionen hervorzurufen."

[25] „[...] Analysegegenstand ist der in einem sozialen Kontext lebende und handelnde Mensch, das soziale Individuum, dessen Handeln mit Sinn, mit Bezug auf andere versehen ist; dieses Handeln muß verstanden werden. Somit bedarf auch seine wissenschaftliche Analyse einer anderen Methode" (LAMNEK 1995: 14).

[26] During my stay within 18 different smallholder families in Kenya and Tanzania I have been included more or less completely in social live and daily activities. A central element besides daily activities (cooking, doing the dishes, fetching water, collecting firewood, cleaning, looking after and playing with the children, going to the market, taking care of animals, field work, etc.) and doing some extraordinary work (repairs, restoration activities like room paintings, drawings serving as pattern for embroidery, etc.) formed visits to neighbours, friends and relatives as well as going to church on Sunday (not on all farms). During those informal meetings I was able to receive a lot of information.

SILVERMAN 2000: 89). Also, it is more likely that the participant provokes a finding through saying something unexpected in a 'normal situation' than he/she would in an interview situation (BECKER & GEER 1979: 159). Furthermore, the researcher has the possibility to ask questions, clarify unclear and deepen aspects (getting a 'feedback' – TREMBLAY 1983: 99) due to the long stay compared with conventional survey methods (TENGNÄS 1994: 154; BORTZ & DÖRING 1995: 317). This also increases the reliability and validity of data collected (SILVERMAN 2000: 90-91).

During longer on-farm stays time can be found to be spend only with the women which is crucial when it comes to 'women-specific' questions. Literature and field experience show that women speak more open about aspects like finances or decision-making when men are not around (see e.g. T'HART 1992: 20). It can be read in the reports that often the interviewers did not succeed in being alone with the woman during the interview; it was admitted that the answers might have been influenced by the presence of the husband (ibid.). What kind of data do I receive under such circumstances? Obviously, the reliability of the data is questionable. A longer stay on the farms gives the opportunity to avoid such situations.

The following quotation from BRADLEY & HUBY (1993: 193) describes the general problem concerning the conventional questionnaire survey method: "In the course of surveys [...] it was found that respondents tended to be very cautious and suspicious when confronted by a person with a large bunch of papers, asking questions and recording answers. Enumerators suspected that some inaccurate answers were given as a result." And BURGESS (1983e: 107) notes: "[…] talk, conversation and elements of everyday life often go unrecorded within formal interviews; yet these provide basic data for the field researcher."

In the common social research the principle for an interview is neutrality. This means, the persons interviewed are brought into an artificial situation which has nothing to do with the normal live situation;[27] accordingly, the participants do not have a possibility to react independently, gain experience or have an influence on the exploitation of their opinions (KRAMER et al. 1979: 24; LAMNEK 1995: 16; see also LENTZ 1992: 332).[28] This asymmetrical situation between interviewer and participant can have a negative impact on the motivation of the interviewed person (LAMNEK 1994: 16).[29] Through participant observation discrepancies between real and verbal situation are avoided, overt behaviour instead of covert behaviour like in interviews can be assessed (FRIEDRICHS & LÜDTKE 1973: 20, 93; see also SILVERMAN 2000: 5, 85; FONTANA & FREY 1994: 372). A closer relation between researcher and participant can be developed and status differences be minimised, also through showing the 'human side' and feelings as well as answering ques-

[27] „Situation ist ein Komplex von Personen, anderen Organismen, materiellen Elementen, der zumeist an einen bestimmten Ort und Zeitraum gebunden ist und als solcher eine sinnlich wahrnehmbare Einheit bildet" (FRIEDRICHS & LÜDTKE 1973: 54).

[28] Despite the fact that the attempt to create standardised situations of data collection does not fit to the reality since every interview runs differently; moreover, even if the situation would be exactly the same, perceptions and interpretations of the researchers can differ, and this cannot be included due to standardisation (see LAMNEK 1995: 16).

[29] Detailed information about interviewing can be found in ATTESLANDER & KOPP 1984: 144-172).

tions, unlike in the traditional hierarchical situation in conventional interviewing. A greater spectrum of responses through the 'open approach' and a greater insight into participants is provided since 'real' conversation is created with 'give and take'. Furthermore, the moral concern for participants is heightened (FONTANA & FREY 1994: 370-371; see also GIRTLER 1984: 40; LAMNEK 1995: 22). FONTANA & FREY (1994: 371) conclude: „[...] the old „distanced" style of interviewing cuts the subjects' involvement drastically and, thus, rather than giving us an „objective" interview, gives us a one-sided and therefore inaccurate picture." The problems that occur through conventional questionnaire methods induced through lack of confidence and a common basis between researcher and participants is demonstrated by MADULU (1998: 39) through own field experience: „The respondents found it hard to understand the purpose of the survey, and a lot of time was required to convince the respondents that their participation was important to the completion of the work. The relevance of the research itself to their daily activities needed to be stressed repeatedly." The reliance and quality of data gathered under such conditions is questionable.

Furthermore, no interpreter is involved, so that problems related to this aspect (pre-interpretation of respondent's statements, interpreter's [educational] background - see also T'HART 1992: 22) can be avoided.

- Working alongside with the people gives the opportunity to the researcher to see the performance of tasks (see ROCHELEAU et al. 1988: 62); he/she is directly involved in the implementation of all measures and – following the principle of *'learning by doing'* – comes to know difficulties as well as potentials him/herself which results in a deeper understanding and consequently in a more detailed collection of data (BORTZ & DÖRING 1995: 312-313). DENZIN & LINCOLN (1994a: 5) explain: "Qualitative researchers are more likely than quantitative researchers to confront the constraints of the everyday social world. They see the world in action and embed their findings in it." REASON (1994: 328) adds: "[It] is the lived experience of people, and the idea that through the actual experience of something we may "intuitively apprehend its essence […]."
- Processes can be determined which normally can be ascertained only through repeated interviews and content analyses. Furthermore, some aspects can only be observed or are better to be observed as questions might meet with lack of understanding, might produce attitudes and reactions simply through the interview situation or they might not be able to reveal a certain aspect since facts are solved through the natural – unconscious – action of the observed/interviewed person (FRIEDRICHS & LÜDTKE 1973: 20-21, 93).
- The female farmers are directly confronted with their daily constraints, potentials, etc. which makes it easier for them to get down to these aspects as in an 'artificial' situation created through the conventional questionnaire survey method.
- The time spent for receiving the necessary information can be kept as short as possible. This is very important for the women since they generally dispose of limited time resources (see also BLISS 1994: 245). Compared with conventional sit-down interviews, which actually take time away from the people (see ROCHELEAU

et al. 1988: 62), almost no time has to be expended additionally. Furthermore, the work performed is a positive contribution (ibid.), and 'lost' time can be compensated through lending a hand in the kitchen, etc. A researcher, relying on quantitative interviews, is not only confronted with the unwillingness of respondents to participate in interviews, especially during the planting or harvest season. It is also common to find locked houses or only one or two household members present which contributes to the collection of incorrect data as has been described by MADULU (1998: 39).

- However, the most important criterion might be that this approach is based on interaction: Not a one-sided interest of collecting data from informants stands in the centre, which has been described by various authors (see a.o. TÜTING 1990, BLISS 1990, 1994) as ‚research /scientific/rural development tourism' and 'survey slavery' (see also Fig. 8)[30]. Contrarily the participants get the possibility to ask questions, too and by this receive e.g. background information on the research, the researcher, etc. (see e.g. KRAMER et al. 1979: 27). We have to be aware of the fact that the participants are active and competent partners of interaction within the research process. Moreover, they are 'experts' as to the research questions. They have to be regarded as equal partners instead of pure 'data-representatives'. They are involved in a social relation with the researcher which is fundamental as to the emancipation of participants (LAMNEK 1995: 15). It is about knowledge facilitation, knowledge generation and knowledge sharing (HAUG 1998: 3).

Fig. 8: A critical comic on ‚research tourism' (Source: ROCHELEAU et al. 1988: 69)

- Furthermore, activities and time table depend to a great extent on the arrangement of the contact persons - thus, they are directly involved and participate actively in decision-making processes. The necessity of participation has been described in detail in the literature (see e.g. DENZIN & LINCOLN 1994, HAUG 1998).

[30] An example with regard to research on Indians is given in STRAUß (1994: 352).

Participation has to start with a proper introduction, explaining clearly research objectives, procedure and outcomes (KINGMA 1996: 5). Furthermore, voice shall be given to the people (mainly women) on which research is carried out in order to empower them and their social organisations (OLESEN 1994: 167; STANSFIELD 1994: 176). Of course, the researcher has to be aware of the fact that, although trying to take over the perspective of 'the others', the 'product' is still filtered through his/her perspective (see also LINCOLN & DENZIN 1994: 577). The different quotations regarding various issues are analysed and compared, so that correspondences and differences of views, perceptions and recommendations can be outlined; thus, sometimes different quotations are given. Of course, underlying difficulties like e.g. power relations in general have to be taken into account as well as critics on the extend of participation (see OLESEN 1994: 167; STANSFIELD 1994: 176; see also STAKE 1994: 241-242; FONTANA & FREY 1994: 369).

The approach can be summarised with FONTANA & FREY (1994: 373-374): „The „other" is no longer a distant, aseptic, quantified, sterilized, measued, categorized, cataloged faceless respondent, but has become a living human being [...]. That is, as we treat the other as a human being, we can no longer remain objective, faceless interviewers, but become human beings and must disclose ourselves, learning about ourselves as we try to learn about the other."

However, liveliness and being close to daily life give reason for criticism. Faults are found with the low theoretical level of reflection. Field researchers are regarded as persons affected who are dressed as scientists and whose reports are relevant for the affected persons but not for science (FLICK 1991: 190; see also FRIEDRICHS & LÜDTKE 1973: 22). Furthermore, different observers may record different observations (SILVERMAN 2000: 89). Taking over the position of a participant could result in uncritical identification with the actors and affection could lead to loss of distance (BORTZ & DÖRING 1995: 245, 315-316). The researcher has to balance between identification and being close to practice – foregoing the academic role – (which means safeguarding the interests of the target group) and distance (which means safeguarding the interests of the research for not becoming absorbed in particular interests). It is also a balance between giving-up and maintaining scientific rationality ('naive everyday intellect' versus 'scientific mind' – see LAMNEK 1995: 47-48) (KRAMER et al. 1979: 31; FRIEDRICHS & LÜDTKE 1973: 48-49, 154; see also MORSE 1994: 231; FONTANA & FREY 1994: 367; LAMNEK 1995: 235). JANESICK (1994: 213) gives the following statement: "In a sense, while in the field, the researcher is constantly immersed in a combination of deliberate decisions about hypotheses generated and tested on the one hand and intuitive reactions on the other." The researcher has to face the dual role of being outsider and insider while developing self-criticism and self-awareness (BURGESS 1983a: 1; 1983c: 48). The author (1983a: 1) describes the situation as follows: "[…] researchers maintain membership in the culture in which they were reared while establishing membership in the groups which they are studying; they are socialized into another culture." In fact, the researcher lives in two diffe-

rent worlds of thought at the same time, and thus in categories, concepts and values which often cannot easily be reconciled (ibid.). After POWDERMAKER (1966: 9) involvement and detachment is the heart of the participant observation method.

According to FRIEDRICHS & LÜDTKE (1973: 17) the underlying problem is formed by the fact that the distortion of the reality through the observing subject can only be reduced insufficiently; objectivity is relatively low, subjectivity relatively high. The cause of the fault has its reason in perception and psychology of thinking – thus, the phenomenon of selective perception can be seen in a interconnection of observation and judging. These distortions become most obvious where persons have been characterised and judged by means of empathy (influence of projections and cultural stereotyping) (ibid.: 30, 38-41, 93, 200; see also STANSFIELD 1994: 176). But the authors mention also that this opinion derives from a definition of objectivity which is too narrow and conclude (ibid.: 33): "Die Objektivität eines Beobachtungsverfahrens mißt sich nicht essentialistisch, sondern am Verhältnis zwischen optimaler Methode und den daraus resultierenden sinnvollen Aussagen über den Gegenstand sowie an ihrer intersubjektiven Plausibilität. [...] Objektiv ist somit eine Beobachtungsmethode, die ihre intersubjektiven Möglichkeiten rational und effektiv ausschöpft."

To the opposite, aspects like loss of distance and balancing between neutrality and affection (FRIEDRICHS & LÜDTKE 1973: 48) are meanwhile not regarded as problematic anymore: researchers try to live ever closer to the lives about which they write. It is argued that only, if we have lived close enough to the researched we begin to understand how their worlds have been constructed (see LINCOLN & DENZIN 1994: 582; see also LAMNEK 1995: 20).

Concerning the intensity of participation and interaction four types have been distinguished, with a grading from active to passive (absolute identification with the environment → complete participant; participant-as-observer; observer-as-participant; pure observer without interaction → complete observer) (FRIEDRICHS & LÜDTKE 1973: 47; BURGESS 1983c: 45-46; FLICK 1998: 137-138; see also GANS 1983: 54). All these roles have been played, according to the demands of the respective situation.

Furthermore, GANS (1983: 54) classifies the fieldworker's emotional relationships to the people he/she is studying in *total participant*, *researcher participant* and *total researcher*. He notes (ibid.): "Being a total participant is probably the most fruitful kind of participant observation, for only by being completely immersed in an event as an involved person can one really confront and grasp the social and emotional incentives and pressures that act on people in groups." I would like to transpose this statement also to other situations, but would like to note that I believe that the most fruitful research is the one where the participant observer succeeds in changing the roles accordingly to the situation. Of course, this is not always possible, but should be tried to achieve as often as possible, because an interchange is necessary for data input and analysis on a broad level. But, as GANS (ibid.) asks to consider, the

participant observer "[…] is emotionally first an observer and only secondarily a participant." One can almost not overcome – even if momentarily forgetting the research – to always remember the reasons behind of being in that situation as well as own personality and background.[31]

Participant observation is as hardly as any other method connected to a change of attitudes, thoughts and role expectations of the researcher (FRIEDRICHS & LÜDTKE 1973: 49). Concerning the question of how to present oneself FONTANA & FREY (1994: 367) note that this is very important as one's presentational self leaves a profound impression on the respondents and has great influence on the success (or failure) of the study.

I not only decided to present myself as a learner and to „dress down" to look like the respondents as has been expressed by the authors (ibid.) but I try to behave and feel like a learner as part of my approach through personal experiences. Within my research context I find it extremely important to adapt to the cultural traditions by dressing like the rural female farmers to keep the difference as low as possible. Showing the will to adapt to the conditions within a research setting has been found (also through previous experiences) to support building up confidence and trust as well as closing cultural gaps.[32] The higher the degree of adaptation the higher is at least the degree of quantity and quality of data collected: „The researcher must adapt to the world of the individuals studied and try to share their concerns and outlooks. Only by doing so can he or she learn anything at all" (FONTANA & FREY 1994: 371).

Furthermore, it is difficult to be integrated as participant observer on the one hand and not to change the normal course of daily activities, reactions, expectations, etc. through own initiatives and activities on the other. The danger is that the field might be changed unchecked through the observers' influence in the way that it becomes artificial (see also FRIEDRICHS & LÜDTKE 1973: 36, 41-42). Accordingly, the authors (ibid.: 178) suggest that an adequate observer should react principally more on interactions induced by others than the other way round since in the last case there is a risk that the researcher becomes a more influential key person. They further set out (ibid.: 197) that no other method which has been applied successfully until today depends so much on the behaviour of the researcher for the reliability of data. It

[31] The author gives a valuable description of the inner processes going on when to decide which role to choose (ibid.). Concerning the note of the author (ibid.: 55) that one cannot carry out research in a setting close to the own life situation because the researcher is already biased, e.g. if he/she knows the people, I like to add that this is happening anyway: persons, situations, places, landscapes, etc. always redeem/provoke a variety of emotions, preoccupations, memories, etc. – if not having biases or presumptions, etc. in mind – as the author remarks on page 56, too. The important aspect is to be always aware of this fact to be able to react appropriately, since "[…] 'affective participation' can create not only personal, but methodological problems for the participant observer and can bias the data gathering process in a variety of ways" (ibid.: 56).

does not matter whether in an (intensive) interview, in a group discussion, an experiment or non-participant observation, the participant observer always has to deal with a higher complexity of the subject, more difficult conditions as to communication, more differentiated situations of data collection, longer and more continuous field work or other problems, often with several aspects at one time.

Further problems are simultaneous observation and recording, gaps in one's memory and subjective misinterpretations. Of course, variables like length of stay, knowledge of language, culture and traditions, etc. have got an influence on the research and its outcomes, too, but are hard to assess (see also FRIEDRICHS & LÜDTKE 1973: 22).

Validity and quality of collected data cannot be measured easily; however, the empirical value of the collected material can be seen indirectly in the degree of integration in the setting and acceptance of the researcher by the participants (FRIEDRICHS & LÜDTKE 1973: 153-154). Concerning validity LINCOLN & DENZIN (1994: 579) sets out: „Hence a text is valid if it is sufficiently grounded, triangulated, based on naturalistic indicators, carefully fitted to a theory (and its concepts), comprehensive in scope, credible in terms of member checks, logical and truthful in terms of its reflection of the phenomenon in question." FRIEDRICHS & LÜDTKE (1973: 176) comment that a compromise as to the behaviour of the observer is desirable: "Er soll einerseits möglichst intensiv und in repräsentativen Situationen das "normale" Feldgeschehen erfahren, andererseits aber auch strukturelle Spannungen und Veränderungen wahrnehmen, ohne an deren Entstehung und Lösung direkt beteiligt zu sein."

According to FRIEDRICHS & LÜDTKE (1973: 176) a principle of participant observation is that the scientific reason of the observation has to be hidden; this opinion is not supported by the author: contrarily, exactly the demand for frankness forms the underlying principle of this research as a prerequisite for trust, understanding and inter-cultural exchange (see also BURGESS 1983b: 17; 1983c: 46). As PUNCH (1994: 89-90) outlines, one must be open and honest with the participants because they have the right to be informed that they are researched and about the nature of the research (informed consent - see FONTANA & FREY 1994: 372).

The aspect discussed above brings up the ethical aspect within research. After SILVERMAN (2000: 200) a researcher who studies people's behaviour or asks them questions has to face his/her own values to as well as his/her responsibility for those studied. FRIEDRICHS & LÜDTKE (1973: 27) mention that reflection on unintentional moralistic and political side-effects and how to avoid them must be part of the strategic calculation of the participant observer just the same as the methodical-technical exactness of his/her research (see also JANESICK 1994: 212; PUNCH 1994: 84, 88-

[32] „Gaining trust is essential to an interviewer's success, and even once it is gained trust can be very fragile indeed. Any faux pas by the researcher may destroy days, weeks, or months of painstakingly gained trust" (FONTANA & FREY 1994: 367).

94). As to the last-named author political and ethical elements often have to be resolved depending on the situation, even spontaneously. He mentions furthermore: "Entry and departure, distrust and confidence, relation and despondency, commitment and betrayal, friendship and abandonment – all are as fundamental here as are dry discussions on the techniques of observation, taking field notes, analyzing the data, and writing the report."

Another traditional ethical concern after FONTANA & FREY (1994: 372) is the protection from harm a. o. through the right of privacy (anonymity). In general, interpretation of observed behaviour ideally should orient towards an explicit theoretical model of the respective socio-cultural system (MAYNTZ et al. 1969: 88 in: FRIEDRICHS & LÜDTKE 1973: 155)[33]. Since a lot of data collected within the context of this research are 'facts' source and extension of failures can be kept low.

Participant observation implies to reveal and discuss approach and objectives openly with all groups involved (*bottom-up access* - see SILVERMAN 2000: 199). Explaining why the researcher has come and what he/she wants to do is essential for confidence-building as well. It is clear that the more one gives and the more one reveals of him/herself the higher the degree of familiarity and trust among the participants as to the researcher. The strategic definition of the role of the observer provides the structural preconditions for participation; furthermore, individual frankness and adaptability of behaviour provides the guarantee for a successful participation in a situation. On the other hand, being a stranger gives the possibility to the observer to gather (differentiated) information (FRIEDRICHS & LÜDTKE 1973: 44-45). Critics and suggestions for improvement are welcomed and are taken into consideration.

Participant observers have to consider the degree of influence of their personal attributes (age, sex, dress, social class, speech and ethnicity, etc.) on the research (BURGESS 1983c: 46-47). It has been experienced that age, sex and appearance can raise expectations ('e.g. you have to be married in that age'... – see also FRIEDRICHS & LÜDTKE 1973: 45). The sex of the researcher plays a crucial factor in observational research (SILVERMAN 2000: 206; FONTANA & FREY 1994: 363, 369-370; EASTERDAY et al. 1983; chapter 1.3.1): in many cultures specific roles and traditions determine the relations between men and women. For instance, a woman may not be allowed to stay alone at home with a male non-family member ($\rightarrow$ researcher). Being a woman might be the precondition to create an atmosphere of trust ('we have a thing in common') and accord privileged access (SILVERMAN 2000: 207). After own experiences, it can be presumed that information given is more detailed and trustworthy. Being a woman serves the benefit to have the possibility to enter the 'women's world': a male researcher would not find out special issues which are discussed among women only (see also SILVERMAN 2000: 207). BARROW (1996: 183) suggests that an opportunity for action could be "[...] giving agroforestry and social forestry ample scope to

[33] FRIEDRICHS & LÜDTKE (1973: 156-157) give a catalogue for rating the validity of data collected.

train and hire women. Women clients often relate better to women professionals on more sensitive issues of access to land, trees or their products."

According to the research approach, I have lived with the families, participated in daily activities and held informal unstructured interviews with members of the selected families. However, main attention has been directed to the women (reasons have been described above). Male farmers play an important role within the research context, too; accordingly, it has been tried to come into contact with male family/village/group/staff members as often as possible: their opinions form an important contribution to the process of present problem detection and within the context of evolving solution-strategies.

Data have been obtained by means of question guidelines and minutes taken from memory which have been designed after the special requirements and questions; the guideline has been attached (see appendix 1).

1.3.3.2 Assessment and revelation of field experiences

> "Researchers' reflections on their actions and observations in the field, their impressions, irritations, feelings and so on, become data in their own right, forming part of the interpretation, and are documented in research diaries or context protocols […]."
>
> U. FLICK in his book about qualitative research (1998: 5).

After DENZIN & LINCOLN (1994a: 15) we are now in a new age where reflexive forms of fieldwork, analysis and intertextual representation become more common. Experiences made during the field work/the phase of data collection, problems occurred and solution strategies form an important, if not *the* central part of the empirical research process (BRAUKMEIER 1992: 14); they have to be revealed and discussed also in studies dealing with natural resources management, especially if they are based on a qualitative approach, for being able to correlate the scientific results with this 'side-effects' to make out a balance-sheet. PUNCH (1994: 87) summarises: "The actual conduct of research and success in the field can be affected by myriad factors, including age, gender, status, ethnic background, over-identification, rejection, factionalism, bureaucratic obstacles, accidents, and good fortune." Within this context, a critical review of inner processes and circumstances[34] as well as of the influence of the social environment on the researcher and vice versa (inter-human processes) like stress, deep personal involvement, role conflicts, physical and mental

[34] Often, self-reflection is the only source of access to important phenomena (BORTZ & DÖRING 1995: 246-247) – apart from the fact that research is conducted in a team or that researchers, project staff, friends, etc. are around for discussion. However, if the person(s) contacted is/are not familiar with the situation – and even then – to make a valuation or to give an advice may not be possible or even wrong; on the other hand, non-involvement can result in objectivity and become relevant to the analysis of thought-processes.

efforts, drudgery and discomfort as well as even danger[35] (see PUNCH 1994: 85; see also LAMNEK 1995: 41) is as necessary as dealing with external (technical) factors (KUTZSCHENBACH 1982; BRAUKMEIER 1992). Attention has not only to be paid to the observation of others, but also to reflexive self-observation for a further grounding of the interpretation of the observed (FLICK 1998: 137). GANS notes: "[…] one means is to become aware of one's problems and anxieties, and then to find out whether they are generated by the participant observation role, by the situation and people under study, or by personal difficulties which surface because of the research." It is criticised that findings are presented as if problems of access, termination and maintenance of contact never existed and as if data collection, analysis and findings are not influenced by these circumstances (see also FRIEDRICHS & LÜDTKE (1973: 22). Accordingly, FONTANA & FREY (1994: 372) are of the opinion that „[...] these „confessions" are very valuable, as they make readers aware of the complex and cumbersome nature of interviewing people in their natural settings and lend a tone of realism and veracity to studies [...]." There are various mutual/reciprocal influences between researcher and his/her surrounding, especially if the research is based on a close contact to a different culture.[36] But external factors have to be considered and assessed, too. At least, all circumstances have got an influence on the quantity and quality of data gathered 'in the field'. In the worst case, completely wrong data may be collected due to unrecognised and neglected aspects.

Still, no empirical studies within the context of the management and conservation of natural resources can be found, integrating a critical review of these aspects. Such a review, however, is necessary, for being able to correlate the scientific results with these 'side-effects' to make out a balance-sheet. Painstaking self-observation should be carried out while entering the field, during the course of the observation and when looking back on its process in order to integrate implicit impressions, apparent incidentals and perceptions (FLICK 1998: 140).

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[35] Dangerous situations have got a considerable impact on the research process in a whole as has been experienced through the outbreak of the deadly virus-disease Ebola in Uganda on 11th of October 2000 which in the end forced me to stop research in Kenya. As PUNCH (1994: 85) writes: "Such pitfalls and predicaments can rarely be anticipated, yet they may fundamentally alter the whole nature and purpose of the research."

[36] A short digression on tribe, race and ethnicity is given below by STANFIELD (1994: 175):

Tribes "[…] are localized forms of social organization with an emphasis on ancestry rights and "the camp" or "the village", there is also, obviously, the presence of a localized culture reproduced and at times transformed intergenerationally."

Races "[…] are constructed categories of populations that gain social and and cultural relevance when random human qualities such as intelectual abilities, moral fiber, personalities, aethetic tastes, and physical abilities become fixed and systematized through their association with phenotypical attributes. […]. […] race and tribe are special forms of social organization and stratification associated with certain historical and political economic conditions […]"

Ethnicity "[…] is a critical attribute of race in that it is a basis of diversity within and between racial categories. […]. […] ethnicity is a more universal human attribute. […] we all have ethnicity, even though it may be entangled with status and social organizational attributes such as class, gender, age, ethnoregionalism, and religion."

Generally, it is assumed within the research context that research tends to be tendentious, if personal experiences and data are included (STRAUß 1994: 36); subjectivity is another much discussed factor (ibid.: 39). In opposite to this opinion other authors (FRIEDRICHS & LÜDTKE 1973; PUNCH 1994) regard personal experiences as fundamental for the analysis of (qualitative) data; data gathered ‚in the field' derive from inter-action between human beings, thus, they are not just mere data, but have to be seen in a broader context.[37]

Keeping a field journal (*reflexivity journal* - see HUBERMAN & MILES 1994: 439, after CARNEY 1990) for writing-down of field notes – field experiences inclusive positive hypotheses, own spontaneous associations and feelings – is crucial for the research process and outcomes and forms an extraordinary difficult part of the study (see e.g. FLICK 1991: 192; NADIG 1986: 40). Moreover, writing a record intensifies the field contacts through making the events, persons, etc. more present; reflection supports the clarification of hypotheses and misunderstandings (FLICK 1991: 192).

First of all, assessment of the above named factors supports knowledge exchange concerning an almost unnoticed aspect in the context of field research on natural resources management: every researcher who collects data in a different surrounding than the one he/she is coming from,[38] is inevitably confronted with well-known aspects like culture shock, isolation, getting used to different cultural traditions, etc.; of course, the degree differs, a. o. according to personality of the researcher and the respective setting. Strange enough, experiences made are completely faded out when it comes down to the presentation of results as PUNCH (1994: 85) outlines: „Successful studies attract the limelight; failures are often neglected. Dilemmas in the field are glossed over in an anodyne appendix, and it may even be deemed inappropriate for the "scientist" to abandon objectivity and detachment in recounting descriptions of personal involvement and political battles in the field setting. This can be reinforced by the strictures of publishers, who may find personal accounts anecdotal, trivial, and scarcely worthy of space." According to the author (ibid.), personal and anecdotal accounts are not widely written down "[…] largely because we have failed to develop a "genre or narrative convention within our standard works" that would shape a taken-for-granted imperative that field-workers own up to the manner in which they solved such issues during their research [...]."

Within this context, feminist research has made a "[…] powerful and significant contribution to the recent debate on the politics of research […] in reaction to the patri-

[37] Furthermore, features like researcher personality, geographic proximity, nature of research object, researcher's institutional background, gatekeepers, status of field-workers, expectations in team research and of publishers, social and moral obligations, etc. have got a material impact on qualitative research in general and fieldwork in particular, the same as they shape the politics of research (PUNCH 1994: 86-88).

[38] This can even be within the same society but a different social class and is not only related to a completely different socio-cultural surrounding, in general going along with a different language, different ecological conditions, etc.

archial nature of academic life […]. […] In effect, the impact of feminist research has been to awaken the whole issue of gender in research activities and to politicize the debate on the conduct of research; similar arguments have been raised about race and ethnicity" (PUNCH 1994: 85; see also REINHARZ 1992). Knowing about the factors is relevant for the revelation of similar and different structures (influence of psychological constitution on period in the field); the revelation can support exchange of experiences between researchers who have worked with similar methods in the field; by means of this, methods can be improved through supporting the understanding of 'what happens in the field'; this is a necessity to improve not at first the method and quality of data collection, but – since the data derive from people – inter-cultural exchange and understanding. It is a challenge to create „[...] an objectified form of reflexivity, making an object of that which shapes your own knowledge, never giving into a romantic subjectivist fantasy. The objective, critical treatment of the contexts that produce objectifying modes of thought (reason) is indeed a valuable form of reflexivity with many possibilities regarding how to expand/reconstruct the [...] research project" (MARCUS 1994: 570).

1.3.3.3 Qualitative unstructured interviews

> „Conversation is a crucial element of field research. […]. […] unstructured interviewing [is] a form of conversation that incorporates elements of everyday life into the conduct of field research. […] Nevertheless, interviewers need to be good listeners as well as questioners."
>
> R. G. BURGESS in his field manual (1983e: 107-108).

Informal meetings and conversations with female and male farmers (neighbours, group members, friends, relatives, farmers met by coincidence), including farm visits with special emphasis on natural resource management (farm unit, crops, trees), livelihood (e.g. income generation through doing pottery, inclusive improved cooking stoves) and gender have been conduced by means of unstructured interviews.

Unstructured interviews have been included because they provide "[…] the opportunity for the researcher to probe deeply, to uncover new clues, to open up new dimensions of a problem and to secure vivid, accurate, inclusive accounts from informants that are based on personal experience" (BURGESS 1983e: 107; see also HATIBU & MTENGA 1996: 17). FONTANA & FREY (1994 366-367) explain that [unstructured interviewing] "[...] is used in an attempt to understand the complex behavior of members of society without imposing any a priori categorization that may limit the field of inquiry. [...] He or she must be able to put him- or herself in the role of the respondents and attempt to see the situation from their perspective, rather than impose the world of academia and preconceptions upon them." This also implies that the researcher has to be able to ascertain socio-cultural meanings (BURGESS 1983e: 108).

Concerning this method it has to be noted that "[…] although the informant is given latitude to choose his own order and manner of presentation, there is a systematic attempt on the part of the researcher to cover completely the topic under analysis" (TREMBLAY 1983: 98). Conclusively, "the unstructured interview is flexible, but is also controlled" (BURGESS 1983e: 107).[39]

Furthermore, meetings with women's/mixed groups have been attended and informal group discussions been carried out. "The group interview has the advantages of being inexpensive, data rich, flexible, stimulating to respondents, recall aiding, and cumulative and elaborative, over and above individual responses" (FONTANA & FREY 1994: 365; see also HATIBU & MTENGA 1996: 17; DHAMOTHARAN & BECKER 2000: 7). The researcher can learn about concepts and decision-making processes among farmers as well as preferences and criteria held by farmers; furthermore, a group approach can help to overcome inhibitions about expressing ideas or criticism in front of researchers, also due to sex differences; language problems can be overcome more easily (KINGMA 1996: 7; RUGIMBANA & NYANGA 1996: 20). BURGESS (1983e: 109) notes: "Such a situation provides informants with an opportunity to discuss their world and to argue over the situations in which they are involved." On the other hand, he refers to methodical problems like comparability of questions covered, only views are produced which can be stated publicly and less detailed material is gathered from individuals (ibid.). Furthermore, a group approach is not suited to sensitive subjects, and few farmers can be dominant by a few outspoken individuals. Also, especially large group discussions are time consuming (KINGMA 1996: 7; RUGIMBANA & NYANGA 1996: 20). Skills required from a (group) interviewer are being flexible, objective, emphatic, persuasive, a good listener, etc.; furthermore, one person or a small coalition of persons must be kept from dominating the group, recalcitrant respondents must be encouraged to participate, responses must be obtained from the entire group to ensure the fullest possible coverage of the topic, and the researcher must balance between the directive interviewer and moderator role (FONTANA & FREY 1994: 365).

[39] BURGESS (1983: 108, after STRAUß et al. 1964) explains four different types of questions suggested to be used. WHITE (1983: 111-122) gives valuable descriptions on several aspects of the conduction of non-directive interviews.

1.3.3.4 Qualitative structured written expert interviews

„Different practitioners (i.e. farmers, extensionists, research scientists and administrators) can view field problems in quite a different light. They may have different agendas and objectives and sometimes only a limited level of shared experience."

P. HUXLEY in his book on tropical agroforestry (1999: 300).

Like has been outlined in chapter 1.3.3 a multimethod approach has been chosen to deal with the different aims of the research. Thus, in the field of the research standardised written questioning/survey with experts from different organisations, institutions, etc. working in Tanzania and Kenya have been conducted by means of a questionnaire which has been attached (see appendix 2).

As the statement at the beginning of this chapter explains, views, objectives and strategies may differ among different (groups of) practitioners. Accordingly, both, the inclusion of non-structured interviews and meetings with additional farmers and groups as well as structured expert interviews implies several advantages: contribution to the casting of new light on field observations, verification of field interpretations, and correction of holistic fallacy which means perceiving all facets of a social situation as congruous with each other[40] (SIEBER 1983: 186-187). Problems of written interviewing are discussed in ATTESLANDER & KOPP (1984: 168-170).

In general, as to the design of a questionnaire it can be concluded with SIEBER (1983: 180): "As a rule, the more knowledgeable the questionnaire designer about his ultimate population, the more sophisticated the instrument and the smoother its administration."

1.3.3.5 Other methods

Training, workshops, farmer field days, etc. have been joined and demonstration plots been visited to get an insight view of the translation of the project's approaches into action and to observe interactions between staff members, farmers as well as staff and farmers. Furthermore, own learning processes are supported and skills are broadened. Additionally, experience in this field has been gathered during visits paid to other projects respectively visits paid to the same projects during the previsit in 1998 as well as during earlier visits.

[40] „When the search for congruence overrides important refinements or dictates assumptions that are unsupported by direct evidence, and especially when striking exceptions to one's theory are subtly discounted on behalf of a unified conception, one is indulging in the holistic fallacy" (SIEBER 1983: 186).

The method of wealth ranking and farm budgets has been involved as one major concern was to find out key criteria related to success, although farmer rationales and livelihood strategies are not easily quantifiable (see also CROWLEY et al. 1996: viii, 4). A thorough investigation of the literature led to the indicators used.

1.3.3.6 Data recording

> "Note-taking is a personal activity that depends upon the research context, the objectives of the research and relationships with informants. [Note-taking is] […] central to the research process, as it marks the beginning of preliminary analysis and theoretical discovery for the researcher."
>
> R. G. BURGESS in his field manual (1983g: 191).

An important aspect to be taken into consideration is data recording: *what kind of notes should be taken? How should they be taken? And when should they be taken?* (see also BURGESS 1983g: 191). I decided to include the following techniques:

- note-taking
- keeping of a field journal
- mappings (farm sketches)
- transect walks
- tape recording (only occasionally)
- photographs, maps
- collection of documents (project reports, literature, maps, photographs)

Concerning note-taking I agree „[...] that regardless of the circumstances one ought to (a) take notes regularly and promptly; (b) write everything down, no matter how unimportant it may seem at the time; (c) try to be as inconspicuous as possible in note taking; and (d) analyse one's notes frequently" (FONTANA & FREY 1994: 368; after LOFLAND 1971; see also BURGESS 1983g: 191).

Different types of notes have been kept: jotted, full and mental field notes (BURGESS 1983g: 192). Note-taking included systematic notes, descriptions of and reflections on settings, events, conversations, persons, etc., aspects like impressions, personal and emotional involvement as well as methodological aspects. Note-taking took place in the evening or in breaks (noon, etc.) and not in front of the people since I did not want to disturb processes of interaction. However, short notes have been taken in special situations (in case of a lot of information like during a field excursion into a forest for examining medicinal plants. The people themselves asked to take notes and said that 'otherwise I might forget important things'); generally, people have been asked whether notes may be taken. A change in behaviour due to note-taking has not been recognised, maybe because of the fact that only short notes have been taken so that the people saw that I was still engaged in the situation and

accordingly did not feel irritated. One day, farmer 1K-I even asked me to get the book to write down her comments and stories she wanted to give/tell while preparing the meal.

The pros and cons of note-taking have been discussed by BURGESS (1983e: 118). While, at the one hand, note-taking adds to the formality of the occasion, some participants might express anxiety when the researcher is *not* taking notes. On the other hand, the researcher cannot give full attention to the participant and the situation, so he/she cannot be as alert on picking up productive leads as the researcher who does not take notes (ibid.). Further, the author explains problems which occur when taking notes later; besides that note-taking is likely to interfere with the flow of the interview he states concerning the reconstruction: "At best, [the researcher] will present an interview that is accurate in its main outlines but that condenses and organises the data."

For reasons of verification and 'self-objectivation' keeping of a field journal is essential; within this context separate diaries are kept for self-expression, self-exploration and self-analysis (BURGESS 1983g: 192-193). This means writing-down field notes - own spontaneous associations and psychological aspects (FRIEDRICHS & LÜDTKE 1973: 42, 70 ff.; NADIG 1986: 40; DENZIN 1994: 526).

A tape recorder has been used only in few situations because transcriptions have to be quickly produced for reasons of reflection and data analysis, but transcription work is notoriously slow and technically difficult (BURGESS 1983g: 193).

Furthermore, 'second-hand observation' (FLICK 1998: 136) has been included: mappings have been made which have led to a draft from each farm, in combination with a description of the homesteads and the arable land, showing the distribution of each building (house, animal sheds, etc.), the tree-/shrub resources (species, location, number of individuals, purpose, status), cropping patterns, physical soil and water conservation methods, etc.; transect walks within the respective farm environment, thus walking through a cross section of the community, have been carried out for getting a general overview of the given area and for spatial data collection on ecological criteria, land use and settlement patterns: "[…] this tool can be particularly helpful in understanding interactions between the physical environment and human activities" (DHAMOTHARAN & BECKER 2000: 6).

Photographs (documentary photography - HARPER 1994: 403-412) – another form of visual data – have been used to document and make visible measures, daily life, tree species, farm settings, etc. as a complement to observations (see also BRADLEY 1991: 235; HATIBU & MTENGA 1996: 16). Through this method, processes and actions can be elucidated like e.g. stove-making.

The central benefits of using cameras can be summarised as follows: they allow detailed recordings of facts and provide a more comprehensive and holistic presenta-

tion of lifestyles and conditions. Artefacts can be transported and presented as pictures. The borders of time and space can be transgressed, and facts and processes be caught that are too fast or complex for the human eye. Cameras allow non-reactive recording and observation, and they are less selective than observations (FLICK 1998: 152, after MEAD 1963). For instance, photographs in family-albums as well as photos and images of family members on the walls show a family's history, etc. Photographs document the world, but also transform the world which they present into a specific shape. Photographs tell the truth, but one can also ask, how far they are marked by the interpretations of the ones who take or analyse them (FLICK 1998: 152-153).

The combination of visual material in general (figures, drawings, etc.) with text is a valuable method to make research findings more transparent and understandable for the reader. Visual material for complementary documentation is called into play and contrasted with the presentations and interpretations in textual form in order to extent the integrated perspectives on the subject (FLICK 1998: 152). Already HESSE (1907: 76) writes: „Denn jede Wissenschaft, nicht nur die ästhetische, braucht in entscheidenden Momenten das rein künstlerische, unmittelbare Zusammenhängen von Auge und Sprache, die Fähigkeit des sinnfälligen Ausdrucks."

Of course, visual material is only an additional source of information and form to present findings, situations, etc. It cannot overcome problems of direct observation; selection criteria and significance have to be taken into consideration (BURGESS 1983g: 193). Visual material is not a mirror image of reality but only a form of presentation which remains blind without analysis (FLICK 1998: 151).

Finally, the collection of documents has been involved for data collection on special issues like project approaches, aims, etc.).

For my opinion, an important aspect of visual material is linked to knowledge-exchange between researcher and participants. I have used different visual as well as a combination of visual and textual material to illustrate my own personal back–ground (e.g. photographs of me and my family, my home place, my garden, land-use, maps showing my hometown, Tanzania, Kenya as well as a world map, a recent publication to explain my field of work, etc.). This method is exceptional important for the familiarising process. How, e.g. to explain snow if people have never seen it? A photograph simply can help to bridge gaps and to create understanding. Moreover, according to HARPER (1994: 410), photographs can stimulate participants to produce narratives or answers.

1.3.4 Data analysis

1.3.4.1 Statistics, tools (data bases), etc

Data collected have been analysed through applying an analytical model (SILVERMAN 2000: 234). Generally, a multistage evaluation process has been applied. First, all data have been stored in a data base. Subsequently, each topic has been looked at for each case, then compared with the other cases to find out similarities and differences. Finally, these findings have been related to other topics to put them in a broader context for the sake of reliability and generalisability. Within this context, the most insidious/obvious biases have been verified through checking for representativeness, researcher effects (reactivity), triangulating and weighing the evidence. Tactics applied for testing the viability of patterns are search for comparisons, contrasts, and freak values. Furthermore, it has been tried to rule out spurious conclusions and rival explanations to replicate key findings and to look for negative evidence; moreover, feedback of participants has been included (see also HUBERMAN & MILES 1994: 438). The following steps according to Fig. 9 below have been undertaken for data analysis (after HUBERMAN & MILES 1994: 429-438):

Data reduction: a) before starting fieldwork: choosing a conceptual framework, research questions, cases, and instruments b) after data collection: further data selection and condensation of field notes, interviews, etc. through summaries, coding, finding themes, clustering, writing stories.

Distinction between *description* - reasonable accounting of the data collected - and *explanation* of data - putting facts in relation to others, providing requested information, justifying an action, giving reasons, supporting a claim or making a causal statement, making the descriptions intelligible -, the general logic of analysis.

Data display: conclusion drawing and/or action taking out of organised, compressed assembly of information (more focused displays are structured summaries, synopses, vignettes, diagrams, matrices, etc.) - data displays have to be focused enough to permit viewing of a full data set in one location and systematically arranged to answer research questions at hand; analysis is sequential and interactive: the sequence of displays is from „unordered to ordered by case on one or several dimensions of interest, regrouped by families of cases that share some characteristics, and displayed again as an interlocking set of more explanatory variables, ones that undergird the clusters of cases that have been identified."

Interpretation: drawing meaning/conclusions and verification from displayed data (through 1), noting patterns and themes, 2) clustering by conceptual grouping to see connections, 3) making metaphors, a kind of figurative grouping of data, also a tactic for achieving more integration among diverse pieces of data, 4) counting to see 'what is there', 5) making contrasts and comparisons to sharpen understanding by clustering and distinguishing, 6) differentiation through partitioning/unbundling variables, 7) subsuming particulars into the general, 8) noting relations between variables and finding intervening variables) to confirmatory tactics such as triangulation, looking for negative cases, following up surprises → data transformation as information is condensed, clustered, sorted, and linked over time. Facts discovered are already products of many levels of interpretation.

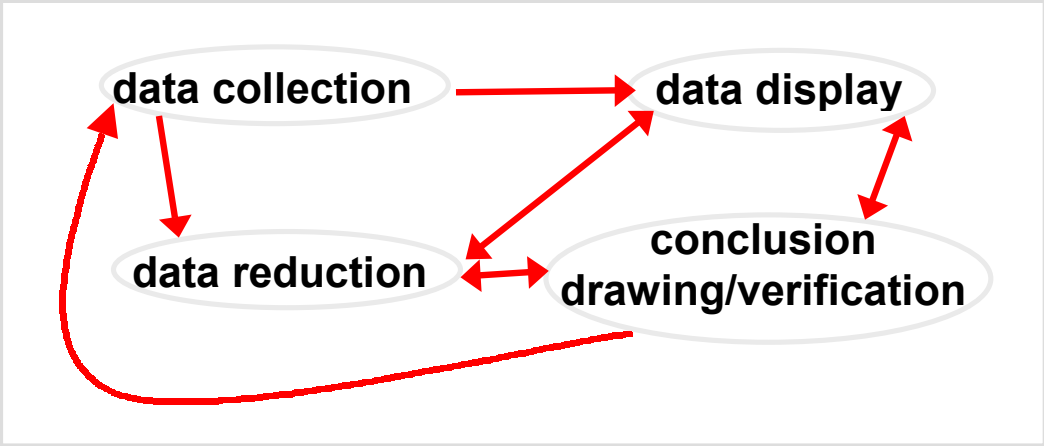


Fig. 9: Interactive model of components of data analysis (after HUBERMAN & MILES 1994: 429)

This approach is mainly *case-oriented* (but is also trying to find variables/'themes'/ patterns cutting across the cases), applying a *cross-case analysis*: after looking at each entity, configurations within each case are teased out and are subjected to comparative analysis. In these comparisons, underlying similarities and systematic associations are sought out with regard to the main outcome variable(s); the cases are inspected to see if they fall into clusters sharing certain patterns or configu–rations through applying matrices and other arrays of the data. From there, a more explanatory model is explicated, at least for the cases studied (see also GLASER 1983; BURGESS 1983i).

Inductive and deductive analyses are mixed: when a theme, hypothesis, or pattern is identified inductively, the researcher then moves into a verification mode, trying to confirm or qualify the finding. This then keys off a new inductive cycle: „[...] the re-searcher shifts between cycles of inductive data collection and analysis to deductive cycles of testing and verification" (HUBERMAN & MILES 1994: 438). Exploratory and confirmatory sampling drive data collection; gradually, the data assemblies become more „conclusive" (ibid.).

The research encompasses both deductive and inductive methods of theorising:[41]

Hypothetico-deductive method ("[…] progress is made by empirically testing deduc-tions made from a universal statement where the results are used to verify or falsify the original theory" - BURGESS 1983h: 210):

- role of ‚strong women' within groups positive → 'multiplicator-effect'
- role of ‚strong women' within groups negative → might control
- role of women's groups positive

[41] BALDAMUS (1983: 213-224) gives an interesting description on aspects of theorising.

Analytic induction ("[…] generalisations are derived from data presented in case studies by means of refinement, abstraction and generalisation" - BURGESS 1983h: 210). Tentative formulation of two theories:

- men & women together most effective
- encouragement of engaged/open-minded men & women in projects positive effect on success of measures

Generally, within the research process, deduction and induction occur at the same time (ibid.). Retroduction or abduction ("[…] focuses on the interplay of theory and data whereby the researcher reasons back to develop a theory which will account for the observations that are made" (BURGESS 1983h: 210).

Formal theory occurs when a particular substantive theory is extended by the comparative analysis of it with other research data or by comparative analysis with other substantive theories (GLASER 1983: 226): 'ecological success found to be reflected on the economic and socio-cultural levels in one case' or 'higher degree of sustain–ability on male-headed farms compared to female-headed farms shows that men are key persons within the sustainability context'; these findings have to be compared with the other cases to formulate a substantive theory; from here, generalisations can take place to come to a formal theory like 'ecological success is interwoven with success on other levels' or 'if men and women cooperate, the highest degree of sustainability and project's success can be achieved'. GLASER (1983: 230) notes: "Thus, parsimony and scope increase with comparison of different substantive classes. […]. Formal theory is extensive compared to the intensiveness of substantive theory." The higher the data variety included in a comparative analysis the more diverse the comparative information on categories; among the data which can be included are data out of 'anecdotal comparison' – own experiences, general knowledge, reading, stories of others (GLASER 1983: 229). To be included within a set of comparison groups a case must have enough features in common with the group, to be excluded, it must show fundamental difference from the others. The problem is that one can not be sure that "[…] in this set of purified comparison groups spurious factors will not influence the findings and relationships and render them inaccurate" (ibid.). On the other hand, weeding out spurious factors is not important within the process of generating, but diverts attention away from important similarities and differences (ibid.).

Data are analysed after a qualitative analysis of the contents (FLICK 1991: 209-213). The aim is a systematic handling of material deriving from communication (ibid.: 209). Furthermore, computer-assisted methods of analysis for frequency counts, tabulations, and low-level statistical analyses have been applied (DENZIN & LINCOLN 1994a: 5).

1.3.4.2 Levels of analysis

> "Land use throughout the world is characterized by its dynamism. All land use systems are influenced by economic, social and ecological changes at the macro, meso and micro levels."
>
> Statement of the Netherlands Development Assistance, Ministry of Foreign Affairs (1998: 13).

Since we are now (1995 onwards) in the so called institutional stage, after having left behind the production stage (ca. 1900-1975), the economic stage (roughly 1975-1985) and the ecological stage (roughly 1985-1995), jargon buzzwords like 'interrelation', 'networks', may describe the new cornerstones for a global knowledge exchange on different levels, guided by the development of alliances between different institutions and disciplines (see a. o. HAUG 1998: 6-7).

Like has been outlined by ADJOVI & ADEGBOLA (2000: 18) the functioning of the farming system is determined by global decisions, depending on factors endowment at farm level like ecological conditions, economic resources, socio-cultural criteria, etc. These various interconnections have to be analysed to understand their mechanisms and functioning. The total environment in which the rural household operates can be divided into a technical and a human element. The technical element reflects how physical and biological conditions can be manipulated (fertilisers, irrigation, breeding varieties, etc.) to reach the potential system. However, whether improvements can be followed up by small-scale farmers mainly depends on the human element in the total environment. The human element is divided into an exogenous and an endogenous component. The exogenous component which includes the social, economic and political environment and which is largely out of control of the individual household, determines the ability to act. The endogenous component is more under control of the individual farmer: the inputs like land, labour, capital and management can be used to develop a system within the boundaries laid down by the technical and the exogenous component. Availability of and access to these inputs varies among areas and households, influencing a farming system's performance and potential. The farmer's aims and motivations, however, give the system its dynamic dimension.

The human element has often been neglected in traditional agricultural research approaches. However, development is determined by the interaction and availability of natural *and* human resources (ENSERINK & KAITABA 1996: 3).

The research comprises a combined data-analysis across three scales (see Fig. 10):

- Local/micro-scale (catchment, village, family, individual),
- Regional/meso scale (region) and
- International/national/macro scale (international community, nation).

Although it is on the local level where the implementation of measures takes place (or not!), other scales have to be taken into consideration as well: international and/or regional regulations and laws can support or hinder the implementation of innovations; e.g., regional production of crops is often in the hands of international trade and the flows of investment and fiscal manipulation through the taxes that it generates (HUXLEY 1999: 31).

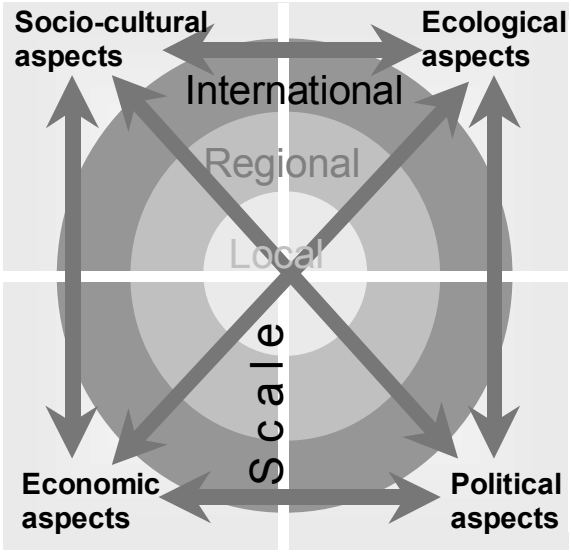


Fig. 10: Aspects and levels of analysis

The claim is to work with an approach as integral as possible. Hence, one of the key concerns of this study is a careful consideration of socio-cultural, economic, ecological and political aspects, and of the linkages between these inter-related factors. For instance, we can regard the natural environment as an arena within which socio-cultural, economic and political activities and processes revolve and militate and ultimately become a means of directing development (SHAO et al. 1992: 2, 11). Any answer to the research question will, therefore, require the intervention of the interaction of natural and human factors. The various issues need to be looked at and addressed under the consideration of different levels (e.g. farmer's, groups, projects, [governmental] institutions, etc.). Regardless of the scale where the analysis starts, an explicit recognition of the linkages between the three scales shall be given. An assessment of these aspects makes it possible to define and prioritise steps towards a positive and realistic change.

These two key concerns are derived from the fact that people live in highly complex and constantly changing socio-cultural, economic, political and ecological systems: Extremely complex natural systems act in combination with just as complex systems of social life of man, short-term survival strategies of local societies meet with long-term conservation strategies of habitats and species, local interests and systems of values are confronted with those of national and global actors. Factors influencing the process of natural resources degradation are likewise highly complex. Thus, this study demands an inter- and transdisciplinary approach; it is based on a systems theory perspective where physical and social systems function in a dynamic process with positive and negative feedback mechanisms, all of which induce opportunities and constraints for change (HATZIUS 1998: 278; HUXLEY 1999: 33). There is always a causal complexity since causes are combining and affecting each other as well as the supposed effects (HUBERMAN & MILES 1994: 435): „[c]auses and effects must be seen as configured in networks - themselves deeply influenced by the local context." Common sense causal questions are: under which conditions does x appear, what facilitates the appearance of x? Which factors influence variations (ibid.)?

1.3.4.2.1 Local level

The concept of this paper is based on the choice of case studies as objects to be studied, thus the local level forms the overall basis; as the most important level and starting point it stands in the centre of the reflections (see Fig. 10 above). Farming systems research in the 1980s showed that an understanding of the totality of enterprises on an individual farm is needed to fully understand its potentials and constraints (HUXLEY 1999: 33). Of course, decisions and interventions made on the regional and international level have a decisive effect on the local level, and it always has to be kept in mind that the levels are closely connected with each other. But it is the direct activities and measures undertaken of people on the local level - be it individuals, families, groups or communities - which in general determine success or failure of project measures (see also BARROW 1996: 210).

This level focuses on women and men as individuals, on households, groups, and communities as a whole. On this level in each project area six farms, situated in two different agro-ecological zones (three farms in a high/medium potential area and three farms in a low potential area) will be analysed. The central questions

Which measures are carried out and what are the differences between the farms?

What are the impacts of successful (female) farmers and women's groups on their natural, economic and socio-cultural environment?

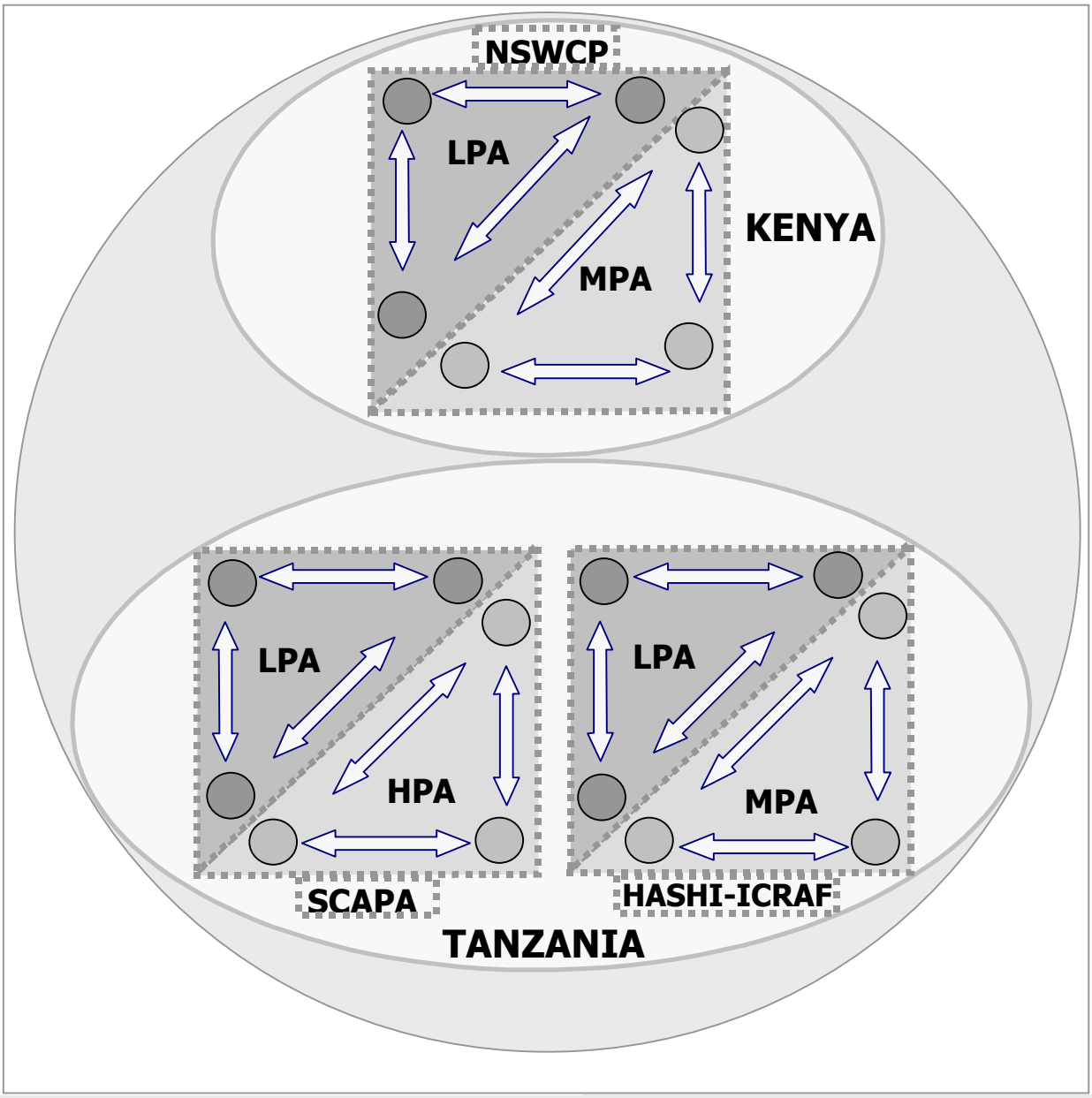
What are the effects of project measures on the (female-headed) households?

What are the reasons for the (female) farmer's success?

shall be answered through an inventory and analysis of different subjects attached to ecological, socio-cultural, economic and political aspects carried out for each farm; data of three different households in each agro-ecological zone shall be compared. The different aspects and subjects are listed below in Tab. 1; see also Fig. 11). It has to be noted that many aspects are considered on all levels, but for the reason of clarity, only the most important ones have been mentioned for each level.

Tab. 1: Criteria considered, grouped after ecological, socio-cultural, economic and political aspects

Farming system analysis
♦Socio-cultural aspects
General data (age, religion, tribe, etc.)
Household structure
Family background
Role of traditions (e.g. concerning trees) & cultural norms, religion
Indigenous knowledge → cropping patterns, medicinal trees/plants, etc.
Gender-based roles, rights and obligations (Labour division and workload, level of democratic participation)
Comprehension/appreciation of nature(conservation)
Education
Social engagement/group activities (people's organisations)
'Psychological' and empowerment related factors
♦Ecological (physical and biological) aspects
General data (plot size, etc.)
Ecological/climatical data, soil erosion phenomena, etc.
Biological soil and water conservation measures – tree management (→ tree plantings - species, use, spatial arrangement, status), tree nurseries, forest related aspects, organic farming, fertilisers, pesticides, mixed cropping/intercropping, crop rotation, fallow systems, natural tree regeneration
Field trials
Physical soil and water conservation measures
Water management (→ supply, harvesting & conservation methods)
Energy management (→ firewood supply, improved cooking stoves)
Agricultural aspects (general data, food crops/horticulture, cash crops) Livestock (e.g. animal species, keeping, fodder)
♦Economic aspects
Income generating activities (farm & off-farm)
Credit
Expenditures (inputs, labour requirement)
Standard-of-living: farm budget
Marketing, infrastructure
♦Political aspects
Land (tenure) (traditional vs. formal law); international linkages; political influences
Project related questions (structure, extension services/service provision planning [information dissemination]; approach; activities/linkages of other organisations, projects, etc. in the project area)



Legend

analysis on local scale/farm level

All farms within one agro-ecological zone are analysed with regard to ecological, socio-cultural, economic and political aspects

Central questions: "Which measures are carried out and what are the differences between the farms? What are the impacts of successful (female) farmers and women's groups on their natural, economic and socio-cultural environment? What are the reasons for the (female) farmer's success? What are the effects of project measures on the (female-headed) households?"

farm units

MPA — medium potential area

HPA — high potential area

LPA — low potential area

NSWCP — *National Soil and Water Conservation Project*, Machakos District

SCAPA — *Soil Conservation and Agroforestry Programme* - SCAPA, Arumeru District

HASHI-ICRAF — *HASHI-ICRAF-Agroforestry Research Project* - Shinyanga

Fig. 11: Level 1 – analysis on local scale/farm level

1.3.4.2.2 Regional level

On this level different questions will be answered (see also Fig. 12):

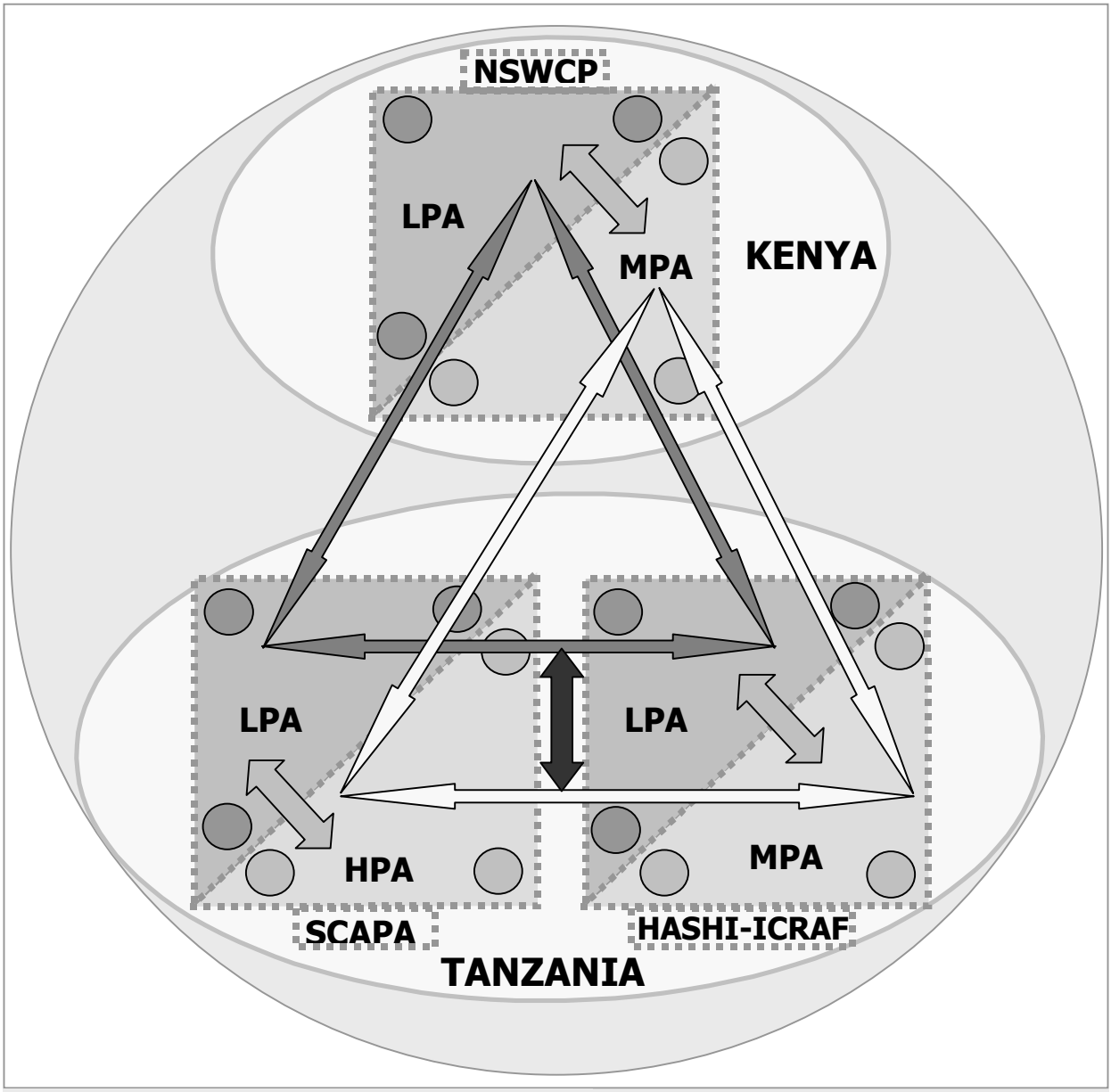
What are the differences between measures and activities carried out on different farms on the level of AEZ and project area? (Comparison concerning ecological, socio-cultural, economic and political aspects - see Fig. 10).

What are the general differences and similarities between female-headed and male-headed farms as well as between project measures?

What are the 'trickle-down'-/'spin-off-effects' of successful female farmers and self-help groups?

Which success indicators do exist?

Besides of a comparative analysis on the above named aspects, this level focuses on structures, institutions, (local, projects) and services that function to operationalise links between international and local level. This aspect as well as the importance to focus on local institutions has been outlined by MUGABE (1998a: 2-3): "[...] institutions – whether women's groups, clans, religions, research institutions or universities – are the framework within which social and economic transitions are organized, conducted and co-ordinated. One cannot deal with the management of social, economic, political and environmental matters without confronting institutional issues. [...] The other reason [to] focus on institutional issues is to bring out the role of traditional and local groups. Often approaches that treat the problem of biodiversity degradation as a purely technical matter tend to ignore the contributions that traditional and local people from various socio-ecological regions make to solve the problem. There is adequate evidence that local people are making new institutional arrangements to conserve and sustainably use biological diversity. Such institutions include women's groups, farmers' associations and clans. Effective management depends to a great extent on the space that dominant governments, economic and environmental institutions create to allow local institutional innovations to evolve and grow. Efforts must be made to understand the nature and activities of these local institutions."



Legend: Analysis on regional scale/level

- Comparative analysis of all farms in one project area on project level
- Comparative analysis of all farms in LPAs
- Comparative analysis of all farms in H/MPAs
- Comparative analysis of all farms in the LPAs with all farms in the H/MPAs

Central questions: "What are general differences and similarities between farms in different AEZs and project areas as well as between project measures? What are the 'trickle-down' effects' of successful (female) farmers/(women's) groups? Which success indicators do exist?"

- farm units
- MPA — medium potential area
- HPA — high potential area
- LPA — low potential area
- NSWCP — *National Soil and Water Conservation Project*, Machakos District
- SCAPA — *Soil Conservation and Agroforestry Programme* - SCAPA, Arumeru District
- HASHI-ICRAF — *HASHI-ICRAF-Agroforestry Research Project* - Shinyanga

Fig. 12: Level 2 – analysis on regional scale/level

1.3.4.2.3 (Inter)national level

> "In practice, it is much more enticing for donors and activists alike to focus attention on local-level problems, projects and individual actions, which provide demonstrable results, than to try to grapple with macro-level issues. However, if we accept, as appears reasonable, that critical, global threats to the environment are fundamentally attributable to the current globalized model of development, then local-level actions have limited scope and, moreover, can eventually be neutralized by events occurring in the wider society or in the world as a whole. Consequently, curbing the crisis will eventually require broader and more collective effort, aimed at understanding global critical issues and acting upon them."
>
> G. MARTINE, FAO (1997: 20)

According to the statement given above, aspects on macro-level have to be taken into consideration as well like trade markets or the impact of globalization which can be outlined with the following quotation: "Die Globalisierung eröffnet ökonomische Spielräume, überfordert jedoch auch ganze Weltregionen. In den Schwellenländern haben sich die ökonomischen und sozialen Lebensbedingungen in den vergangenen Dekaden enorm verbessert. Aber andere Weltregionen (wie z.B. Sub-Sahara-Afrika) scheinen kaum eine Chance zu haben, von der Globalisierung zu profitieren" (FES 2000: 25; see also CORDUWENER 2001a: 41). Also, the institutional frame of a country effects failure or success of projects.

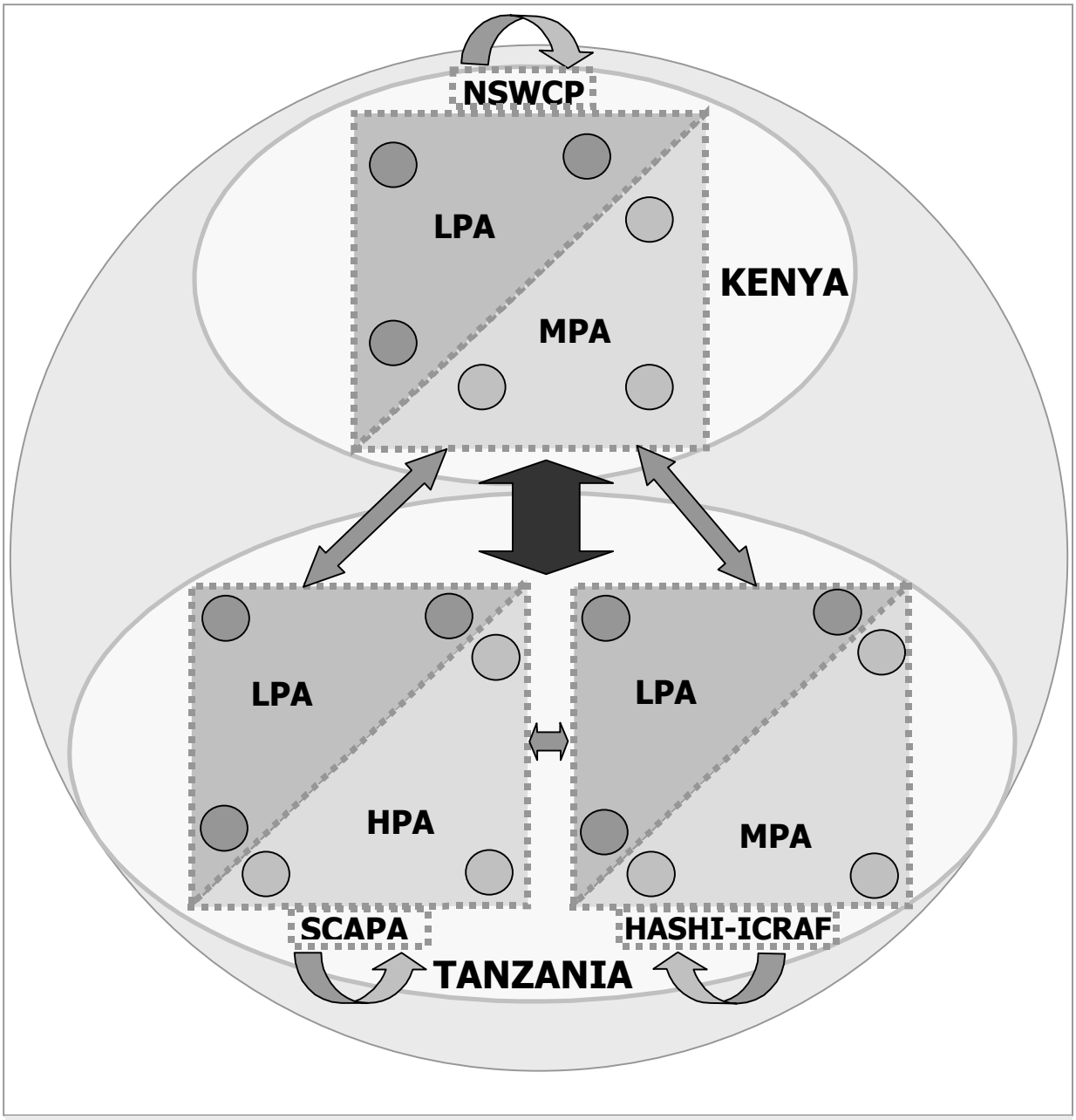
However, this study cannot pay attention to all levels in detail; since the main focus lies on the local level for which the reasons have been outlined in detail in chapter 1.3.2 attention will be paid to some general aspects only. Key concerns are

How do the projects work? What differences and similarities between them do exist? "What are general success-indicators?[42]

Other criteria (see also Fig. 13) to be considered are

- linkages to other projects, institutions, etc.,
- the incorporation of information from the field into the planning as well as
- implications of policies from the international - to the local-level and vice versa.

[42] Generally, an observation of the political development of a country is important: "So werden die für Oktober angesetzten Wahlen zum Prüfstein für den Stand der Demokratisierung in dem ostafrikanischen Land. Zudem könnten nicht frei und fair abgehaltene Wahlen dafür sorgen, dass sich die tiefe Krise auf den Insel verschärft, auf das Festland übergreift und die friedliche Entwicklung Tanzanias und die politische Stabilität in der Region gefährdet" (FES 2000: 53).
Further important issues which have to be left out in this study are impacts of international agreements and policies as well as national policies on projects, introduction of socio-economic (e.g. gender!) and environmental protection analysis issues into the policy process, social and economic aspects of major macro-economic policies, development policies such as structural adjustment programmes, international and national agricultural policies, land-use and land tenure policies, international and national trade markets, international and national social policies (e.g. civil legal instruments - marriage, property rights, inheritance, etc.), education policies and national curriculum, etc.



Legend: Analysis on (inter)national scale/level

Analysis of project approach (gender concept, extension service etc.)

Comparative analysis of project approaches, political/institutional aspects, etc.

Comparative analysis of (inter)national policies, e.g. with regard to agricultural, social and gender aspects, trade, etc.)

Central questions: "How do the projects work? What differences and similarities between them do exist? What are general success-indicators?"

farm units

MPA — medium potential area

HPA — high potential area

LPA — low potential area

NSWCP — *National Soil and Water Conservation Project*, Machakos District

SCAPA — *Soil Conservation and Agroforestry Programme* - SCAPA, Arumeru District

HASHI-ICRAF — *HASHI-ICRAF-Agroforestry Research Project* - Shinyanga

Fig. 13: Level 3 – analysis on (inter)national scale/level

2 Background: problem analysis

„The very survival and well-being of the poor, especially women, often depends on access to forests, trees and other natural resources, and on the quality and quantity of those resources. [...]. How to effectively manage forest resources for both conservation and sustainable development, for women as well as men, for the poor as well as the privileged, has emerged as one of the key challenges in natural resource management."

FAO (1999: 5)

The underlying problem in the so-called 'developing countries' and the East-African countries Kenya and Tanzania in particular is formed by the situation of an increasing pressure on land - resulting from rapid demographic growth and poverty, often aggravated by increasing climatic fluctuations such as recurrent droughts[1] - in the face of a continuous decrease of natural resources through man-induced processes of destruction and degradation (human misuse) (VOLLMER 1984; JARVIS 1991; ESSER-WINCKLER 1993; ACHOKA et al. 1996; GOUDIE 1997; BMZ 1997, 2000; MUGABE & CLARK 1998; BLUME 1997b, 1998, 2001; FAO 2001; PINSTRUP-ANDERSEN & PANDYA-LORCH 2001). FROST & DESANKER (2001:1) write: "Whereas land cover over much of the world always has been, and continues to be modified and transformed by people using the land, the present extent and rate of change is unprecedented. […] There is particular uncertainty about the precise nature, extent and rates of land-use and land-cover change in tropical Africa, the drivers of such changes, and their environmental and social consequences."

Fig. 14: Eroded landscape around Mt. Meru, Tanzania

However, some factors can be elucidated: in the densely populated high potential areas, like e.g. on the slopes of Mt. Kilimandscharo or Mt. Meru (see also Fig. 14) in Tanzania, people are forced either to press towards the last remaining forest areas, even on steep slopes in search for land (in general, the East-African highlands face a drastic depletion of soil nutrients - HENAO & BAANATE 2001: 159) or to migrate into the low potential areas where population density is lower, but

[1] Concerning the food situation in Kenya and Tanzania the FAO (2001: 4-5) notes that in Kenya the severe drought in 1999/2000 seriously undermined the food security of nearly 4.4 million people, especially in the northern pastoral districts which resulted in a massive relief operation. In Tanzania, the main season harvest in 2000 was poor due to erratic rains as well.

climatic conditions are unstable (VORLAUFER 1990: 47; MUTURI 1992: i; SCHMIED 1993: 160; BAUM 1995: 38; BMZ 2000: 239).[2]

Hence, migration (e.g. due to population growth) is one serious cause of pressure on natural resources: unsuitable land-use techniques, shortening or complete omission of fallow periods are direct consequences out of this phenomenon. The serious threat of migration to traditional knowledge on land-use systems has been elucidated by UNEP: "Since indigenous knowledge of ecosystems is learned and updated through direct observations on the land, removing the people from the land breaks the generation to generation cycle of empirical study. Maintaining the full empirical richness and detail of traditional knowledge depends on continued use of the land as a classroom and laboratory" (SNIFFEN 2001: internet; see also RAUCH 1994: 124).

Overgrazing, a phenomenon leading to processes of degradation and destruction within the landscape household which is linked to pastoralism, has to be named as another factor within this context: keeping too much livestock within an area being too small (due to land scarcity!) simply means going beyond the regeneration potential of the vegetation and thus exceeding the *carrying capacity* of a landscape (BAUM 1995: 38; HUXLEY 1999: 42; BMZ 2000: 238).

However, these processes, are not a result of the system of pastoralism itself, but of external factors: "It is still common to blame the pastoralist for overgrazing and degradation of the pastoral lands.[3] [...] However, an environmental study carried out in Turkana District, Kenya found that most signs of environmental degradation and overgrazing were associated with external interventions, primarily centred on settlements, and were not a result of the existing land management system. In other areas people have been marginalised from their traditional dry-season grazing areas to make way for settled agriculture, which results in a breakdown of the traditional land management system and increases the likelihood of degradation" (BARROW 1996: 5).[4]

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[2] Ranging along central-eastern Tanzania is an arc of montane forests which contain 33 % endemic plant species and thus almost 15 % of Tanzania's 11.000 plant species. With a population density of 300 people per km^2, e.g. the Usambara mountains have got one of the highest population densities in the world for an agriculture-based economy. The loss of these forests is all the more regrettable in view of the fact that certain plant species offer marked potential for economic development like the African violet, an ornamental flower: out of the known 20 species, 18 are confined to Tanzania's montane forests (MYERS 1997: 435).

[3] See e.g. RICHTER 1998: 239-240.

[4] Nevertheless, farmer 1T-I complained that many Maasai still hold on to their tradition of keeping as much free-grazing livestock as possible: „They don't see that things have changed and that they have to change, too, if they don't want to destroy the land they live on. They have to reduce the number of cattle, keep it in fenced areas or practice zero-grazing, plant trees and make terraces."

A serious problem linked to resource degradation is the increasing demand for firewood, which likewise led respectively leads to the degradation or even complete removal of the vegetation cover in many areas (see Fig. 15). For instance, in Africa, 70 % of the energy derives from firewood (BMZ 2000: 245); the portion of firewood concerning supply of energy is 71 % in Kenya and more than 90 % in Tanzania (OPITZ 1991: 169; OTSYINA et al. 1998: 61).

Fig. 15: One of the last big indigenous trees near Shinyanga, Tanzania is cut for firewood

Consequences are topsoil removal through sheet wash, rill erosion or gullies (see Fig. 16 and 17). In general, it has to be kept in mind that "Land degradation does not occur because people are ignorant, stupid, greedy or lazy, as colonial, newly independent governments and development planners often assume. It happens because they are driven by poverty to get as much out of the land as possible in the short term. They know they are losing the land – but they have to feed their families and make ends meet" (BARROW: 1996: 4).

Besides these factors, destruction is caused to a large extent through industrial processes and commercial activities like mining, tree logging, etc. (STEEN 1995: 82; BMZ 1997: 155; 2000: 247), as well as through their direct effects like air, soil and water pollution (GOUDIE 1997).

Fig. 16: Rill-erosion on the neighbour's field of farmer 2K-m

Furthermore, the countries are affected by a climatic change, leading to a serious increase of droughts not only on microclimatic level; especially Kenya is exposed to this ongoing process since ¾ of the land have to be classified as arid and semi-arid, characterised by a high rainfall variability and periodic droughts (BARROW 1996: 13).

Fig. 17: Gully, Oloitushula, Tanzania

Besides these factors, historical aspects on the political, economic and institutional level have had a decisive influence on the situation described above as well: colonial and post-colonial systems followed the principle of 'divide and rule', giving profits to some ethnic groups while others experienced negative effects; furthermore, fertile land has been taken away by colonialists (van BEURDEN 2000: 17), socio-cultural structures have been transformed and disrupted, e.g. through the invention of the European wage labour system, forcing 'western' socio-cultural traditions on indigenous societies, etc. (SHAO et al. 1992: 141; BLUME 1998: chapters 3.1.2 and 3.1.3). Urbanisation, industrialisation, change of agricultural systems through intensification and extension as well as the Structural Adjustment Policy (SAP) of IMF and World Bank are directly linked to the current problems of the disruption of the balance between man and nature as well (MANSHARD & MÄCKEL 1995: 33, 36). Not at least, the sector of development aid has to be named within this context[5]: in the sixties up to the mid of the eighties development strategies have focussed on the increase of growth while at the same time ignoring the importance of the conservation of natural resources.[6] The crisis in many countries of the South in the eighties became obvious in the international context mainly through a crisis of indebtedness, showing the limits and failure of a sustainable development through economic growth. Overexploitation of resources through unsustainable production and consumer-oriented patterns in the industrial countries aggravates the situation; with other words, it is these countries still gaining the profit while the poverty of the (rural) population in the so-called 'developing countries' escalates (see a.o. RATHGEBER 1990: 490; MOFFAT 1992: 8; JOMMO 1993: 158; RAUCH 1994: 119-120; HANAK 1995: 333; ANDORFER 1995: 10; SHIVA 1995: 207-208; THIEL 1999: 16; BMZ 2000: 238-239).[7] As MANSHARD & MÄCKEL (1995: 44) outline: "Um-

[5] MANSHARD & MÄCKEL (1995: 43) give a brief overview of the different stages development aid has gone through.

[6] SHIVA (1993a: 70-71) explains: „Concepts and categories relating to economic development and natural resource utilization that had emerged in the specific context of industrialization and capitalist growth in a centre of colonial power, were raised to the level of universal assumptions and thought to be successfully applicable in the entirely different context of basic-needs satisfaction for the people of the erstwhile colonies - newly independent Third World Countries. [...] Development [...] became a continuation of the colonization process."

[7] One billion people living in the Western countries consume three quarter of the global energy, the remaining five billion people share the rest (STEEN 1995: 88; BECKER 1999: 56).

weltpolitisch gesehen ist ein Teil unseres Wohlstandes ein subventionierter Wohlstand, der längst nicht alle Kosten erfaßt, die dafür bezahlt werden müßten. Zeitlich gesehen ist dieser Vorsprung auf Kosten zukünftiger Generationen, räumlich gesehen, auf Kosten des Südens entstanden, der die Rolle eines ökologischen Ausgleichsraums – in der Regel mit Leistungen zum Nulltarif – für den Norden übernommen hat“ (see also RAUCH 1994: 119).

Moreover, it is a fact that in the past decades, national and international foreign aid projects in the field of rural development, resource management, agriculture and food security often have provided separate and even conflicting advice about the use of natural resources like water, soil and vegetation since interconnections among the different disciplines involved in research and development planning have been disregarded and taken into account only recently (ROCHELEAU et al. 1988: 30); another decisive factor are difficulties of communication among the sciences concerning development theories (economic against cultural approach) (THIEL 1999: 14-15).[8]

Further important factors braking development are natural hazards, ethnic conflicts (more than 90 % of almost 200 wars since 1945 took place in so-called ‘developing’ and ‘transformation countries’ – BMZ 2000: 224), foreign dept, corruption (estimations of the percentages of money, e.g. for development aid, disappearing in international transactions vary between 10 – 50 % - MUSKENS 2000a: 33; after Transparency International, Kenya and Tanzania belong to the most corruptive countries – POSTHUMUS 2001: 8), violation of human-rights, and anti-democratic political systems (BMZ 2000; MUSKENS 2000a: 33-38; EVELEENS 2001a: 8).

HIV/AIDS is aggravating the problems through fast reducing active labour force (TARDT 2000: 3) since 95 % of the persons affected live in the so-called ‘developing countries’ out of which more than 75 % live in Sub-Saharan Africa (BMZ 2000: 285) - which is 25 Mio people - and due to the fact that most illness and death occurs in the 15-20 age group (BARNETT & RUGALEMA 2001: 43). In rural areas of the so-called ‘developing countries’ seasonal labour scarcity is now very common (PINSTRUP-ANDERSEN & PANDYA-LORCH 2001: 274).

As the statement at the beginning of this chapter outlines, women hold a key position within the complex of natural resource management. 70 % of the global 1,3 billion people belonging to the poor are women (BMZ 2000: 217). Consequently, gender aspects are crucial: the increasing degradation and destruction of natural resources shows dramatic consequences particularly for female farmers in the rural areas of the so called ‚Third World countries’ since it is predominantly them being in charge

[8] PINSTRUP-ANDERSEN & LORCH (2001: 112) see a major reason for the current rapid degradation of natural resources in the low priority given to research to develop appropriate strategies in areas with high risks of environmental degradation. After the authors, failure to significantly expand agricultural research in and for so-called ‘developing countries’ will make poverty eradication an elusive goal (s.p.: 114).

of the management of natural resources in order to produce subsistence crops for the security of the family's food supply (see Fig. 18) whereas male farmers are generally engaged in cash crop cultivation (usually mono crops) (FORTMANN & ROCHELEAU 1985: 3; DAVISON 1988: 1; GEIER 1990: 377; BLISS & GAESING 1992: 3-4; BENNHOLDT-THOMSEN 1993: 403; ESSER-WINCKLER 1993: 4-5; SHIVA 1993: 232; BRYCESON 1995: 47; ANDORFER 1995: 24; WILLIAMS 1996: 1; BLUME 1998: 68-69; SIDA 2000: 24; BROWN et al. 2001: 206): "It is true that women form a nucleus around which the family and indeed the community revolves, by being the main agricultural producers and suppliers of welfare activities both at the household and community levels" (KINUTHIA 1993: 40).[9] Indeed, women play a key role in maintaining three pillars of food security: food production, food access, and food utilisation (BROWN et al. 2001: 205; see also SHAO et al. 1992: 3). Moreover, women perform the majority of household activities, and are often engaged in off-farm activities for income generation (SHAO et al. 1992: 10).

Fig. 18: Women wielding the hoe near Kahama, Tanzania

This fact causes a close relation between women and the natural environment, especially in the field of land-use and forestry. Their profound involvement in subsistence production often implies a comprehensive and far-reaching indigenous knowledge concerning natural resources and environmental problems (DANKELMANN & DAVIDSON 1988: 15; KETTEL 1992: 16; RODDA 1993: 64, 75; AUGUSTAT 1995: 4; BROWN et al. 2001: 206).

Within project approaches focussing on the development of strategies for the conservation and sustainable management of natural resources (vegetation, water, soil etc.) the slogan 'gender' is widely found. But a look behind this catchword shows that gender relations, their potentials and central positions within the context of environmental change in rural areas, particularly deforestation and desertification, are often not taken fully into consideration but are even ignored (see e.g. HOSKINS 1980, DANKELMAN & DAVIDSON 1988, HYUNA 1989, BLISS & GAESING 1992; SHAO et al. 1992, BENNHOLDT-THOMSEN 1993, ESSER-WINCKLER 1993, OFOSU-AMAAH 1994, DSU 1995; BARROW 1996: 175). This is fatal as "Gender relations are primarily related to sustainability at the level of localised environmental problems, in the context of tradi-

[9] Rural female farmers in Kenya produce approx. 80 % of the subsistence crops, substantially contributing to cash crop production as well (CHAVANGI 1998: 12).

tional agrarian societies" (MARTINE 1997: 1). It can be stated, that if "[...] women fail to participate, it is not them who are the problem, as is frequently assumed, but lack of gender awareness on the part of the project authorities, about the different roles of men and women in the society, and the fact that women have to balance their numerous roles" (KINUTHIA 1993: 51). Accordingly, an untapped source of productivity gains and resource degradation reduction lies in addressing gender disparities in agriculture (BROWN et al. 2001: 205). As SHAO et al. (1992: 3) outline: "Women and men participation in the economy fundamentally differs. This difference determines their social and political activities."

Development projects commonly overlooked these gender-related differences in land-use with direct impacts on the economic level as described above with the effect that women are excluded from direct support; technical and financial inputs, advice and training often only reached the free enterprise oriented production of males and not the subsistence oriented production of women (FORTMANN & ROCHELEAU 1984; OBERMAIER 1986; GEIER 1990; BLISS & GAESING 1992; BENNHOLDT-THOMSEN 1993; BRAIG 1999: 112): „Men will attend barazas, field days and demonstrations, but they rarely discuss the issues with the women, and yet the women carry out most of the farm operations" (CHAVANGI 1998: 56). This one-sided support also has the effect that mechanised operations become a men's task, at the same time pushing women to more labour intensive activities (HATIBU & MTENGA 1996: 6).

On the other hand, the participation of female farmers renders more difficult in view of the fact that they almost do not dispose of capital and time, and they only have limited or no access to land (only 1 % of the land world wide belongs to women) or credits. Moreover, they are subject to socio-cultural restrictions (deficient rights of co-determination, restriction of mobility, etc.).[10] Because of their marginalisation and limitations for active participation in decision-making processes (whether they may be related to farm activities or the public sector) women get into a vicious circle as victims of and actors for environmental degradation at the same time. To summarise, women live under greater insecurity than men, not only in economic terms but also in terms of legislation, status, physical well-being and personal integrity (see a. o. FAO 1989a: 3; BLISS & GAESING 1992: 107; ESSER-WINCKLER 1993: 3; RODDA 1993: 77; AUGUSTAT 1994: 130; HANAK 1995: 346; KAMATARI 1996: 6; BLUME 1998: 62-71; SIDA 2000: 5; WASWA et al. 2000: 184-185; BROWN et al. 2001: 206-207). Therefore, WILDE (1998: 11) emphasises: "There is overwhelming evidence that development must address the needs and priorities of both women and men in order to be successful. It is recognised that across all socio-economic groups, women are disadvantaged vis-a-vis men. This must be taken into consideration because development

[10] Traditionally, most cultures in Kenya and Tanzania, treat(ed) women as commodity of exchange since a dowry was/is paid by the man to the parents of the bride; "their position was [is] made worse by other intervening variables such as lack of access to cattle, land, other productive assets and general attitudes towards women on the part of both men and women" (HYUNA 1989: 12).

efforts in which women are marginalised are destined to fail."

Additionally, men's traditional roles in resource management, for instance with respect to forestry and fishery have not been taken equally into account in the discussion of sustainability (MARTINE 1997: 104; see also BARROW 1996: 184). After MARTINE (1997: 10) the literature fails to sufficiently highlight that environmental change also affects men, though differentially. He concludes that a true gender approach is needed to get a more balanced picture; therefore, it is important to include men in the analyses as well as the relations between men and women. Furthermore, it has to be taken into account that gender roles are culturally constructed and that they change with changing circumstances (ibid: 18). Hence, boundaries of gendered knowledge are neither fixed nor independent. And VILLARREAL (2000: 5) mentions: "Gender relations are embedded in the social structure and are the outcome of a system in which all of its elements relate to one another in specific ways. These relations are affected by (and affect) economic, social, cultural, political and historical factors. They are context-specific and need to be understood holistically and in the framework of this context. Being part of a dynamic system, gender relations change according to all these factors. In order to promote changes, e.g. towards gender equality, the systemic nature has to be taken into account."

Within this context it is important to keep in mind that "[...] gender equality does not mean abolishing the differences between the genders (which would amount to having only one gender), but dismantling the mechanisms by which these differences lead to discrimination should be promoted. In fact, far from pursuing to make the genders equal, it should be recognised that each gender has a different contribution to make to society and that the difference has thus an important social value. These differences should not, however result in any kind of discrimination or hierarchical value attached to them" (VILLARREAL 2000: 5).

The neglect of gender-related criteria and their dynamic is one of the bottlenecks for sustainable resource management and nature conservation activities on the local level. Over and above that, not taking gender aspects into consideration causes far-reaching consequences, not only in the project areas – with regard to socio-cultural, ecological, economic and political aspects – but in the end for the well-being of the whole global community and natural environment.

With regard to the above named context a growing consciousness can be stated in recent times, perceptible at the integration of strategies for the encouragement of gender issues in project concepts (e.g. taking into consideration gender-related labour division, access to and control over resources, the special position of female-headed households, women's groups, etc.) (BMZ 2000: 218).[11] The *'Rio Earth Sum-*

[11] "It is clear that not all knowledge needed for the preservation of biodiversity is in women's hands, but their traditional knowledge has to be acknowledged" (MARTINE 1997: 12).

mit',[12] signed by 178 countries in 1992, stresses the important role of women within the context of 'sustainable development' in general and outlines a global action plan (BMU 1993: 218); further aspects have been outlined on the Global Conference on Women held in Peking 1995 as well as on the Special General Meeting in June 2000 (BMZ 2000: 219-220). The quotation below elucidates the involvement and importance of policy and finances within this context: "Deforestation, land degradation and desertification - which are generally stressed as affecting women and yet are amenable to being improved by women's action - are all serious environmental problems yet, with political will and financial resources, they could be arrested and/ or reversed" (MARTINE 1997: 4).

In the presence of the speed of the two ongoing contrary processes mentioned in the beginning of this chapter and as to the *World Summit on Sustainable Development* (Rio + 10) held in 2002 to reinvigorate the global commitment to sustainable development strategies have to be evolved for coming up with the propagated principle of sustainability on the ecological as well as social and economic level. ANGELSEN & FJELDSTAD (1995: 34) refer to a '*sustainable intensification of tropical agriculture*' to alleviate the pressure on marginal areas and fragile ecosystems (see also KAPPEL 1993: 240; BMU 1993: 110).

Fig. 19: The world trade system is, according to experts, not a 'Pro-Poor-System' at all (Source: IS 11/2000: 24, own translation)

Last but not least we have to take the consequences of the world trade and globalisation into consideration (see also Fig. 19): for instance, the expansion of trade has affected developed and so-called 'developing countries' in different ways. Huge cross-border capital flows leave these countries particularly vulnerable to international economic fluctuations; distorting policies and high tariffs are further restrictions for sharing the benefits of trade liberalisation and increasing globalisation (MANSHARD & MÄCKEL 1995: 42; BAIS 2000: 37-38; BABINARD & PINSTRUP-ANDERSEN 2001: 235). To sum up: the poorest countries have largely been left out of the growing financial market (DIAZ-BONILLA & ROBINSON 2001: 226-227). ISEGAWA (1999: 30), an Ugandan author, describes the situation as follows (translated): "As long as Europe rules half of the world trade nothing will change. Europe will continue to cultivate its ego by giving development aid, meanwhile protecting its markets."

[12] Document of the '*United Nations Conference on Environment and Development*', Rio de Janeiro 1992.

Due to the existing trade restrictions the so-called 'developing countries' loose 500 billion US-$ per year, which is 20 % of their GDP and 10 times the total amount of development aid. While the industrial products of the North are becoming more expensive, the prices for raw materials of the South have decreased by 40 % between 1980-1991 (MANSHARD & MÄCKEL 1995: 7, 42). With a share of 0,5 % on the foreign direct investments the group of the least developed countries (LDCs) belongs to the losers of globalisation. A decisive hindrance for the so-called 'developing countries' to participate in the world trade is the missing infrastructure (streets, harbours, communication technology, banks, insurance) which is the key to market-access; low buying power and market size forms a direct hindrance for foreign investors and one of the main reasons for the low success of efforts for liberalisation during the last years (BAIS 2000: 36-37; FES: 2001: 46; see also MANSHARD & MÄCKEL 1995: 6). In this light, the World Bank slogan of 'Pro-Poor-Growth' has to be regarded (and is by experts) as non-tenable (MUSKENS 2000b: 13-15; COOLEN 2001: 44).

Socio-cultural aspects are influenced by globalisation as well: "Nature's secrets, locked away in the songs, stories, art and handicrafts of indigenous people, may be lost forever as a result of growing globalisation. The freeing up of markets around the world may well be the key to economic growth in rich and poor countries alike. But this must not happen at the expense of the thousands of indigenous cultures and their traditions" (TOEPFER, in SNIFFEN 2001: internet).

It has to be kept in mind that the term 'sustainable development' has to be seen critical as well: development might lead to material and technical improvements; on the other hand, cultures might be disrupted and the natural environment destructed by new opportunities within the social and economic context (MANSHARD & MÄCKEL 1995: 5).[13]

In most areas, the harmonic coexistence of people living close to nature reserves with wild animals or – as can be seen in Fig. 20 – in areas without a conservation status, is jeopardised. The conservation of biodiversity is a major task, also or especially within agricultural research in the tropics and subtropics, not only because the ecosystems in the co-called 'developing countries' dispose of more than 90% of species known so far (BMZ 2000: 249): „In short, land-use systems are needed that provide useful products, that conserve and restore natural resources and that build self-reliance rather then dependence on expensive materials" (ROCHELEAU et al. 1988: 27).

[13] The authors (ibid.: 8) have drawn up a balance sheet on the progress and negative sides of development.

Fig. 20: The harmonic side by side of Samburu, cattle and zebras near Maralal, northern Kenya is threatened due to different factors

A sustainable management and conservation of natural resources can only be achieved through food security and poverty elimination - and vice versa, only to name two catchwords describing the current and future challenge (see also Fig. 21). BARROW (1996: 185) concludes: "Conservation and sustainable development are mutually dependent. The reliance of rural communities on living resources is direct and immediate. Unless those resources are conserved, there is no prospect of improving living standards. It would be wrong to conclude, however, that conservation is a sufficient response to problems of the rural and urban poor. People whose survival is precarious, and whose prospects even of temporary prosperity are lean cannot be expected to respond sympathetically to calls to subordinate their acute short-term needs for uncertain longer-term promises. Conservation must, therefore, be combined with measures to meet short-term economic needs." The challenge is to conserve land whilst attempting to make it more productive; indeed, it is this trade-off between sustainability and productivity that lies at the heart of the matter (HUXLEY 1999: 18).

Fig. 21: Poor farmer near Maralal, northern Kenya: Poverty elimination, food security and conservation of natural resources are present and future challenges

3 Study area: general data and project concepts

The study comprises investigations in 18 rural households in three research sites located in one project area in Kenya and two project areas in Tanzania (A, B + C-see Fig. 22).

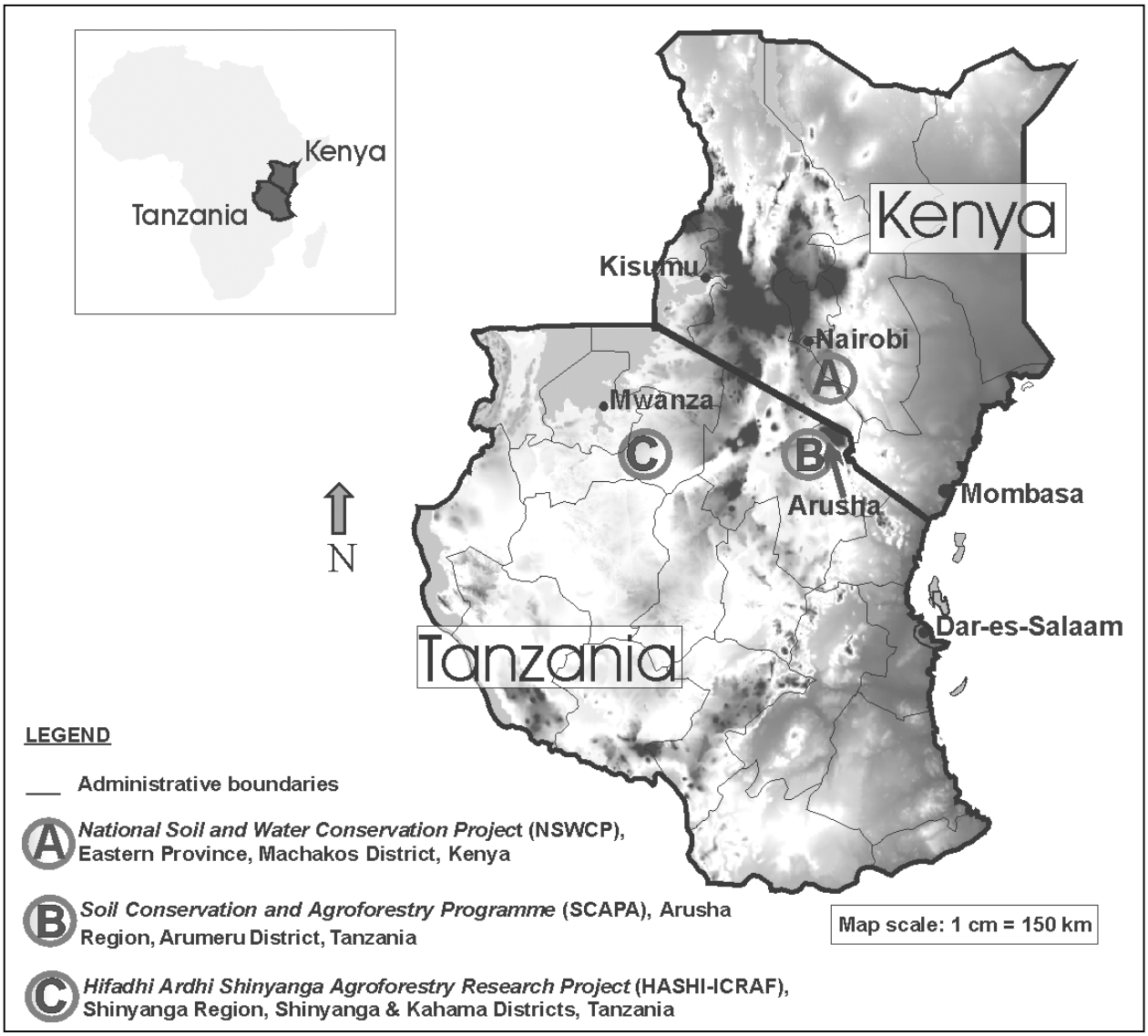

Fig. 22: The project areas

Some general data have been listed in Tab. 2 and 3 below:

Tab. 2: General data on Kenya and Tanzania (Source: OPITZ 1999; ZIHINDULA 2000; FAO 2001)

	Kenya	Tanzania
Geographical site	34° O – 42° O, 5° N – 5° S	30° E – 40° E, 1° S – 11° S
Size	**total**: 582.650 km^2 **land**: 569.250 km^2	**total**: 945,087 km^2 **land**: 886,037 km^2
Population	**30.75 Mio** (2001)	**35.3 Mio** (2001)
Ethnic groups	**~ 40**	**120**
Population in rural areas	**75 %**	**70 %**
Inhabitants capital	**1,5 Mio**	**1,4 Mio**
Capital	**Nairobi**	**Dar-es-Salaam**
Administrative divisions	**7 provinces**, 1 capital area	**25 regions**
Growth rate	**3.09 %** (1998 - '99)	**2.57 %** (2000)
Independent since	**12.12.1963** republic since 1964	**26.4.1964** (Tanganyika 9.12.1961; Zanzibar 19.12. 1963)
Status	**Republic**	**Republic**
Government type	**Multiparty democracy**	**Multiparty democracy**
President	**Daniel** Toroitich **arap MOI** (since 14.10.1978)	**Benjamin** William **MKAPA** (since 23.11.1995)
GNP per capita (in US $)	**360** (1999)	**240** (1999)

Tab. 3: General data on project and farm areas (Source: VORLAUFER 1990; GOT 1996; SEMU 1992; TARDT 2000)

Project	Country	Pro-vince/ Region[1]	District	Size (district) (km^2)	Population density (inhabitants district per km^2)	Popula-tion in Mio	Villages	District capital
NSWCP	Kenia	Central	Machakos	5.818	65-110	~1.4	Makaveti Kithathai Kaithi Ivutu Kitie Kyamwee	Machakos
SCAPA	Tanzania	Arusha	Arumeru	2.900	133-200	0.4	Oloitushula Nambala Karangai Loita Nkwamala Ndatu Nkoanekoli	Arusha
HASHI / ICRAF		Shinyanga	Shinyanga	9.920	18 – 183 (Meatu), (Shinyanga Urban) ~ 35	0,4	Lubaga	Shinyanga
			Kahama				Ufala Kagongwe Nyambula	Kahama

[1] The data given apply to the area within which the visited farms are located and not to the coverage area of the projects in total!

In all three project areas, traditionally men are head of the households, being responsible for the family (ensuring food security through livestock and cash, involvement in community decision-making processes; women are involved in the household-sphere. The role of women can be described as reproductive (child bearing and rearing) and productive (agriculture, assistance with livestock, income-generation); furthermore, they are involved in community management (caretaker/user of natural resources). Herding is mainly the responsibility of men and boys, milking is done by both sexes, but processing is only done by women. Chicken are under the responsibility of women. Both men and women prepare and cultivate the fields for cash and subsistence cultivation. Men own the land. Money from sale of subsistence crops by the women is turned over to the husband, and he has the sole control over the proceeds from the sale of cash crops. Women rarely plant trees (although, in principle, they are allowed to) as tree ownership and planting is regarded as men's activities (SHISCAP 1992: 2-5; SHAO et al. 1992: 113-114, 118-122).

An overview of the project approaches, extension and measures is given in Tab. 60.

3.1 National Soil and Water Conservation Project (NSWCP), Machakos District, Kenya

3.1.1 Area

Machakos District, subdivided into six administrative divisions and one of the ten districts in Eastern Province, lies within the foreland plateau between the Eastern Rift Valley and Nyika plateau. The centre mainly consists of a series of hill masses of metamorphic rocks and small plateaus (1.800 - 2.100 m), surrounded by a large plateau, which is elevated to about 1.700 m in the west and slopes down to about 700 m a.s.l. in the southeast. The undulating peneplain is broken by isolated mountains like Oldonyo Sabuk (also Kiima Mbogo or Kilimambogo) - who forms with about 2.144 m the highest point of the district -, by the volcanic outflow of the Yatta plateau in the east, and the Chyulu Hills in the southeast - a range of volcanic ashes. The majority of the district lies between Athi-Kapiti plains in the west and the Yatta plateau in the northeast, with Tana river forming the natural boundary. The overall drainage is from west to east. Most of the rivers and streams are seasonal with sandy deposits along their beds (JÄTZOLD 1983: 149, 167; KENYAWEB 2000: Internet).

The underlying geology is Basement System rock formed out of precambrian sediments, which were transformed mainly into gneisses, but also schists, quartzites and marbles. These crystalline rocks cover the greater part of the district. Furthermore, tertiary sediments and volcanic rocks consisting of miocene phonolites are found in Kapiti Plains in the northwestern part of the district and in the Yatta Plateau. In general, the soils are variable in fertility. On the foot slopes the soils are characterised by an increase in clay with depth and have a moderately low fertility; in the

northwestern part of the district the soil fertility is moderate to high; in the uplands the dominant soils are low in fertility with variations in the different areas. The soils in the plains around Athi river to the west of the Yatta plateau are generally low to moderately fertile (JÄTZOLD 1983: 167; KENYAWEB 2000: Internet).

The annual average of rainfall ranges between 500-1.300 mm and has a bimodal pattern with long rains between end of March and May and short rains from October to December, although they are not very reliable. Historical data indicate that in 4 out of 10 years the district faces a major drought. The higher parts receive additional rains and mist on their eastern slopes from June – August. The temperature varies between 20° and 25° C throughout the year. July is the coldest month, the warmest months are October and March prior to the rains (JÄTZOLD 1983: 149, 167).

Machakos was first settled by the *Akamba* people in the early part of the 20th century. They still form the major ethnic group in the district (VORLAUFER 1990: 55; CNIE 2000: Internet).[2] Approximately 1.4 Mio people live on a total rural area of 5.818 km^2; around 92.300 people live in Machakos Town, the administrative capital. The small farm – the usual pattern of agriculture for East Africa – is also typical for this district. The average farm sizes are 6.79 ha (1979) per household (5.48 people). Since the land-use potentials vary considerably, differences can occur from location to location with regard to AEZ (KAPLAN 1976: 91; JÄTZOLD 1983: 171; VORLAUFER 1990: 47; KENYAWEB 2000: Internet). The hill massifs of Iveti, Mua and Kangundo not only act as catchment area for numerous springs and streams, but are also relatively high potential areas for agricultural production. Coffee, the major cash crop in the district, is grown along these hills as well as horticultural crops such as tomatoes under irrigation. The low lying Kapiti Plains and Yatta plateau with relatively low rainfall are suited for ranching activities and the cultivation of drought resistant crops only. 76 % of the land is semi-arid (JÄTZOLD 1983: 171; KENYAWEB 2000: Internet).

This district has a remarkable success story concerning sustainable land-use: “By the 1930s, it had been severely degraded by overuse, with less than 5 percent tree cover and soil erosion visible in 75 percent of the inhabited area. Some observers predicted ecological collapse. Instead, the reverse happened. Over the next six decades, the population of Machakos expanded almost six-fold, to 1.4 million. Yet soil erosion decreased, tree cover increased, and the district moved closer to self-sufficiency in food. More people were taking better care of scarce, and therefore precious, land, even as they coaxed more production out of each hectare. [...] Within Machakos, many farmers were able to diversify their income by finding non-farm jobs, applying the additional income to land conservation. Education, land tenure, community-government partnerships and prominent leadership roles for women also enhanced conservation efforts” (CNIE 2000: Internet).

[2] The four major ethnic groups in Kenya are the Kikuyu (21,2 %), Luhya (14,0 %), Luo (12,9 %), and Kamba (11,4 %) (VORLAUFER 1990: 52).

Despite this fact, the region suffers from increasing population density, land scarcity, etc. Together with the uneven nature of the topography this results in serious soil erosion, causing numerous gullies, especially where terracing has not been practised and also adversely affect development of the road network in some parts of the district: “Yet this experience hardly suggests the district’s human population could increase sixfold again and still improve yields and reduce soil erosion. Finding the balance between people and land remains a critical task” (CNIE 2000: Internet).

3.1.2 Approach

The *National Soil and Water Conservation Programme* (NSWCP) within the Kenyan Ministry of Agriculture, Livestock Development & Marketing (MoALDM) began in 1974 on an experimental basis with pilot activities in four districts within the high and medium potential areas; the semi-arid and arid areas were mainly left to special district integrated development programmes. Already in 1977 it covered 30 of the by then 40 districts. During the last years increasing attention has been paid to the semi-arid lands, too; meanwhile, the programme, which is supported by the Swedish Government through SIDA, covers the whole of Kenya (59 districts).

The extension approach has shifted from forced conservation (initially working through the normal extension channels of the Ministry and the general frontline extension worker - FEW) to a willing farmer approach (Catchment Approach)[3] in the mid 1980s through the introduction of a Training & Visit Extension system (T&V), working in selected catchments through a Divisional Soil Conservation Officer (DivSCO) and two frontline workers, given special training and allowances as Soil Conservation Assistants (SCAs). Initially, this approach, introduced in 1987/’88, was characterised by a top-down concept; gradually, from 1989 onwards, the methods of RRA and PRA were included. The current *participatory catchment approach* works with and through an elected Catchment Committee[4], giving the farmers more choice in conservation methods. Parallel to this approach, the programme promotes soil conservation through the general agricultural extension services. Generally, this approach resulted in a substantial increase in staffing and costs; presently, the programme has offices in all divisions of all districts.

In 1981/82 the programme was transferred from the Project Management and Evaluation Division to the Land Resources Development Division and became the Soil and Water Conservation Branch (TIFFEN et al. 1996: iii, 1, appendix 1; MoA 1996: iv-v; MOALDM 1998: 5-6; CHAVANGI 1998: 12): „Methods of transferring knowledge

[3] „The ‘catchment approach’ of the NSWCP is based on geo-physical and socio-cultural conditions prevailing in high rainfall areas, often „high potential areas“, referring to their potentials as agricultural cropping areas“ (MoA 1998: 2).

[4] „Catchment Committees (Ccs) play an important role in mobilising the communities, assisting in laying out land treatment plans and promoting interaction between the farming community and the extension officers and DPTs“ (TIFFEN et al. 1996 13).

to farmers on land husbandry have changed shape and content over the years both as a result of the internally gained experience and through influence from international trends (e.g. PRA)“ (CHAVANGI 1998: 71).[5]

3.1.3 Objectives and activities

„The main objective of NSWCP is to contribute to increased production among farmers and pastoralists through advise on sound land husbandry“ (MOALDM 1998: 5). Furthermore, NSWCP attempts to reduce poverty among the target group - small-scale farmers - and to contribute to improved land husbandry. About half of the Kenyan people live in absolute poverty; out of which NSWCP aims to reach 100.000 beneficiaries (MoA 1996: vi-v). Three objectives to be achieved have been given in the project proposal for 1997-2000 (same place: vi):

- enhancement of soil productivity through improved melioration and management practices,
- increased and diversified production and use of tree products and
- promotion of effective control of run-off from physical infrastructure.

The integration and consideration of gender aspects is another relevant criterion: „Gender has been included as important elements in PRA ‘training of trainers’, workshops, field studies/reports, semi-annual and annual (disaggregated) data gathering […]”, in the extension work and for developing of research techniques, e.g. for the impact assessment (MOALDM 1998: 4; see also MOALDM 1999: 30).[6]

The programme has undergone a re-orientation from a pure emphasis on technical aspects towards a more comprehensive land husbandry approach through the incorporation of physical and biological soil and water conservation measures (e.g. agroforestry), but also other components such as water conservation (like spring protection) and harvesting, improved crop and animal husbandry, fodder production, energy saving stoves, kitchen gardens, fish ponds as well as socio-cultural/economic measures. Assistant activities include training, monitoring and evaluation (TIFFEN et al. 1996: iii; CHAVANGI 1998: 12; MOALDM 1998: 6).

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[5] „The advantages of PRAs can be summarised as increasing the ability of the community to come together to solve its own problems; in getting more commitment to soil conservation; and in teaching officers to respect local knowledge and abilities and to interact with people rather than simply instructing them“ (TIFFEN et al. 1996: 24). Although this is not necessarily a guarantee for success: „Obviously, those improvements that have been made in the operation of the programme, such as the introduction of the PRA, have either not been effectively carried out (which seemed more likely) or have not borne the expected results in terms of efficacy“ (ADMASSIE 1998: 89). Furthermore, disadvantages have been named like creating unreasonable expectations amongst farmers or the work is becoming ‘tedious’ for the officers after having carried out several PRAs (same place).

[6] But a study carried out in nine catchments mentions: „The study could not find even traces of attempts made by DPT’s SCCs, or any other body or group, to address matters of special concern to the women“ (ADMASSIE 1998: 97). A study carried out on female-headed households revealed that the women farmers were not involved in most of the key activities of NSWCP (MoALD & M 1998: 15-16).

Activities carried out are

- farmer field days/study tours/farmer-to-farmer extension tours (1 day)
- demonstrations/training (1 day)
- house-to-house visits
- seminars/training (for several days)
- development of Land Management Plans for individual farms
- problem discussing/meetings (*barazas*)
- support of election of catchment Committees
- training of special groups like staff, committee members, local leaders, young farmers (in/out of school)
- refresher courses for staff (MoA 1998: V-VI)

Whereas according to CHAVANGI (1998: 12) the programme has reached a total of 1,4 million farms out of an estimated number of 3 million farms (1997/'98), MOALDM (1998: 5) gives a number of 1.6 million farms; half of more than 100.000 annual beneficiaries of the programme belong to the 'poorest of the poor' (CHAVANGI 1998: 12).

In general, the following constraints ('unique problems experienced') have been mentioned by the project (MOALDM 1998: VI-VIII, 44-45, 52; 1999: vi-vi, 25; ADMASSIE 1998: 90-91, 94).

Project-related factors

- release/disbursement of funds, resulting in
- frustration of & low working moral amongst NSWCP staff
- lack of staff
- incomplete planning teams
- lack of transport for extension staff

External factors

- 'election euphoria'
- heavy rains
- failure of short and long rains
- cattle rustling and banditry
- leasing out of land for cultivation, high number of absent landlords
- increase of administrative units, resulting in
- 'dependency syndrome' (farmers expect handouts/rewards for activities carried out by them
- conditions made by NGOs & departments concerning collaboration with NSWCP
- land tenure issues (sub-division [or not!], land conflicts between sedentary farmers and pastoralists)[7]
- farmers frequent absence (due to alcoholism, frequent market days, residence outside catchment).

[7] „Land tenure issues appear to be the second common factor affecting implementation, cutting across the republic" (MoA 1998: 44).

3.2 *Soil Conservation and Agroforestry Programme* (SCAPA), Arumeru District, Tanzania

3.2.1 Area

Arumeru District (2900 km^2) – one of eight districts in Arusha Region[8] – simultaneously includes Arusha District (Arusha municipality – 135.000 people) and Mt. Meru (4.562 m a.s.l.) as highest elevation. The district lies in the north-eastern part of Arusha Region (takes 3,5 % of the total area of the region) and can be divided into two major zones: the undulating landscape surrounding Mt. Meru with an average annual rainfall of 1.000-1.400 mm (bimodal type, rains fall between October and December [short rains] and from March to June [long rains]) and the plains with isolated hills and depressions and a precipitation of 500 - 800 mm (mono-modal type, rains fall between November and April). The annual temperature ranges between 21° - 28°C. The soils are mainly andosols as the basement rocks are volcanic in origin; the most fertile land is found on the slopes of Mt. Meru and associated hills (here are living more than 50 % of the population). About 15 % of the district are under forest cover. The steep slopes on the southern side of Mt. Meru are mainly covered with indigenous forests, while on the western and northern slopes the natural forest has almost been replaced by agricultural land and planted forests (SEMU et al. 1992: 2; GOT 1996: 3,5-6).

The population (400.000 people – 1988 population census) mainly consists of *Masai* and *Meru*. With a population density with an average of about 133 people per km^2 (around Mt. Meru as much as 200 persons per km^2) the district is one of the most densely populated districts in Tanzania; it holds 24 % of the population of the region. The annual population growth (3,8 %) is among the highest in Tanzania, too. The household/family size of small scale farms ranges between 6-8 people with land holdings of about 2-3 ha; in the HPAs the average farm size is about 0.8 ha. 90 % of the population are engaged in agricultural activities including livestock production with the majority practising mixed farming; production of agricultural crops and animal husbandry are both for food and cash. Major cash crop in the district is coffee; other crops cultivated in the HPAs are pyrethrum, sugar cane, bananas, potatoes, maize, fruits and vegetables; crops cultivated in the lowland areas include maize, beans, cassava, sorghum and wheat, but these areas are to a large extent characterised by ranching activities (SCAPA 1992: 2; SEMU et al. 1992: 1-2, 30; GOT 1996: 3-5, 8-9, 36).

Soil erosion is found on 70 % of the district area (90 out of 137 registered villages), a result of the combination of different factors – deforestation and destruction of the natural vegetation, poor land husbandry, shortage of farming land due to rapid popu-

[8] „Arusha is one of the regions in Tanzania which is severely affected by soil erosion while it at the same time is one of Tanzanias most important areas for both domestic and export agricultural production“ (SCAPA 1992 1).

lation growth (especially on the slopes of Mt. Meru and the associated hills), overgrazing since the amount of cattle exceeds the carrying capacity of the area (40-72 %); these aspects are regarded as main obstacles for a sustainable land husbandry (see also Fig. 23). The most severe effects are found in the divisions Mukulat and Kingo'ri (SEMU et al. 1992: 1, 9, 12; SCAPA 1992: 2).

Fig. 23: Degraded landscape near Oloitushula, northern Tanzania

The current status (8/1998) of soil degradation in Arumeru and Arusha District is as follows (see NYAKI 1998: 49): in Arumeru District approximately 55% are eroded (excluding Poli, Mbuguni and Enaboishu) – Mukulat division is almost 100% affected. In Arusha district approximately 60% of the area are affected.

3.2.2 Approach

During the 1980's the increasing problems of soil erosion and decrease of productivity became of great concern to the Arusha Regional Office. At the beginning of 1983/84 SIDA and RSCU contacted the responsible authorities in Arusha Region and carried out in cooperation training for small scale farmers, consultants and staff working on regional and district level since 1986. In Feb. 1989 SCAPA was initiated by SIDA/RSCU (Nairobi) in collaboration with the Tanzanian government. The pilot project (Feb. 1989 - Jan. 1993) started in four different villages - Olkokola, Lengijave, Sakila und Oloitushula (SEMU et al. 1992: 3-5; GOT 1996: 1). The programme is now working with 115 villages (out of 140 villages in Arumeru district 105 have been attended plus 10 villages in Arusha district) (NYAKI 1998: 1, 50).

From the financial year 1993/94 onwards SCAPA was included in SIDA's Environment and Land Management under the country frame. In 1995, SCAPA and other programmes supported by SIDA were included in the long term planning of SIDA's Environment and Land Management Sector (GOT 1996: 1). In the pilot phase the project confined its activities to Arumeru District; in 1993, activities were extended to include Arusha District. Meanwhile, training activities cover the whole of Arusha Region while field activities are still confined to Arumeru and Arusha districts (GOT 1996: 13).

SCAPA's activities are organised and implemented by the so called ‚Project Coordinating Team' (PCT), a multi-disciplinary team comprising of technical staff from for-

estry, agriculture, community development, livestock, and water development. The programme manager is the overall supervisor while the programme co-ordinator is the team leader of the PCT. Although SCAPA follows the set up of the government, the programme is more or less autonomous (NYAKI 1998: 46).

Field activities at the village level are implemented by the Village Soil Conservation Committee (VSCC) under guidance of the Village Extension Officers (Veos). The VSCCs are in many respects the equivalent of a catchment/sub-catchment soil conservation approach (NYAKI 1998: 46-47).

The project documents stress the consideration of gender aspects (SCAPA: 1992: 10): "Gender awareness will be given special attention with regard to community participation. The project will promote women participation in its activities by involving them in various stages of implementation and in soil conservation committees."

The technical and managerial skills of SCAPA staff have been improved by the concept 'learning-by-doing', the extension method is as simple as 'teaching-by-showing'. Direct contacts with the farming communities has been the leading principle in the attempt to promote soil conservation and to respond to the farmers' problems (SEMU et al. 1992: 27).[9]

3.2.3 Objectives and activities

„The overall aim of agricultural research in Tanzania is to promote sustainable food security, income generation, employment growth and export growth. This is to be achieved through the development and dissemination of environmentally friendly technology packages" (KOLSHUS et al. 1997: 6).

Objectives are the increase of sustainable agricultural production through integrating soil and water conservation activities as well as agroforestry techniques in common land-use practices. Main attention has been laid on so called 'low-cost techniques'; in the beginning complicated structures like cut-off drains, water systems and measures for gully-control were excluded (SEMU et al. 1992: preface, 4; NYAKI 1998: 1). NYAKI (1998: 46) summarises the objectives as follows:

- improvement and increase of agricultural production on a sustainable basis with emphasis on smallholder farms in Arumeru/Arusha districts,
- formulation of an appropriate extension package for integrated soil conservation with regard to rural development and
- provision of sites for training in and demonstrations of soil conservation practices.

[9] NYAKI (1998: executive summary) recommends the promoting of the catchment approach: „The impact of the soil conservation efforts in the areas that may be identified in future can be significantly increased [...], particularly for the areas located on steep slopes and cases in which run-off water is diverted from the fields."

The activities include training of small scale farmers, staff and extension on soil and water conservation, agroforestry, livestock husbandry (zero-grazing and diversification of fodder plants, etc.), crop husbandry, water management focussing on the development of improved conservation based agricultural technologies (GOT 1996: 9, 25, 29). Furthermore, SCAPA supports the establishment of tree nurseries, horticulture, water harvesting methods (especially in the semi-arid areas), communal and on-farm woodlots, techniques of 'dry land farming' (since the high population pressure in the HPAs results in an increase of the population in the LPAs; hence, land-use practices need to be improved), wildlife-management and bee-keeping. SCAPA attaches importance to the active encouragement and participation of the farming community in planning, implementation and management of conservation activities. The concept is referred to as 'integrated approach'. Village Soil Conservation Committees have been implemented, composed of 8 - 10 farmers; at least 3 members of the committee should be women (SCAPA 1992: 8; GOT 1996: 33).

It is the intention to create gender awareness by involving women's groups in planning and implementation of agroforestry as well as soil and water conservation activities (SCAPA 1992: 10; GOT 1996: 36). Furthermore, the concern is to reduce the workload of women and to raise their standards of living through increased income and food security.[10] These aims are to be achieved through active participation of women in training, meetings, study visits, formation of women's groups and activities like tree nurseries, tree growing, dairy and horticulture. In general, ‚vulnerable groups' (children, women, sick/elderly people) find special attention (GOT 1996: 36).

Service is offered by SCAPA to the farming community, the village leaders or government officials only after request for assistance; the farmers decide about the sustainable management, use and cultivation activities of their land themselves (SEMU et al. 1992: 26-27).

Activities carried out are

- seminars/training/workshops for farmers, staff (also from other institutions), teachers and pupils (for several days)
- study/field visits for farmers, staff and policy makers (day tours)
- demonstrations & training (1 day)
- establishment of tree nurseries
- support of implementation of Village Soil Conservation Committees and formation of women's groups
- collaboration with governmental and non-governmental organisations through study visits (GOT 1996: 13, 33; NYAKI 1998: executive summary, 50).[11]

[10] „The relationship between men and women in the programme area has improved considerably with greater harmony in the household, decreased workload on the part of the woman through increased sharing of responsibilities between men and women, particularly in aspects related to livestock production" (NYAKI (1998: executive summary).

[11] NYAKI (1998: executive summary) states: „[...] with the exception of HPI, collaboration between SCAPA and other institutions/NGOs working in the Programme area was not optimised."

After NYAKI (1998: executive summary) about 35 % of the total area susceptible to degradation in Arumeru district has been conserved; awareness concerning soil conservation has been created in over 85 % of the households.

The following constraints and problems have been mentioned (SEMU et al. 1992: 14, 17-18; NYAKI 1998: executive summary, 64):

Project related factors

- inadequate extension staff and facilities for effective knowledge transfer
- lack of a co-ordinating instrument for the different NGOs and institutions
- lack of inventory of various activities in the programme area
- insufficient distribution of training material, language problem
- insufficient link between agriculture, livestock and forestry extension services

External factors

- shortage of agricultural land in the HPAs, e.g. high loss of cultivation area through terraces
- suspiciousness/mistrust against conservation activities due to historical bad experiences in this field; fear, the land could be confiscated after rehabilitation (result of insecure land tenure rights)
- risk that the weed *Digitaria scalarum* (African couch grass) which can be very detrimental to young trees (HUXLEY 1999: 35, 132), spreads on the terraces
- high costs of inputs
- dependency on the donor
- weak status of farmer groups
- amongst the Masai the women still stay in the background in public meetings and decision processes; hindrances with regard to the creation of gender awareness generally exist due to traditions; a change can only be achieved slowly (GOT 1996: 7, 36; SEMU et al. 1992: 30-31; NYAKI 1998: executive summary, 52).

Concerning soil and water conservation activities physical measures are mainly implemented by the male farmers while biological measures and cultivation activities are mainly carried out by the women (GOT 1996: 9). It has been observed in the high potential areas that the women are more involved in activities (planning and implementation (SEMU et al. 1992: 30). A project document (SCAPA 1992: 5, 3) concludes: “SCAPA has in many aspects succeeded where other projects have failed. [...] SCAPA has with its achievements, utilising an integrated approach and farmers active participation, attracted a lot of attention from both different parts of Tanzania as well as from outside the country.”

3.3 *Ardhi Hifadhi Shinyanga/International Centre for Research in Agroforestry* - HASHI-ICRAF, Shinyanga and Kahama District, Tanzania

3.3.1 Area

Shinyanga Rural District lies at the centre of Shinyanga Region which is situated in the northwestern part of Tanzania south of Lake Victoria at about 2°-5° south and longitude 31°-35° east and bordered by Mwanza, Mara, Arusha, Kigoma, Tabora and Singida Regions. The district occupies an area of 9.920 km^2 and consists of flat, gently sloping plains which stretch from the foot hills of the rocky areas through the Manonga and Sibiti rivers; Shinyanga Urban District covers an area of 548 km^2 (SHAO et al. 1992: 67; OTSYINA et al. 1997a: 2, 1998: 2-3; URT 1998: 1-2; TARDT 2000: 1).

The climate (whole region) is characterised by uni-modal, highly erratic and poorly distributed rainfall between December and April/May (short rains from September through October and longer rains from February to May) and by a prolonged dry season from May to November; mean annual is 600-800 mm (SHAO et al. 1992: 53; OTSYINA et al. 1997a: 3, 1998: 3; 500-1200 mm after ICRAF 2001). Year round temperatures vary between 27,6°C to 30°C maximum and 15°C to 18,3°C minimum (OTSYINA et al. 1997a: 3, 1998: 3; URT 1998: 2; ICRAF 2001: internet; BESSIRE 2001: internet).

Soils are moderately well drained greyish brown and sandy on the hilltops, moderately up to well drained greyish brown sandy loams on the slopes and poorly drained black clays on the low-lying bottom lands. However, vertic soils cover 47% of the region (URT 1998: 2; OTSYINA et al. 1998: 2-3).

The population in Shinyanga Region which mainly consists of *Wasukuma*, the largest ethnic group in Tanzania, is estimated at ~2 Mio people (7.2 % of the total population of Tanzania) with an annual growth rate of 2.9 %. About 48.6% of the population is male, 51.4% are female. The average population density is 35 persons/ km^2 (18 persons/km^2 in Meatu district and 183 persons/km^2 in Shinyanga Urban district) (SHISCAP 1992: 1). In Shinyanga Rural District the population is estimated at ~0,4 mio people with a population growth of annually 1,1 %. In Shinyanga Urban District the population is estimated at ~106.645 people. The *Wasukuma* have got a strong cultural tradition, although sedentarisation and the introduction of a cash economy had a decisive impact on the society (SHISCAP 1992: 1).

The *Wasukuma* were historically nomadic pastoralists. In the course of the implementation of strategies to get rid of the tsetse fly infestation in the area during the British colonial period (especially 1920s and 1930s) – mainly clearing of forest area accompanied with promotion of cotton production – the *Wasukuma* became agropastoralists. The factor of intermarriage with the *Wanyiramba*, a tribe from Sin-

gida District with an agricultural tradition which had been hired by the Wasukuma to work as labourers on the cotton fields, contributed to the change in land-use tradition in this area. Furthermore, grazing land scarcity through expansion of cultivation (mainly cotton production) led to the brake-down of the traditional land management system. Agropastoralism, nowadays the main mode of livelihood in so-called Sukumaland,[12] is characterised by a close integration of crops and livestock. Livestock encompasses cattle, sheep, goats, donkeys and poultry; the common herd size of cattle ranges between 20 and 50. The livestock component provides milk and animal products for household consumption (and marketing), ox-ploughing and transportation. In addition, animals fulfil various social functions and act as a bank or security for individual families so that farmers tend to increase stock numbers to meet their various needs. Animals are herded to grazing lands during the day and returned to *bomas* (fenced areas) at night. For dry season grazing the Sukuma have adopted the concept of grazing reserves (*ngitiris*).

Due to population pressure, cultivation systems have gradually changed to almost semi-permanent with short fallow periods between 1 – 2 years. The most important food crop is maize, followed by rice, millet, sorghum, cassava, sweet potatoes, ground nuts as well as various types of legumes and vegetables like beans and cow peas. Maize, sorghum and millet are grown in mixtures with cereal legumes. The main cash crop is cotton; however, rice is increasingly becoming a cash-earning crop due to declining production, low prices and unreliable payments for cotton. Livestock production is extensive and based on traditional communal grazing. As a source of income, peri-urban dairy production is becoming an important source of income for small-scale farmers (SHAO et al. 1992: 68; SHISCAP 1992: 1-2; OTSYINA et al. 1997a: ix, 2, 4, 1998: 4-5; URT 1998: 2-3; MADULU 1998: 3; TARDT 2000: 1-2).

Shinyanga Region is the most degraded and deforested region in Tanzania with serious water problems (SHAO et al. 1992: vii). Predominant problems identified in Shinyanga Region are land scarcity through population pressure, causing food shortages and inadequate fodder supply in terms of quantity and quality, especially during the dry season, degradation of non-renewable resources and a decreasing access to firewood resources – over 95 % of the households use wood – and other wood products (timber, poles, fruits, etc.). Deforestation (mainly caused by bush clearing during the colonial period to eradicate tsetse flies and quelea birds and to set-up of plantations and settlements, small-scale farming and increasing charcoal burning – SHAO et al. 1992: vii; OTSYINA et al. 1997a: 1, 5, 33; KARMANN 1998: 90)[13] has led to rapid land degradation, creating large tracts of unproductive lands, reducing species diversity and extent of the *Miombo* woodlands. URT (1998: 2) men-

[12] Sukumaland refers to an area south of Lake Victoria, covering the whole of Mwanza and Shinyanga as well as parts of Mara, Kagera and Tabora Regions.

[13] Already the deforestation campaign during the 1920s and 1930s to eradicate the tsetse fly and quellea quellea birds in Shinyanga Region (and parts of Tabora Region) has resulted in serious fuelwood and fodder shortages as well as in a decline in soil fertility (TARDT 2000: 4).

tion: „In the past, Shinyanga is said to have been extensively forested with woodland and bushland species such as Acacia, Brachystegia, Albizia commiphora and Dalbergia melanoxylon. [...]. At present, the land is almost treeless except for a few Acacia and Baobab trees. The vegetation has gradually reverted to an open bush savanna."

Decline of soil fertility is brought about by inappropriate management techniques (like continuous cultivation without application of fertilisers/manure), soil erosion and low inherent soil fertility. Furthermore, severe overgrazing through large herd sizes coupled with low range lands' productivity and annual fires have to be named; burning of crop residues is still commonly used on the fields, but forms a serious threat to trees, especially young seedlings (see Fig. 24; see also HUXLEY 1999: 44). HIV/AIDS and migration flows of people to other areas aggravates the problems through fast reducing active labour force. The various recent developments have necessitated both changes of social and economic patterns; accordingly, the youth is increasingly investing in trade rather than in cattle and land: The factors are indicators for the shrinking agricultural sector (OTSYINA et al. 1997a: ix, 1, 1998: 5-6; URT 1998: 3; MADULU 1998: 1-2; TARDT 2000: 2-4).

Fig. 24: Burning of vegetation is still a common land-management practice like in Southern Costa Rica

3.3.2 Approach

On a conference held in 1984 at the background of severe problems in Shinyanga Region like deforestation, overgrazing, over-cultivation for cotton production, droughts and diseases the initiation of a soil and water conservation project was amongst the resolutions leading to the formulation of the *Hifadhi Ardhi Shinyanga* project (HASHI) through the Ministry of Lands, Natural Resources and Tourism which started in 1986/87 with funding provided by the Tanzanian government (SHAO et al. 1992: 71; HATIBU & MTENGA 1996: 11; URT 1998: 5; OTSYINA et a. 1998: 61). Phase I began in 1991 when NORAD started supporting the *Shinyanga Soil Conservation and Afforestation programme* (SHISCAP), an umbrella financing facility for the *Shinyanga Mazingira Fund* (SMF), *Hifadhi Ardhi Shinyanga* (HASHI) and Agroforestry Research (ICRAF). SHISCAP and SMF were phased out in 1994, HASHI and ICRAF remained as separate entities at administration level, but worked together

very closely during the bridging phase (1995-1997) (ibid.: ii-iii). Phase II started in 1998 (until 2001).

The project, located in Shinyanga and Tabora Regions in the Western part of Tanzania, is a natural resource management project to develop technologies for fodder and wood production. Between 1987 and 1993, most of the research was based on station, involving screening of multipurpose trees and development of prototype technologies (like rotational woodlots, fodder banks, improved *ngitiris*, boundary planting and improved fallow; since 1998 domestication activities). From 1993 to 1995, prototype technologies were taken on-farm for limited testing with few farmers. Since the conduction of an internal review in June 1993 national scientists have managed research, dissemination, planning and implementation of activities. An ICRAF Senior Scientist, located at Shinyanga Research Station, backstops technical and financial activities (OTSYINA et al. 1997a: 1, 1998: 1-2; TARDT 2000: 3-4).

3.3.3 Objectives and activities

"Tree planting activities in Shinyanga have been going on to revegetate the degraded lands and restore its fertility" (OTSYINA et al. 1998: vii). Phase I (1991-'94) of the project mainly concentrated on awareness-creation on environmental issues. During the bridging phase (1995-1997) immediate objectives were to establish a closer partnership between people, government and NGO's. In Phase II (1998-2001), these processes will be consolidated. Besides this, the project wants to improve food security and to contribute to poverty alleviation by extending tree planting technologies to farmers in Shinyanga Region, based on a gender responsive participatory approach. Major objectives are to improve the economic and nutritional well-being of resource poor farmers through development and dissemination of appropriate agroforesty technologies to reduce deforestation, alleviate firewood scarcity, natural resources degradation, fodder shortages and declining soil fertility in the Sukuma agropastoral system of Tanzania (OTSYINA et al. 1997a: 1, 1998: 1; URT 1998: ii, 7; TARDT 2000: 3). Thus, major thrusts are:

- wood production
- dry season fodder supply
- soil fertility improvement for crop production
- domestication of high value (fruit and medicinal) trees (OTSYINA et al. 1997a: 1, 1998: 1; TARDT 2000: 3; see also SHISCAP 1992: 3/1)

Part of the project is to bring wild fruit trees belonging to the miombo ecosystem to the farm, not only to improve production and food supply, but also for safeguarding biodiversity and protecting the environment (TARDT 2000: 30). Furthermore, training in the production of energy-saving stoves and techniques for the establishment of nurseries shall be increased. Laws shall be enforced, especially with regard to local rules and by-laws (URT 1998: 7; see also HATIBU & MTENGA 1996: 11).

Concerning the socio-cultural aspect the SHISCAP-report (1992: 1) outlines: “Certain traditions have been eroded but not replaced; others remain intact but no longer adequately serve their purpose. Some of the traditional carry-overs as well as some of the “reinterpretations” will present the greatest challenge to effective implementation and to the development process itself.”

Gender aspects have been taken into consideration already in the early stages of project implementation, and a special gender/women action plan has been developed to enable project activities to be gender and women sensitive (SHISCAP 1992). URT (1998: 18) write: “Women, men and the youth have a role to play in environmental management.” In the SHISCAP report on gender/women action planning it is suggested that surveys and preliminary discussions (as step 1 of activity methodology) as well as seminars are attended by men only respectively differentiated after a) 10% women attendance if it’s a specialised field/technical discussion and b) 30 % women attendance if it is […] “a discussion ‘where women can contribute. In decision-making meetings (as step 3 of activity methodology) a 10 % women attendance is recommended. On the other hand, only 40 % men attendance is recommended in surveys and preliminary discussions as well as seminars and 50 % both in decision-making meetings (SHISCAP 1992: 4/3). Within this context community empowerment is one of the main goals to enhance and propagate sustainable environmental management (OTSYINA et al. 1998: 18).

Activities carried out are

- cinema shows, video shows/narration, drama, music/dance performances
- calendars
- meetings
- study/field visits for farmers, staff and policy makers
- training for farmers, ward and village environmental committees, staff, policy-makers
- demonstration plots
- formation of Village Environmental Committees, task forces and grazing committees
- law enforcement
- collaboration with governmental and non-governmental organisations
- setting-up of an eco-museum (“The Eco-museum will thus aim at documenting and activating the awareness of the population’s traditional wisdom and cultural heritage” (URT 1998: 28)
- up-keeping of environmental education centres

Core activities are reforestation, land-use planning, *in-situ* planning, energy saving stoves, soil and water conservation, agroforestry technologies, amenity forestry, bee-keeping (URT 1998: 8).

An extension approach involving the three main criteria sensitisation, skills training and empowerment, has been evolved. Considerable awareness has been created

among farmers on the severity of environmental problems and the potential of agroforestry to contribute to problem solutions. With this approach 477 villages (about 60 % of the total 817 villages) have been reached and sensitised. People's awareness on environmental conservation has been increased from 40 % at project's start to over 90%. There exist 270 environmental committees, in 70 villages training on nurseries, improved stoves and bee-keeping have been given to 1230 women (URT 1998: 8; TARDT 2000: 3). The objective is to reach another 84.000 male and female-headed households in 240 villages out of which at least 25 % are expected to adopt/adapt agroforestry technologies to manage their land on a sustainable basis (URT 1998: iii).

The following problems and obstacles have been mentioned (URT 1998: 10, 12; OTSYINA et al. 1998: viii, 21; TARDT 2000: 9, 14, 26, 42):

Project related factors

- lack of finances
- lack of qualified staff/inadequately trained staff
- poor monitoring and reporting system
- low seedling production
- lack of transport

External factors

- late release of funds/inadequate funding
- inadequate and conflicting land use planning policies, mechanisms and legislation
- unclear monitoring and reporting system of partners
- animal damage (livestock and wildlife)
- pests (e.g. psyllid attacks, termites, nematodes, cricket, caterpillars)
- theft (of dead trees for firewood and neem leaves for medicine)
- availability of seeds/seedlings
- drought
- restricted participation of farmers/adoption of technologies
- restrictive traditional norms and values
- low fodder quality
- lack of good care of dairy cows
- lack of awareness
- lack of adequate skills
- short live span of improved firewood stoves

4 General farm-related data

„The physical structure of a farm, its crops and cultivation patterns and its general status result from the interaction of a number of factors. […]. The composition of the family […] will obviously affect decision-making and opportunities on the farm. The size of the farm itself is also significant."

P. N. BRADLEY in the frame of a project evaluation on woodfuel, women and woodlots (1991: 230).

The farms, farmers and groups have been given abbreviations to guarantee the anonymity since many data are personal and have therefore to be handled with respect (see also BORTZ & DÖRING 1995: 45; MORSE 1994: 232; BURGESS 1983i: 237). PUNCH (1994: 92) notes that "settings and respondents should not be identifiable in print and that they should not suffer harm or embarrassment as a consequence of research" (see also GACHOWETZ 1984: 272). Subsequently, these abbreviations will be used for the farmers and their farms as well as for the women's groups for the reasons of intelligibility, thus, a farmer, farm or group are summarised under the same abbreviation. The abbreviations directly refer to the country and the agro-ecological zone:

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h**= HPA

The farms are confined to the respective projects as follows:

NSWCP			SCAPA			HASHI-ICRAF		
1K-l	**2K-l**	**3K-l**	**1T-l**	**2T-l**	**3T-l**	**4T-l**	**5T-l**	**6T-l**
1K-m	**2K-m**	**3K-m**	**1T-h**	**2T-h**	**3T-h**	**4T-m**	**5T-m**	**6T-m**

4.1 Ecological data

Ecological aspects have been assessed and included in the analysis as they are supposed to play a role within the context of a successful management of natural resources. Some general data on ecological criteria have been listed in Tab. 4 below.

The farms are located on an altitude between 1.100 – 1.650 m a.s.l. in the LPAs, 1.210 – 1.600 m a.s.l. in the MPAs and between 1.450 - 1.700 m a.s.l. in the HPAs.

On eight Tanzanian farms (all farms in HASHI-ICRAF project area, 3T-l, 2T-h) the inclination is between 0 - 4 %, on four farms (2K-l, 3K-l, 2T-l, 1K-m) between 5-10 %, on three farms (1K-l, 1T-l, 3T-h) between 11-30 % and on another three farms (2K-m, 3K-m, 1T-h) it exceeds 31 %. Of course, the inclination varies on the farms; accordingly, e.g. even almost flat areas can be found on a farm where the inclination in general lies above at least 10 %.

The annual rainfall pattern varies between 500-800 mm in the LPAs, 800-1.000 mm in the MPAs and 900-1.200 mm in the HPAs.

Tab. 4: Ecological data related to the farms

Farms	Village	AEZ*[58]	Main Zone	Altitude in m a.s.l.	Inclination on farms in %	Precipitation *a^{-1}mm	Soil texture*
1K-l	Makaveti	LPA (5)	Low Midland	~ 1.650	11-30	700-800	sandy loam
2K-l	Kithathai			~ 1.250	5-10	650-750	sandy loam
3K-l	Kaithi			~ 1.100	5-10	600-700	loamy sand
1K-m	Ivutu	MPA (3)	Upper Midland	~ 1.450	5-10	~ 1000	sandy loam- loam
2K-m	Kitie	MPA (4)		~ 1.550	>31	800-950	loamy sand - sandy loam
3K-m	Kyaviwee	MPA (3)		~ 1.600	>31	900-1.000	loamy sand - sandy loam
1T-l	Oloitushula	LPA (2a)	Arid Lands (Northern)	~ 1.500	11-30	~500	silt loam
2T-l	Nambala	LPA (2b)	Arid Lands (Masai Steppe)	~ 1.200	5-10	500-750	silt loam
3T-l	Karangai	LPA (2b)		~ 1.150	0-4	500-750	silt loam
1T-h	Loita Nkwamala	HPA (6a)	Northern Highlands	~ 1.700	>31	900-1.200	sandy loam
2T-h	Ndatu	HPA (6a)		~ 1.450	0-4	900-1.200	silt loam
3T-h	Nkoanekoli	HPA (6a)		~ 1.500	11-30	900-1.200	sandy loam
4T-l	Lubaga	LPA (3)	Western Plateau	~ 1.112	0-4	600-800	silt loam
5T-l	Lubaga	LPA (3)		~ 1.112	0-4	600-800	silt loam
6T-l	Lubaga	LPA (3)		~ 1.112	0-4	600-800	silt loam
4T-m	Ufala	MPA (4a)	Western Plateau	~ 1.210	0-4	800-1000	loamy sand - sandy loam
5T-m	Kagongwa	MPA (4a)		~ 1.210	0-4	800-1000	sandy loam
6T-m	Nyambula	MPA (4a)		~ 1.210	0-4	800-1000	loamy sand

Legend:

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA	* The soil texture has been determined on the basis of THOMAS (1997: 237-243) and AG BODEN (1994: 137-140); the AEZs have been classified after THOMAS (1997) for Kenya and DE PAUW (1984) for Tanzania

Four different soil textures have been identified with partly more than one soil texture on one farm due to inclination (catenas – see also DEFOER et al. 1998: 273). Sandy loams have been found on two Kenyan farms in the LPAs (1K-l, 2K-l) and two Tanzanian farms in the HPAs (1T-h, 3T-h); silt loam has been found on all farms in the LPAs in Tanzania as well as on farm 2T-l. On two farms (3K-l, 6T-m) loamy sand has been found, on three farms (2K-m, 3K-m, 4T-m) the soils consists of loamy sand – sandy loam; the soils on farm 1K-m consist of sandy loam – loam, and on farm 5T-m sandy loam has been found.

[58] Land husbandry involves the concept of using land in an appropriate way according to its potential. The assessment of the potential of agricultural land is based on the concept of ecological zoning which indicates the climatic potential of the land. A comparison with information on soils and slopes shows possibilities and constraints for crop and livestock production. In this study the system of agro-ecological zones (AEZ) is handled; the zoning is based on water availability and altitude, largely determining the temperature. This system is rather more defined than the system of agro-climatic zones which is based on moisture availability and temperature, because it additionally includes data of the duration of the growing period (THOMAS 1997: 7-9).

4.2 Socio-cultural data

Ethnicity determines land-use patterns as well as socio-cultural aspects like gender roles all of which have a decisive influence on resource management patterns.[59] Within the NSWCP-project area in Kenya, all farmers belong to the *Kamba*, within SCAPA- project area in Tanzania five farmers (2T-l, 3T-l, 1T-h, 2T-h, 3T-h) are *Meru*, farmer 1T-l is a *Massai.* Within the HASHI-ICRAF- project area in Tanzania five farmers (4T-l, 5T-l, 6T-l, 4T-m, 6T-m) are *Sukuma*, farmer 5T-m is an *Iveti*.

Religion is an important factor as it groups people together; often, religious groups are involved in socio-economic activities, and members are likely to be more committed due to the spiritual linkages (see also HATIBU & MTENGA 1996: 28).[60] Except farmer 1T-l (animist) all farmers are christians, belonging to different churches: Four farmers (1K-l, 4T-l, 5T-m, 6T-m) are members of the *Roman Katholic Church*, four farmers (3K-l, 1K-m, 3K-m, 4T-m) are members of the *African Inland Church* (AIC). Six farmers are *Lutherans* (2K-m, 2T-l, 3T-l, 6T-l, 2T-h, 3T-h), farmer 2 K-l belongs to the *Gospel Redemption Church* and farmer 5T-l is a member of *Juma mosi sabbati*.

Within the sample, a variety of households has been integrated, reflecting the changes of household composition in Sub-Saharan Africa which have emerged through different factors, among which male labour migration is only one facet (see van VUUREN 2000: 1). As the literature shows, female-headed households constitute a major section of the poor (see e.g. OMARI 1989a & b; SENDER & SMITH 1990; CHAVANGI 1998; NYCANDER 1998). Furthermore, not only a distinction has to be made between male- or female-headed households, but also concerning the status of the female-headed households by reason (widow, divorcee, abandoned or single). Within the households selected the head of each household has been ascertained by asking the household members; no disagreements occurred.

The sample comprises ten male-headed and eight female-headed households; the female-headed households again comprise of four different types: two farmers are widowed, one farmer is divorced, four farmers are abandoned and two are single (see Tab. 5). The female-headed households are distributed on the AEZs in both countries as follows:

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[59] Ethnic groups in Kenya: Kikuyu 22%, Luhya 14%, Luo 13%, Kalenjin 12%, Kamba 11%, Kisii 6%, Meru 6%, other African 15%, non-African (Asian, European, and Arab) 1% (http://www.odci.gov/cia/publications/factbook/geos/ke.html)

Ethnic groups in Tanzania: mainland - native African 99% (of which 95% are Bantu consisting of more than 130 tribes), other 1% (consisting of Asian, European, and Arab); Zanzibar - Arab, native African, mixed Arab and native African (http://www.odci.gov/cia/publications/factbook/geos/tz.html).

[60] Religions in Kenya: Protestant 38%, Roman Catholic 28%, indigenous beliefs 26%, Muslim 7%, other 1% (http://www.odci.gov/cia/publications/factbook/geos/ke.html).

Religions in Tanzania: Mainland - Christian 45%, Muslim 35%, indigenous beliefs 20%; Zanzibar - more than 99% Muslim (http://www.odci.gov/cia/publications/factbook/geos/tz.html).

K-l: /; **T-l**: 1T-l, 3T-l, 4T-l; **K-h**: 2K-m, 3K-m; **T-h**: 2T-h, 5T-m, 6T-m.

Two farmers live within a polygamous tradition: farmers 1T-l and 2K-m have been the first wives of their husbands who married another woman.

Furthermore, the time aspect - thus, for how long a women has been abandoned or is divorced resp. widowed – can play a role as well (see Tab. 5). It can be seen that three farmers (2K-m, 3K-m, 4T-l) live alone since more than ten years, farmer 2T-h lives alone since more than 5 years and farmers 1T-l and 5T-m live alone since less than 2 years.

Tab. 5: Marital status and *de facto* presence of husbands

Farmers	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m**	**3K-m**	**1T-l**	**2T-l**	**3T-l**	**1T-h**	**2T-h**	**3T-h**	**4T-l**	**5T-l**	**6T-l**	**4T-m**	**5T-m**	**6T-m**
Marital Status[1]	2	2	2	2	4	3	3	2	1	2	4	2	5	2	2	2	4	1
Monogamous/Polygamous[2]	1	1	1	1	2	1	2	1	/	1	1	1	1	1	1	1	1	/
Time alone since separation[3]					3	3	1		4		2		3				1	4
***De facto* presence of husband**[4]	3	1	2	1				3		2		2		2	2	2		

Legend:

[1] **Marital Status: 1** = single; **2** = married; **3** = widowed; **4** = abandoned; **5** = divorced
[2] / = single; **1** = monogamous; **2** = polygamous
[3] ☐ = married; **1** = < 2 years alone; **2** = >5 <10 years alone; **3** = > 10 years alone; **4** = single
[4] ☐ = no husband; **1** = husband returns home from work at the end of the week; **2** = husband returns home from work every evening; **3** = husband farmer
K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA

A differentiation of data not only concerning marital status but also regarding the *de facto* presence of the husband is a necessity since the mere fact that a woman is married says nothing about this last named aspect (see also chapter 6.2.3.1); however, this aspect is central to the economic conditions of the families and to labour support as to farm activities (see also OOMEN 1992: 55; TORK 1994: 8).

A glance at the *de facto* presence of the husbands shows that two husbands are permanently at home (1K-l, 2T-l), six husbands come home every evening (3K-l, 5T-l, 6T-l, 1T-h, 3T-h, 4T-m) and two husbands (2K-l, 1K-m) come home from work at the end of the week (see Tab. 5).

The farmers are between 24 and 65 years old.[61] In total, the distribution is very heterogeneous as can be seen in Tab. 6. On an average the women are younger in Tanzania than in Kenya.

The average number of children is 4,3. The highest number of children is nine (1K-l), followed by farmer 6T-l with seven children. Most of the farmers have got between five and six children. Three women within the project region of HASHI-ICRAF have

[61] Tragically, farmer 1K-l died in July 2000 in hospital after having suffered from a serious illness.

got one child only (farmer 5T-l was pregnant).[62] The higher number of children on the Kenyan farms correlates with the higher age of the women. The fact that the younger women have got a lower number of children is not only due to the simple fact that they are still in the age of 'reproduction', but correlates with the change of life conditions (pressure on land, high costs of education) and a shift of moral concepts ('it is better to have few children and let them grow up under good conditions' → good education 'than to have many children who grow up under bad conditions' → lack of finances for e.g. education'; see also chapter 6.2.1).

With regard to the it can be seen that the number of female children is lower compared with the number of male children (48: 32). Four farmers have got children above the age of 14 (1K-l, 3K-l, 1K-m, 2T-h). As has been stated above, on the average the women in Tanzania are younger than in Kenya; this correlates with the number and age of children.

Tab. 6 shows the number of household/family members and the number of adults/children. These aspects are important with regard to labour availability and financial resources (see also DIRKS 2000). Household normally defines the 'production and consumption unity' in rural areas of the so-called 'developing countries', keeping in mind that the western understanding of a 'nuclear household' cannot easily be transferred to the situation in those countries (OOMEN 1992: 9). After the author (ibid.; see also T'HART 1992: 10; DHARMAWAN & MANIG 2000: 3) household can be defined as „[...] a person or group of persons generally bound together by tie of kinship, who normally reside together under a single roof or several roofs within a single compound and who share the community of life in that they are answerable to the same head and share a common source of food." After van VUUREN (2000: 5) the persons have to live - eat and sleep – together in one dwelling place all the year round, thus, migrants would not count. In contrast, I argue that migrating persons, who give remittances to their household, belong to the household as well. Within my sample I do not have migrants since the two husbands who migrated to another place in search for a job abandoned their wives for another woman.

The definition of *family* or *household* is fraught with difficulties since many extended families are found in a multiplicity of combinations; secondly, the relationship between the resident family and the land is not always easy to assess, and combinations are many (see also BRADLEY 1991: 232-233; HATIBU & MTENGA 1996: 26). That is why the size has been divided into household members and family members.

The big difference between household and family members in general, demonstrated in Tab. 6, is obvious, especially on six farms (1K-l, 3K-l, 1T-l, 6T-l, 1K-m, 2T-h). The average household size is 5,7; the average family size is 12,7.

[62] In 1990 the average number of children in Tanzania was 7, in the so-called ‚developing countries' in total 4 and in the industrialized countries 2 (BRYCESON 1995: 46).

Tab. 6: Aspects related to household/family (structure)

	Farmers																	
Aspects (in absolute numbers)	1K-l	2K-l	3K-l	1K-m	2K-m*	3K-m*	1T-l*	2T-l	3T-l*	1T-h	2T-h*	3T-h	4T-l*	5T-l	6T-l	4T-m	5T-m*	6T-m*
Age – female farmer	58	43	62	60	46	45	38	36	39	42	54	47	45	24	46	33	25	29
Age – husband	65	46	63	62				45		47		49		36	47	38		
Own children in total	6	4	6	9	6	5	5	4	3	6	6	5	3	1	7	1	2	1
Daughters	3	2	1	2	3	2	2	2		3	3	1	1	1	3	1	1	1
Household-members in total	5	5	2	5	9	6	6	6	4	8	4	7	5	5	6	5	7	8
Adults	2	4	2	3	5	4	2	3	2	4	3	4	3	4	3	3	3	2
Children	3	1			4	2	4	3	2	4	2	3	2	1	3	2	4	6
Children below 14	3	1			2	2	3	3	2	4		3	2	1	3	2	4	5
Children not own	3				2	1					2				1	1	2	5
Family-members in total	24	9	19	38	12	9	22	8	4	9	19	8	5	5	17	7	9	14
Adults	12	8	13	20	8	6	10	5	2	5	12	5	5	4	12	5	5	7

Legend:

= not on the resp. farm = not in the resp. zone/country	**K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA * = female-headed household

In almost every household at least 50% are adults (except 1K-l, 6T-m). Eight households out of which four are female-headed care for children of relatives. The children of two farmers do not live in the household anymore. The daughter of 4T-l was pregnant during my visit and meanwhile received a girl child (3/2001). These aspects are important to assess since they yield information as to active against dependent residents which is linked to income and labour (see also BRADLEY 1991: 233).

The average size of female-headed households is slightly higher than the average size of male-headed households (~ 6,1 compared to 5,4 members).[63]

All female farmers went to primary school. Whereas all Kenyan farmers except 1K-m joined secondary school (farmer 3K-m went up to form 2 only) only the Tanzanian farmer 4T-m went to secondary school (up to form 4) (see Tab. 7).

The children of three farmers (1K-l, 3K-l, 2T-h) have finished secondary school, the children of three Kenyan farmers (2K-l, 2K-m, 3K-m) still go to secondary school. The children of three Tanzanian farmers (1T-l, 2T-l, 4T-m) still go to primary school. Some of the children of four Tanzanian farmers (3T-l, 4T-l, 6T-l, 1T-h) have left school after primary (lack of finances) resp. still go to primary school. Some children of farmer 1K-m finished primary resp. secondary school; on farm 3T-h some finished secondary school and some still go to primary resp. secondary school. (see Tab. 7). The children of three Tanzanian farmers (5T-l, 5T-m, 6T-m) do not go to school yet.

[63] According to HATIBU & MTENGA (1996: 4) the average size of male-headed households in Tanzania is 5,4, compared to 4,3 members in female-headed households. Thus, the sample size for male-headed households is the same, but higher for female-headed households.

Eleven farmer's mothers went to primary school, out of which two did not finish primary school. Thirteen farmer's fathers went to primary school, out of which two did not finish primary school, one father went to secondary school.

Concerning the (present) husbands it can be seen that seven husbands went to primary school out of which three husbands (1K-l, 4T-l, 5T-l) did not finish primary school. Nine husbands went to secondary school, out of which four husbands did not finish (1K-m, 3K-m, 6T-l, 4T-m) secondary school.

Nine husband's mothers went to primary school, out of which one did not finish primary school. No mother in the Tanzanian low potential areas went to school: Ten husband's fathers went to primary school, and three fathers went to secondary school.

The educational level is generally higher in Kenya than in Tanzania, and the lowest level of education is found in the LPAs in Tanzania. Further aspects are elucidated in chapter 6.2.1.

Tab. 7: Education

	Farmers																	
Aspects (in absolute numbers)	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Education she[1]	4	4	4	2	4	3	2	2	2	2	2	2	2	2	1	3	2	2
Education children[2]	4	3	4	5	3	3	1	1	2	2	4	6	2	ny	2	1	ny	ny
Education her mother[1]		2	2	2		2		2		2		2		1		1	2	2
Education her father[1]		2	2	2	4	2		2		2		2	1	1	2	2	2	2
Education husband[1]	1	4	4	3	4	3	2	2		2	4	4	1	1	3	3	2	
Education his mother[1]		2	2	2	1	2					2	2					2	2
Education his father[1]		2	2	2	4	2		2			2	4	2	2	2		2	4

Legend:

1 Education: **1** = primary, not finished; **2** = primary; **3** = secondary, not finished; **4** = secondary **2 Education children**: **ny** = not yet; **1** = still primary; **2** = primary finished & still; **3** = secondary (finished resp. still sec.); **4** = secondary finished; **5** = primary & secondary, finished; **6** = secondary finished & still in sec. resp. primary; ☐ = not on the resp. farm; ▒ = not in the resp. zone/country	**K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household

Seven farmers have received a vocational training. In general, Tab. 8 below shows that the rate of women with vocational training is higher in Kenya (4 out of 6 in Kenya compared to 3 out of 12 in Tanzania): five farmers have been trained as teachers (2K-l, 3K-l, 2K-m, 1T-h, 4T-m), farmer 6T-l has been trained as a secretary, and farmer 3K-m has been trained as a *District Community Development Assistant*. Eight farmers (1K-l, 1K-m, 3K-m, 4T-l, 5T-l, 6T-l, 2T-h, 3T-h) additionally joined training from different institutions like church or other projects. The farmers in the low potential areas in Tanzania within the SCAPA-project (1T-l, 2T-l, 3T-l) did not join a vocational or other training, nor did their parents.

Tab. 8: (Vocational) training and additional data

	Farmers																	
Aspects (in absolute numbers)	1K-l	2K-l	3K-l	1K-m	2K-m*	3K-m*	1T-l*	2T-l	3T-l*	1T-h	2T-h*	3T-h	4T-l*	5T-l	6T-l	4T-m	5T-m*	6T-m*
Vocational training[1]		1	1		1	2,3				1					4	1		
Training[2] (except project)	1			3		2					2	2	2	2	2			
Vocational training & community/ church position her mother[3]		†		-					†	†						1		
Vocational training & community/ church position her father[3]			1,4	/	1	2		†			†				1	1,4		5
Vocational training & community/ church position husband[4]	8	3	2	4	9	6	10	11		5	6	7			12	1		
Vocational training & community/ church position his mother[5]										6								
Vocational training & community/ church position his father[5]		+			1			†			1	3						
Vocational training children[6]	1	2	1	1	3	2	6	6	4	2	2	4	3	6	5	6	6	6

Legend:

[1] **Vocational training: 1** = teacher ; **2** = nursery teacher; **3** = Divisional Community Development Assistant; **4** = secretary

[2] **Training: 1** = church; **2** = other projects; **3** = church & other

[3] **Vocational training & community/church position: 1** = teacher; **2** = priest; **3** = forester; **4** = church leader/elder; **5** = engaged in project activities; **6** = trad. healer

[4] **Vocational training: 1** = teacher; **2** = medical officer, church elder, initiator of group; **3** = insurance agent; **4** = AIC immigration officer, church elder; **5** = Ward secretary, trad. healer; **6** = police officer; **7** = librarian; **8** = village council member; **9** = teacher, secretary of funeral association; **10** = initiator of VSCC; **11** = chairman of VSCC, trainer; **12** = trainer

[5] **Vocational training: 1** = all children; **2** = some, others too young; **3** = some, others too young, some not; 4 = too young, some not; **5** = some, some not; **6** = too young; **7** = none

[6] **1** = teacher (father); **2** = teacher (mother); **3** = priest (father); **4** = church leader (father);**5** = engaged in project activities; **6** = church elder, teacher

† = died, when was child; **/** = ran away; **-** = deaf; **+** = two wives

K = Kenya
T = Tanzania
l = LPA
m = MPA
h = HPA
* = female-headed household

▒ = not in the resp. zone/ country;
□ = not on the resp. farm

The vocational training patterns of the female farmer's parents by gender and country show that four fathers had been trained and were working as teachers, one was a priest, whereas only the mother of farmer 4T-m received a vocational training and was working as a teacher. Additionally, some fathers and/or mothers hold important positions in church and/or community.

Seven husbands have received a vocational training, but only three husband's fathers and no mother have got training skills. Additionally, the husbands and some of their fathers and/or mothers hold important positions in church and/or community.

Concerning the children's education not too much can be said since many children are still too young. However, the only children who went or still go to university are the ones of Kenyan farmers (2K-l, 3K-l, 2K-m, 3K-m).

The analysis of the farm samples regarding gender and country resp. agro-ecological zone indicates that the training level is significantly lower among women and that more men in Kenya and in the HPAs in Tanzania have received a training. No family member in the LPAs in Tanzania has received a training. Furthermore, it is interest-

ing that more than half of the family members have been trained as teachers (see Tab. 8).

4.3 Data on agriculture

4.3.1 Land size and use

A prerequisite to carry out a farming-system analysis is to know factors such as land size, use and topography, thus, whether the land is almost flat, undulating or characterised by steep slopes; this last aspect has been described already in chapter 4.1.

Tab. 9 below shows the farm sizes in total as well as sizes of land for cultivation, special grazing area, natural forest/woodland and planted woodlots. Six farmers dispose of a natural forest area; all farmers in the MPA of Kenya have established a woodlot, two farmers have got an orchard, and four farmers dispose of a (fenced) grazing area.

Fig. 25: Small vegetable garden on farm 2T-h (a. o. amaranthine, black night-shade, onions) bordered by napier grass

The average farm size in total is 17,8 acres, the average size of land under cultivation, however, is 8 acres, due to the fact that especially farmers 1K-l and 1T-l dispose of big natural forest/grazing areas.[64] As can be seen, the farm sizes are very heterogeneous: looking at the sizes of land for cultivation one can see that four farms have got less than 2 acres, five farms are around 3 acres, 2 farms are between 6 and 8 acres, six farm sizes are between ~10 - 20 acres; only farmer 1K-m has got more than 20 acres (see Tab. 9). The farm sizes are not relative to the agro-ecological zones in which the land is located as has been stated also by CROWLEY et al. (1996: 41) for their research area in western Kenya. Hence, other aspects like natural conditions and population density (the lower the natural potential of an area the bigger the size of the land and the other way round due to population density), distance to urban centres/ markets (higher population density!), inheritance, historical aspects, financial potential, etc., are of significant importance to the farm sizes.

All farmers (except 1T-l) tend a vegetable garden (see also Fig. 25). Three farmers have set aside a special (fenced) area for horticulture activities close to the house (see Tab. 9), the other farmers have set aside a special area for vegetables, mainly

[64] Farmer 1T-l has to share the grazing- and natural forest area with other family members!

close to a water source and as close to the house as possible. The extent of the gardens varies mainly according to water and crop preferences.

In general, the size of land also indicates tendencies like the growing percentage of people without land due to land subdivisions to successive generations among the resource poor on the one hand and the concentration and accumulation of land among wealthier households on the other hand (see also CROWLEY et al. (1996: 17).

Tab. 9: Purpose and size of farm land

	Farmers																	
Data related to land	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m**	**3K-m**	**1T-l**	**2T-l**	**3T-l**	**1T-h**	**2T-h**	**3T-h**	**4T-l**	**5T-l**	**6T-l**	**4T-m**	**5T-m**	**6T-m**
Inclination[1]	3	2	2	2	4	4	3	2	1	4	1	3	1	1	1	1	1	1
Size in total (acre)	35,5	4,1	13	34,2	9,7	3	150	10	2	1,2	1,5	10	1,5	3,5	3,3	20	3,3	14,8
Homestead	0,4	0,1	0,1	0,4	0,1	0,1	0,4	0,2	0,1	0,1	0,2	0,4	0,1	1	1,5	0,1	0,1	0,4
Cultivation	10,4	3,4	11,9	26,7	7,8	2,9	16	9,6	1,9	1,1	1,3	6	1,4	3,4	3,2	19,9	3,1	10,4
Grazing				7,5			0,7	1,2				3,5						
Natural forest	24,7	0,7	1		1,5		33											2
Woodlot				0,5	2	0,5												
Orchard			2														1,2	

Legend:

K = Kenya; **T** = Tanzania; **l** = low potential area; **h** = high/mid potential area
= not in the resp. zone/country; = not on the resp. farm
[1] Inclination: **1** = 0-4%; **2** = 5-10%; **3** = 11-30%; **4** = > 30%

4.3.2 Crops

In total, 44 different kinds of crops and vegetables are cultivated, mainly for subsistence production.[65] Tab. 10 indicates that beans and maize are the main food crops, cultivated by all farmers, followed by cassava, sweet potatoes, amaranthine, tomatoes, cow peas and kale.

Maize is the main crop among the cereals; marginal are finger- and bulrush/pearl millet (cultivated on three farms only) and clusterbeans (on one farm only).

Cassava and sweet potatoes are the most important starch producing tubers, beans are the main crops for proteins, followed by cow peas, a traditional crop; green gram and lentils are cultivated on two farms resp. on one farm only.

Tomatoes are the favoured vegetables, Amongst the leafy vegetables amaranthine is the most important one, followed by kale; Chinese cabbage is found on three farms only, green salad on one farm only.

Of marginal importance are garlic, chives, sugar cane, pineapple and chillies.

[65] Special attention to traditional food crops will be paid in chapter 4.6.7.1.

Only of regional importance – farms 4-6T-l/h – are *Bambarra*-groundnuts, groundnuts and green gram as important protein suppliers as well as *Corchorus tricularis*, okras, pumpkins and squash for leafy vegetables. Finger millet is only cropped on farms in Kenya, sorghum is found on farms in Kenya and in Sukumaland. Okras, tree tomatoes and water melons are not cultivated on the Kenyan farms.

No decisive differences of single species can be observed with regard to the agro-ecological zones; however, the highest variety of species in total is found in the MPA of Kenya, and the lowest variety of species is found on the Kenyan farms in the LPAs. Farmer 1T-l has got by far the lowest crop variety – she cultivates three different crop species only; farmer 1K-m has got the highest crop variety (28), followed by farmer 3T-h (24). Furthermore, some crops are cultivated during the long rains only. In the NSWCP- and the SCAPA project, there is a correlation between AEZ and crop diversity: species diversity is lower on the farms in the low potential areas compared to the mid/high potential areas. However, among the farms in the HASHI-ICRAF project area crop diversity is slightly higher in the LPA; this might be due to the fact that in this area traditional food crops still play a crucial role to secure the food basis as many crops are drought-resistant.

An assessment of the exact amount of all crops harvested (and sold) was not possible for all farms; this difficulty has been reported also by other researchers (see e.g. SHAO et al. 1992: 116). Reasons named by the farmers were that they did not record their harvest; I also had the impression that some farmers kept these data a little bit like a secret as maybe others should not know the amount to avoid jealousy, etc. However, data on main crops have been listed in Tab. 11 below. Generally, there can be seen a correlation between the amounts, the farm sizes and the AEZ, except for farm 2T-l - here the crop yields are higher mainly due to irrigation.

Tab. 11: Harvest of main crops

Harvest in	Farmers																	
bags (à 50 kg)	1K-l	2K-l	3K-l	1K-m	2K-m	3K-m	1T-l	2T-l	3T-l	1T-h	2T-h	3T-h	4T-l	5T-l	6T-l	4T-m	5T-m	6T-m
Beans	12-15	4	6	24-28	4-6	2	3-6	4-12	6	5-6	2	8	1	1-2	1	1-2	1*	4
Cassava	15	2	10	15-20	8	3		8	2	2	2	8	2	3	~2*	15	3	14
Maize	50	10	25-30	45	8-10	2	15**	30-44	10	5-6	12	~30	~10	9	15	10-15	3	18
Rice								20-30								100	22	/
Sweet potatoes	15-20	3	10	20-25		4		12	2	2	2	5	20-25	10	9	15	3-4	17
Farm sizes	35,5	4,1	13	34,2	9,7	3	150	10	2	1,2	1,5	10	1,5	3,5	3,3	20	3,3	14,8

** = in former times 20-30 bags

Legend:

K = Kenya; **T** = Tanzania; **l** = low potential area; **h** = high/mid potential area
☐ = not in the resp. zone/country; ☐ = not on the resp. farm; *bucket (20 l)

Aspects related to cash crops are described in chapter 6.1.1.1. Botanical, English and Swahili names of crops are given in appendix 4.

Tab. 10: Crops cultivated (grouped)

	Farmers																	
Subsistence crops	1K-l	2K-l	3K-l	1K-m	2K-m	3K-m	1T-l	2T-l	3T-l	1T-h	2T-h	3T-h	4T-l	5T-l	6T-l	4T-m	5T-m	6T-m
species farm	18	15	13	28	11	18	3	19	14	12	15	24	20	14	25	17	20	17
species AEZ	22			31			23			28			28			25		
Vegetables, (annual) fruits, herbs and spices																		
Amaranthine**	1	2	1	1	1	1		2	2	2	2	2	3	3	3	3	3	3
Black nightshade**			1					2	2		2	2						
Cabbage	1	2	2	2		2			1			2			3		3	
Carrot	2		2	2		2		1		2		2			3		3	
Chilli				1							2							
Chinese cabbage								2							3		3	
Chives				2														
Corchorus tri.*													3	3	3		3	3
Eggplant*						2			1				3		3		3	3
Garlic				2														
Green salad				2								2						
Kale	2	2	2	2	2	2		2	2	2	2	2			3		3	
Okra*												2	3		3	3	3	3
Onion		2	2	2	2	2			1	2	2	2			3		3	3
Pineapple												2						
Pumpkin*		2		1		2		1				2	3	3	3	3	3	3
Red pepper					1	2		1	1	2	1	2						
Spinach	1			2				2			2	2			3			
Squash**													3	3		3		
Sugar cane				2								2						
Tomato	1	2	2	2	2	2		2	1	2	2	2	3		3	3	3	3
Tree cassava**	2			2	2	2							2	2	2			
Tree tomato								1	1	2					3			
Water melon*								1				1	3		3			
Protein/oil suppliers																		
***Bambarra*-groundnut**	2				2								3	3	3	3	3	3
Bean	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3
Clusterbean												2						
Cow pea*	1	2	2	2	2	2	2				2	2	3	3	3	3	3	3
Green gram													3		3			3
Ground nut	1			1									3	3	3	3	3	3
Lablab bean*				1		2		1			2					3		3
Lentil													3					
Pigeon pea		2	2	2							2	2		3		3	3	
Sun flower																3		
Cereals																		
Bulrush/pearl millet	1			1								2						
Finger millet	2	2		2														
Maize	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3
Rice								2								3	3	3
Sesamum				3									3		3			
Sorghum	1	2		1									3	3	3	3		
Tubers																		
Cassava*	1	2	2	2	2	2		2	1	2	2	2	3	3	3	3	3	3
Coco-yam				2		2		2				2						
Potato	1	2		2		2		2	1	2								
Sweet potato*	1	2	2	1		1		2	1	2	2	2	3	3	3	3	3	3

* Besides the fruits leaves and young shoots are eaten as vegetable; ** Leaves/young shoots are eaten

Legend: **1** = during long rains only; **2** = during long & short rains; **3** = one cropping season; ▒ = not in the resp. zone/country; □ = not on the resp. farm; **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA

4.3.3 Livestock

> "Livestock are the theme around which life is lived. Animals are important from birth until death. The animals and their products (milk, fat and meat) are utilized among other things to celebrate births; formalize marriages; pay depts; create and solidify relationships; as medicines; establish a family's status and authority in the community; and as food security."
>
> The SHINYANGA SOIL CONSERVATION AND AFFORESTATION PROGRAMME in their Gender/Women Action Plan (1992: 2).

Livestock can form an important element within a farming-system as the quotation above for the *Wasukuma* in the project area of HASHI-ICRAF in western Tanzania demonstrates. There is only a little risk that the actual number of livestock given (especially concerning cattle which might stay at other places also) might be under-reported in some few cases due to fear of taxation and cultural restrictions (a phenomenon repeatedly described in the literature – see e.g. HATIBU & MTENGA 1996: 41) since I have carried out estimations of livestock in most cases myself.

The most important animal species are cattle and chicken, followed by goats, and sheep. Tab. 12 shows that farmer 4T-m does not keep any livestock and farmers 2K-m and 5T-m keep chicken only. Farmer 3T-h has got the highest number of livestock in total as well as the highest number of chicken, goats and sheep; furthermore, this farmer is the only one who keeps guinea-fowls. Farmer 2T-l has got the highest variety of animal species. 1K-m has got by far the highest number of cattle. Farmer 1T-l is the only one to keep donkeys.[66] Rabbits are kept on three farms, pigeons and ducks are kept on two farms only. Sheep are not kept on the farms in Sukuma-land.

Fig. 26: Beehives in a sausage tree (*Kigelia africana*) in a HPA in Tanzania; foreground: banana plants

TARDT (2000: 26) note about cattle: "The local breed the Zebu, has low potential for milk production but is well adapted to the existing environment […]. Cross bred cows, particularly of Frisian and Jersey origin, are known to produce significant amounts of milk depending on feeding level and other ma-

[66] Donkeys are used in this area as major means for transportation of water, agricultural products, firewood and poles (see also NYAKI 1998: 31).

nagement factors." Out of 14 farmers who keep cattle four farmers keep high breed cattle, five farmers keep local species only. Three farmers do not keep dairy cows which corresponds with the fact that they practise free-grazing with local species only; farmer 3T-h and 3K-l have got the highest number of dairy cows.

Out of the ten farmers who keep goats only three farmers keep high breed/mixed species, out of seven farmers who keep sheep only farmer 3T-h keeps a high breed species.

A serious problem linked to the keeping of chicken are diseases; some farmers lost (almost) all of their stock (1K-m, 2K-m, 5T-l, 6T-l, 4T-m, 5T-m).

Two farmers within the area of SCAPA (2T-l, 1T-h) dispose of a fishpond for raising Tilapia, four Tanzanian farmers (1T-l, 2T-l, 1T-h, 3T-h) practise bee keeping (see Fig. 26); on farm 1K-l the bees are kept by the husband only.

Tab. 12: Different aspects linked to livestock

	Farmers																	
Animal species	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Cattle	**9**		**7**	**32**		**2**	**5**	**2**	**9**	**2**	**2**	**14**	**3**	**2**	**4**			**8**
Grown up	7		7	26		1	5	2	6	1	2	8	1	1	3			6
Dairy cows			4	2		1		1	1	1	2	4	1	1	1			
Calves	2			6		1			3	1		6	2	1	1			2
Species*	1		1	5		2	1	7	8	3	2	8	7	3	1			1
Goats	**1**	**11**	**12**	**6**			**4**	**9**		**3**		**24**			**16**			**6**
Grown up	8	1	9	6			4	6		2		24			10			6
Calves	2	1	3					**3**		1					6			2
Species**	1	1	1	1			1	5		4		4			1			1
Sheep	**3**		**7**	**2**				**4**		**4**	**2**	**16**						
Grown-up	3		7	2				4		3	2	16						
Calves										1								
Species**	1		1	1				1		1	1	5						
Donkeys							**3**											
Chicken	**6**	**15**	**9**	**7**	**14**	**4**	**8**	**12**	**8**	**3**	**5**	**3**	**13**	**15**	**5**		**6**	**11**
Hens	5	4	7	5	3	3	2	5	3	2	4	3	6	8	4		5	5
Cocks	1	1	1	1	1	1		2	1	1		2	2	1	1		1	2
Chicks		1	2		1		6	5	4		4	25	5	6				4
Species**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1
Rabbits								**7**		**5**			**2**					
Ducks				**4**				**4**										
Guinea fowls												**6**						
Pigeons													**9**		**5**			
Fishpond								**x**		**x**								
Bee-keeping	**x**						**x**	**x**		**x**		**x**						

Legend:

Species* 1 = local; **2** = mixed; **3** = Frisian; **4** = Jersey; **5** = local & mixed; **6** = local & high; **7** = different high; **8** = local, mixed & high	**K** = Kenya;
Species 1** = local; **2** = mixed; **3** = high; **4** = local & mixed; **5** = local & high)	**T** = Tanzania;
☐ = not on the resp. farm; ▩ = not in the resp. zone/country;	**l** = LPA; **m** = MPA; **h** = HPA

Aspects linked to fodder and keeping are described in chapter 5.3.

5 Farmer's strategies and measures for a sustainable management of natural resources

In the following three chapters measures and strategies related to natural resource management and empowerment as well as their effects are described. This is the first step in order to identify attributes and precise forms of assessment (indicators) for success/sustainability (see also HUXLEY 1999: 286). In the last chapter, effects of these measures are assessed on different levels.

All measures have been assigned to major groups and are discussed in the respective chapters. For getting a general idea and since some measures can be assigned to more than one group, all measures are listed in appendix 3. The intensity of the techniques and practices implemented has been indicated for biological measures only (some farmers carry out measures, e.g. organic farming, more intensively with regard to amount of manure, etc. than other farmers). Whether they are sufficient regarding soil conservation criteria (e.g., farmer 2K-m has not terraced the whole farm land yet due to lack of finances) has been analysed in chapter 7.1.1.

5.1 Physical soil and water conservation measures[58]

"The information now being obtained about 'scouring' of the soil surface […] indicates how much care is needed even on just small areas within a farm if maximum conservation is the objective […]."

P. HUXLEY in his book on tropical agroforestry (1999: 58).

Fig. 27: *Double dug*, a micro-catchment, with bananas, papaya and beans on a farm near Kisumu, western Kenya

In conserving the soil physical measures (also called *earthwork structures* or *mechanical protection works* - see e.g. ROCHELEAU et al. 1988; THOMAS 1997) are crucial within a sustainable management of natural resources. The different types of measures observed on the farms will be described in the following chapters.

[58] A description of biological and/or physical soil and water conservation measures can be found in HUDSON 1984, ROCHELEAU et al. 1988, NILL et al. 1996 and THOMAS 1997.

Fig. 28: Raised bed cultivation on farm 4T-m

The most simple and labour/time saving practice is mechanical protection through contour tillage, carried out on all farms situated on sloping ground (all Kenyan farms and all farms in the SCAPA project area except 3T-l, 2T-h); the land is either tilled by ox-plough or tractor (if slopes are not too steep and/or tools are available) or by hoe.[59] HUXLEY (1999: 55) mentions: "Tillage, or the avoidance of it, is influential in soil and water erosion control, because it directly affects the soil surface."[60] On the same farms a variety of combinations of contour furrows and ridges has been established.

Fig. 29: Retention ditch on a farm near Thika, Kenya

Six different forms of micro-catchments constructed from soil, have been observed on the farms (Fig. 27 and 32): enclosure bunds have been established on six farms, mainly for water harvesting on rice fields. Nine farmers have implemented tied ridges (see also HUDSON 1984: 105; HUXLEY 1999: 58); however, a preference for this practice can be seen in Shinyanga Region. Raised beds, found on seven farms (1K-m and all farms in the project area of HASHI-ICRAF), are a traditional land-use practice in Sukumaland, especially on the farms in

[59] Farmers 2K-m and 2T-h cannot afford to rent oxen/a tractor.

[60] Research has shown that conventional tillage methods like ploughing or intensive hoeing has got negative effects on the soil in the long-term perspective. Alternative soil management methods like *conservation/minimum tillage* or no-tillage systems, combined with mulching, crop rotation, intercropping methods, green manuring and the use of special herbicides (controlling of weeds gets more problematic) seem to be the best method for a sustainable management of soils as they ensure the maintenance of soil structure and fertility; additionally, these methods are labour- and cost-saving and lead to an increase of crop harvests if well-managed (THOMAS 1997: 48-52; STEINER 1998: 159-164; GEO 2000: 199-202; DE JAEGER 2001: 42; VAN TOOR 2001: 42-43).

Fig. 30: Contour furrows and ridges in combination with *fanya-juu* terraces on farm 3K-l

the HPAs; here, wide areas are cultivated in this manner (see Fig. 28); farmer 1K-m uses raised beds especially for vegetable production. Holes/micro basins are used by ten farmers as a water harvesting method. On seven farms circular bunds have been established.

Furthermore, five different types of large conservation structures can be distinguished (see Fig. 32): retention/infiltration ditches (see also Fig. 29) have been established on 15 farms. Contour bunds have been laid on five Tanzanian farms. *Fanya juu* terraces[61] (see also Fig. 30) and cut-off drains have been established on five Kenyan farms; three Kenyan farmers have implemented (level) bench terraces (see Fig. 31).

Fig. 31: Level bench terraces with contour furrows (3K-m)

Contour stone lines are an effective soil erosion barrier (see also MOALDM 1999: 3), but have not been observed on the farms.

Fig. 32 indicates that on the farms with an inclination above 4 % (all Kenyan farms and the farms in SCAPA-project area except 3T-l and 2T-h) the diversity of physical measures is higher than on the other farms. Types and extent of measures vary not only due to natural conditions like relief or project influence, but also according to culture and traditions, labour/time intensity (all earthwork structures require maintenance), financial criteria, personal preferences (there may be different possibilities for reaching a high level of sustainability and output), colonial interventions like

cost-saving and lead to an increase of crop harvests if well-managed (THOMAS 1997: 48-52; STEINER 1998: 159-164; GEO 2000: 199-202; DE JAEGER 2001: 42; VAN TOOR 2001: 42-43).

[61] *Fanya-juu* (Kisw. = 'make above'); terraces are constructed through throwing the soil excavated from a ditch uphill.

forced terracing, etc. A comparison of the farms on project-level shows that contour bunds have been laid on Tanzanian farms in the SCAPA project area only, while *fanya juu* terraces, (level) bench terraces and cut-off drains only occur on the Kenyan farms within the project area of NSWCP. ROCHELEAU et al. (1988: 124) mention: “Each region and country seems to emphasize one or two techniques for general use. For example, many farmers in dry areas of Kenya use contour bunds, protected by cutoff drains.“

Generally, a higher diversity of measures is found on the Kenyan farms. The highest variety of soil and water conservation measures can be found on farms 1K-m and 2K-m; farms 4T-l and 5T-l have implemented the lowest diversity of physical measures. On farm 1T-h the repertoire as to physical activities is low related to inclination, but the family keeps a highly dense plant cover on the fields which prevents soil erosion and results in high soil fertility. This allows the family to limit physical activities to a restricted level, saving labour and costs.

The most common physical soil and water conservation measures carried out are **retention/infiltration ditches** (15), **contour tillage** and **contour furrows/ridges** (11 each), followed by, **holes/micro basins** (10), **raised beds** and **tied ridges** (9 each).

This chapter can be summarised with the conclusion of HUXLEY (1999: 55): “Tillage methods and soil and water conservation systems are all part of the holistic approach needed to achieve good agroforestry design. More is needed than *just* being concerned about the use of environmental resources, competition, etc.”

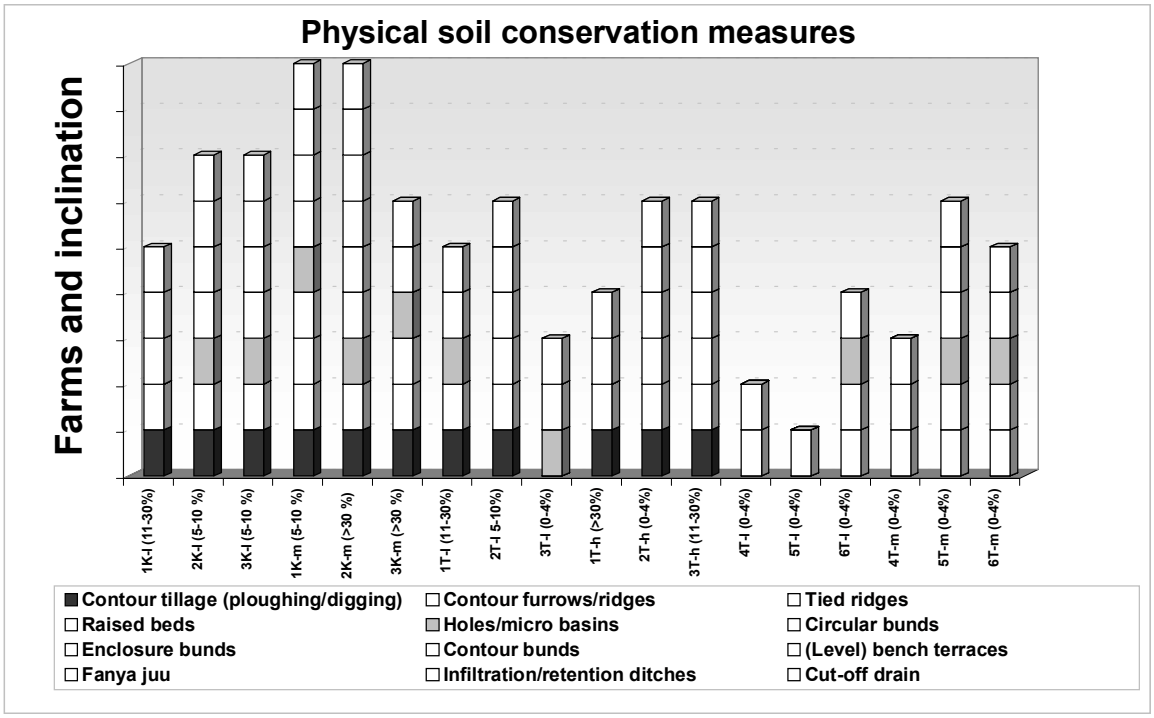


Fig. 32: Physical soil and water conservation measures

5.2 Biological soil conservation measures

> "One of the reasons why there is a proliferation of literature about the place of agroforestry […] is because it works. A number of agroforestry practices have proven to be very effective for soil and water conservation, and the inputs required to establish them can compare favourably with the costs of conventional conservation methods"
>
> P. HUXLEY in his book on tropical agroforestry (1999: 52).

In the following chapters biological soil conservation measures including soil fertility improvement will be described. The biological measures assessed have been listed in Fig. 62. Only soil fertility improvement have been illustrated in Fig. 68.

5.2.1 Tree management

> "Agroforestry is a generic term and the various forms that it can take (agroforestry practices, sometimes called technologies) can be classified into various groups […] based on the arrangement of their components in space and time and their outputs in terms of both products and 'services' (e.g., soil and water conservation, micro-climate improvement, demarcation of boundaries, etc.)."
>
> P. HUXLEY in his book on tropical agroforestry (1999: 10).

Tree management is part of the farming systems researched; the integrated management of trees, crops and livestock is known as *agroforestry*: Agroforestry is an integrative concept for the sustainable management of natural resources, involving a combination of various practices related to forestry, agriculture, animal husbandry, pasture management as well as physical/structural soil and water conservation aspects. The wide range of positive contributions of agroforestry practices[62] to environment and (rural) communities has been widely described in the literature: Trees and shrubs serve several benefits like products and services: firewood & timber, food, fodder & forage, shelter, medicine, handicraft, cash income, savings & investment, reducing labour and time input, water & soil conservation, soil fertility improvement/ soil amelioration capability, microclimatic changes, reclamation of degraded lands, satisfaction of people's needs living in buffer zones around protected areas, positive impact on socio-cultural aspects as to name the main benefits (see e.g. ROCHELEAU

[62] Often, the terms ‚system' and 'practice' are used indiscriminately. After HUXLEY (1999: 13-14) 'practice' is to be applied better as a form of classification, whereas 'system' has functional connotations and so is more properly used to describe specific examples of practices. An agroforestry system could be a single specific local example of a practice, or, the term can be used for a cluster of almost identical such units (see also BLUME 1998: 26).

1988; NAIR 1993; TENGNÄS 1994; BLUME 1997, 1998; HUXLEY 1999).[63] Agroforestry systems are characterised by diversity which helps to reduce farmer's risks like natural hazards and price fluctuations (ROS 2000: 42). Minimising these risks has been found by SENKONDO (2000) who carried out a study in Babati district, Tanzania, to be more important for the farmers than risks like pests, competition on nutrients and water or problems in using a tractor on the field. In general, the relatively greater flexibility of many agroforestry systems may provide some form of buffer, at least for a short period of time, to overcome temporary setbacks (HUXLEY 1999: 31).

However, whether soil erosion through tree plantings can be reduced or eradicated depends on the planting geometry (tree spacing and arrangement), canopy density and form, nature of the litter as well as on ground cover protection (including also extent, duration and kind of crop canopy). Paramount factors are soil structure, rainfall characteristics and inclination. For instance, lack of an understorey and/or wrong arrangement and spacing of trees such that water is channelled between individual trees can initiate severe soil erosion like gulleying, which can frequently be observed on monocultural timber tree plantations (HUXLEY 1999: 52-55). "A consistent protection of the soil by multistrata plant canopies and a litter/mulch layer are the two key factors for erosion prevention, and they may work better than physical structures (ibi.). "Knowing something of the processes concerned, it should not be too difficult to apply this information to individual systems, and obtain improved control of soil and water erosion" (HUXLEY 1999. 55). To avoid negative aspects of tree integration, farm planning, design and management has to be carried out carefully. Tree species, spacing and management, e.g. cutting of branches and/or roots to avoid competition in nutrients, water and light (see Fig. 33) have to be taken into consideration.

Fig. 33: Coppiced mango tree on farm 3K-I in central Kenya

Depending on the involvement of components *agrosilvocultural systems* (trees/shrubs + crops), *silvopastoral systems* (trees/shrubs + pasture/animals) and *agrosilvopastoral sys-*

[63] A study in Chile showed that the yields of fruit trees and forage crops achieve higher than average yields, that milk and egg production far exceeds the one on conventional high-input farms, that nutrient surpluses are produced, and that monthly income generated is 1.5 times higher than the monthly legal minimum wage in Chile while demanding only a few hours spend per week on the farm. The time freed up can be used by the farmers for other on- or off-farm income-generating activities (ALTIERI et al. 2001: 126).

tems (trees/shrubs + crops + pasture/animals) can be distinguished (KIDD & PIMENTEL 1992: 105; NAIR 1993: 33-34; BLUME 1997: 8-19, 1998: 26-40; HUXLEY 1999: 10). Agroforestry systems also vary according to time and space, thus, whether the crop-tree combinations are sequential or simultaneously implemented; on the level of space, a horizontal and a vertical dimension can be distinguished (HUXLEY 1999: 9).

According to researchers, diverse cropping systems are needed in fragile areas instead of intensive monocultures (WILSON 2001: 105). However, there exist several problems resulting in a partly very low adoption/adaptation or even refusal of tree-related technologies; they will be discussed in chapter 9.3.1.

As has been outlined in chapter 2, women's profound involvement in subsistence production causes a close relation between them and the natural environment; their role is especially important in the field of tree management as they are the main users (and collectors) of forestry products like firewood (see e.g. OTSYINA et al. 1997b: 90). Therefore, their role within tree management needs to be carefully taken into consideration.

In the following chapters attention is paid first only to tree/shrub species: which species occur, their number and distribution, use, spatial arrangement, status and management. Subsequently, different tree-annual plant-interfaces will be discussed. Botanical, English and Swahili names for trees/shrubs are given in appendix 5.

5.2.1.1 Woody species

> "When we say that a plant is 'woody' we know that its growth, form and lifespan will be regulated by its ability to manufacture lignin […]."
>
> P. HUXLEY in his book on tropical agroforestry (1999: 69).

5.2.1.1.1 Indigenous fruit trees/shrubs

> "Indigenous fruit trees are important to raise peoples' nutritional standards. The rural people who live with them know a lot more about these trees."
>
> OTSYINA et al. in the annual progress report on the *Agroforestry Research Project* in Tabora Region, Tanzania (1997b: 13).

Indigenous fruit trees are imperative for food security, especially during famines, are an essential source of nutrients, bear monetary benefits, are of high medicinal value, provide good firewood, and many species make superb material for carvings, mortars, and other products (MHANGO 1999: 3-4; see also Fig. 34). Especially in areas where the natural potential or indigenous biodiversity is still high, a huge variety of indigenous fruit trees can be found. In the frame of a study in Tabora region, western

Tanzania, farmers identified 49 fruit trees, many of them growing wild in forests or ravines; this study as well as research carried out in Malawi, Tanzania, Zambia and Zimbabwe indicated that the tree species *Uapaca kirkiana*, *Vitex doniana / mombassae*, *Strychnos cocculoides*, *Parinari curatellifolia* / *maprouneifolia*, *Tamarindus indica* and *Sclerocarya birrea* are not only the most preferred species by the farmers but are potential candidates for domestication and incorporation in agroforestry systems; since the late 1960s population increase led to extensive clearing of forests and woodlands of the African Miombo eco-zone, endangering not only the woodland ecosystem, but also eroding the plant genetic base of numerous species; consequently, planting of trees on farms has become necessary (OTSYINA et al. 1997b: 14 - 16; MAGHEMBE 1999: 2; MHANGO 1999: 3). A lot of indigenous fruit tree species have been identified together with the farmers during my visit of traditional forest reserves in HASHI-ICRAF project area, among which *Adansonia digitata*, *Annona senegalensis*, mpumbula (local name, not identified – msur(l)ula = *Maerua angolensis*?), *Strychnos heterodoxa*, *Strychnos innocua*, *Vangueria madagascarensis*, *Vitex doniana*, *Vitex mombassae*.

Fig. 34: *Annona muricata*, a valuable fruit tree

According to Tab. 13, in total, 19 different indigenous fruit tree species have been identified, 11 species in Kenya and 12 in Tanzania. The number of species is more than double in the H/MPAs (17:8), the difference with regard to Kenya and Tanzania is 3:5 for the LPAs and 10:8 for the H/MPAs. The highest variety of species has been found on farm 2K-m (8) and 4T-m (7) and in general in the mid potential areas of SCAPA and HASHI-ICRAF. No tree species shows a significant importance in general. All species are more ore less spread on few farms with a low number of individuals. On five farms no indigenous fruit trees have been established.

Borassus aethiopum, Parinari curatellifolia, Sclerocarya birrea subsp. Caffra, Strychnos heterodoxa and *Vitex mombassae* only occur in the MPAs of the HASHI-ICRAF project area; *Manilkara discolor, Pappea capensis, Vangueria ssp., Vitex keniensis* and *Ximenia caffra* only occur on Kenyan farms in the MPAs.

The low variety of indigenous fruit tree species is due to the low indigenous tree potential: in many farm areas, the natural forest has been almost destroyed completely already decades ago (e.g. in the frame of the tsetse-fly campaign, for plantations, due to population pressure, etc.); seedlings are hard to get and raise, and projects have introduced exotic species, which again contributes to the neglect of local species (see also MUGO 1999: 8).

Tab. 13: Indigenous fruit trees/shrubs

Indigenous fruit trees/shrubs*[64]	Sp. No. per farm	1K-l	2K-l	3K-l	1K-m	2K-m	3K-m	1T-l	2T-l	3T-l	1T-h	2T-h	3T-h	4T-l	5T-l	6T-l	4T-m	5T-m	6T-m
Species number in total	19	1	–	2	2	8	1	–	2	–	1	–	2	1	1	2	7	–	3
Annona senegalensis	3					**1**							**1**				**2**		
Balanites aegyptiaca	1			**2**															
Borassus aethiopum	2																**2**		**2**
Cordyla africana	1												**1**						
Manilkara discolor	1					**1**													
Pappea capensis	2			**1**	**2**														
Parinari curatellifolia	2																**2**		**1**
Psydrax livi	2	**2**			**2**														
Rhus ssp.	3					**1**								**2**	**3**				
Sclerocarya birrea subsp. caffra	1																**1**		
Strychnos heterodoxa	1																**5**		
Syzygium cordatum	2					**1**										**1**			
Tamarindus indica	3										**1**					**1**	**1**		
Telfairia pedata	1								**2**										
Vangueria ssp.	1					**2**													
Vitex keniensis	1					**1**													
Vitex mombassae	2																**3**		**2**
Ximenia americana	3					**1**	**2**		**2**										
Ximenia caffra	1					**1**													

Legend:

* ☐ = not on the resp. farm; ▒ = not in the resp. zone/country; **1** = 1; **2** = 2-4; **3** = 5-7; **4** = 8-10; **5** = 11-20; **6** = 21-35; **7** = 35-50; **8** = >50<100; **9** = >100
K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA

♦ In total **19 <u>indigenous fruit tree species</u>** have been found, 11 species in Kenya and 12 in Tanzania. The variety of species is more than double in the H/MPAs **(17:8**). The difference with regard to Kenya and Tanzania is **3:5** for the LPAs and **10:8** for the H/MPAs.

No tree species shows a significant importance in general, all species are more or less spread on few farms with a low number of individuals.

5.2.1.1.2 Exotic fruit trees/shrubs

Tab. 14 shows that in total, 26 different exotic fruit tree species have been identified, 20 species in Kenya and 22 in Tanzania. The difference of species diversity with regard to the AEZ is not significant: 20 species in the LPAs and 24 species in the HPAs; however, on farm level the species diversity as well as the number of individuals is much higher in Kenya; on AEZ level the highest diversity and species number is found in the H/MPAs of the SCAPA and HASHI-ICRAF project areas. The difference with regard to Kenya and Tanzania is 15:15 for the LPAs and 19:20 for the H/MPAs. Farmer 3K-m has got the highest number of species (13), followed by

[64] The list of trees/shrubs also includes the naturally growing trees/shrubs on the farms.

3T-h (12), 1K-m and 1T-h (11 each); no exotic fruit tree species has been found on farm 5T-l (there were papayas, but the trees dried up).

Carica papaya, *Musa ssp*. (non grafted) and *Psidium guajava* are the most important fruit trees, followed by *Citrus sinensis* and *Mangifera indica* (see also Fig. 35). *Coffea arabica* occurs in the H/MPAs of SCAPA and HASHI-ICRAF only, but with a high number of individuals.

Fig. 35: Mango tree on farm 6T-m

Tab. 14: Exotic fruit trees/shrubs

Exotic fruit trees/shrubs*	Sp No. per farm	1K-l	2K-l	3K-l	1K-m	2K-m	3K-m	1T-l	2T-l	3T-l	1T-h	2T-h	3T-h	4T-l	5T-l	6T-l	4T-m	5T-m	6T-m
Species number in total	26	9	5	8	1	10	1	1	9	4	1	8	1	3	–	7	2	4	5
Annona muricata	2												1			1			
Carica papaya	11	3	2	2	5	2		3	2		2	3	4	x	x			8	6
Citrus limon	7	2	3	4	3		2		2	2						x	1		
Citrus sinensis	9	3	3		3	3	2		2		2		3	x		x		9	6
Cocos nucifera	0													x					
Coffea arabica	6				9	5	7				7	2	9						
Cyphomandra betacea	3						2				1					3			
Dovyalis caffra	4		6	7			5				4								
Macademia tetraphylla	1				2														
Mangifera indica - non grafted	9	2		4	5	2			2	2			1			1	2		3
Mangifera indica - grafted	3			9		2													4
Morus alba	3			2							1	4							
Musa ssp. - non grafted)	10		5		9	7	4		9	2	8	9	9	x		x		9	
Musa ssp. - grafted	3						4					4	7						
Opuntia ficus-indica	1															6			
Passiflora edulis	7	2			2	2	2		2		2	2	3						
Persea americana - non grafted)	7	2			4	2	2		2		1	2	2						
Persea americana - grafted	4			2		2	2				1								
Phoenix dactylifera	2													2		1			
Pithecellobium dulce	2																	9	3
Prunus domestica	1						2												
Prunus persica	2	2					2				2								
Psidium guajava	10	2		2	2	1	2		2	2		2	2	1		1			
Punica granatum	2												2			3			
Syzygium cuminii	4	4			2				2							1			
Terminalia catappa	2												1	1					

Legend:

* ☐ = not on the resp. farm; ▒ = not in the resp. zone/country; **1** = 1; **2** = 2-4; **3** = 5-7; **4** = 8-10; **5** = 11-20; **6** = 21-35; **7** = 35-50; **8** = >50<100; **9** = >100; **x** = dried-up
K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA;

♦ In total **26** different **exotic fruit trees/shrubs** have been found. The variety of fruit trees/shrubs between LPAs and H/MPAs is in the relation of **20: 24**. The difference with regard to Kenya and Tanzania is **15:15** for the LPAs and **19: 20** for the high/medium potential areas. In Tanzania slightly more exotic fruit tree/shrub species have been registered (**22:20**).

On farm level the species diversity as well as number of individuals is much higher in Kenya, on AEZ level the highest diversity and species number is found in the HPAs of SCAPA and in the MPAs of HASHI-ICRAF.

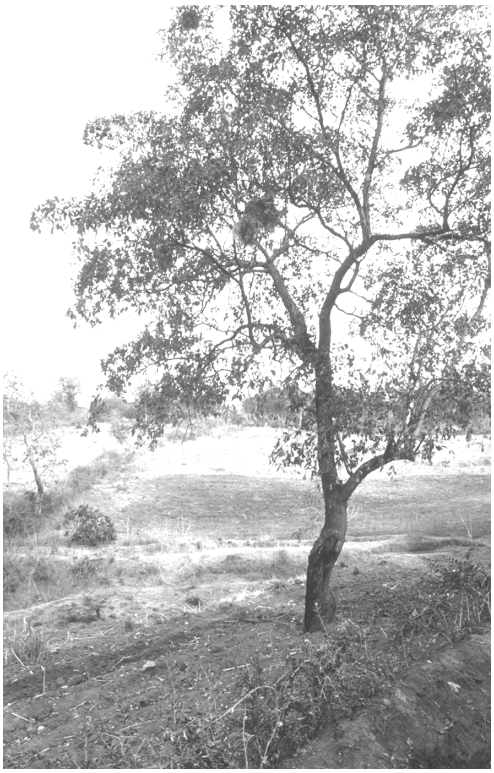


Fig. 36: *Terminalia brownii*, an indigenous multi-purpose tree on farm 2K-l; in the foreground a small hedge of *Dovyalis caffra*

5.2.1.1.3 Indigenous non-fruit trees/shrubs

In total, 66 different indigenous non-fruit tree species have been identified (see Tab. 15; see also Fig. 36), 34 species in Kenya and 54 in Tanzania. The species diversity as to AEZ is lower in the LPAs (36:55); however, a comparison on farm level shows an almost equal species variety in the two zones. The difference with regard to Kenya and Tanzania is 21:28 for the LPAs and 22: 50 for the H/MPAs.

Farmer 4T-m has got by far the highest variety of tree species (23), with additionally a high number of individuals. No indigenous non-fruit trees have been established on farm 5T-m.

Croton megalocarpus and *Euphorbia turicalli* are the most important trees, found on half of the farms, followed by *Acacia ssp.* and *Acacia tortilis*. *Acacia* species are especially important on the farms in the LPAs.

♦ In total **66** different **indigenous non-fruit tree-/shrub species** have been found on the farms. The variety of trees/shrubs between LPAs and H/MPAs is in the relation of **36: 55**. The difference with regard to Kenya and Tanzania is **21: 28** for the LPAs and **22: 50** for the H/MPAs. In Tanzania the variety of indigenous trees/shrubs is higher (**34: 54**).

Croton megalocarpus and *Euphorbia turicalli* are the most important trees, found on half of the farms, followed by *Acacia ssp*. and *Acacia tortilis.*[65]

[65] This is influenced by the fact that many *Acacia* species are found in the natural forests belonging to the farms.

Tab. 15: Indigenous non-fruit trees/shrubs (inclusive naturally growing trees)

Indigenous non-fruit trees/ shrubs*	Sp. No. per farm	1K-l	2K-l	3K-l	1K-m	2K-m	3K-m	1T-l	2T-l	3T-l	1T-h	2T-h	3T-h	4T-l	5T-l	6T-l	4T-m	5T-m	6T-m
Species number in total	65	9	16	10	13	13	2	10	15	4	6	5	6	3	6	8	23	–	12
Acacia ssp.	8	9	4	4		5		9	2						2	1			
Acacia depranolobium	3	2	2					5											
Acacia mellifera	2																8		2
Acacia nilotica	6	2	2					2						2	5	2			
Acacia refrascia	1																3		
Acacia senegal	4	1	1					5							1				
Acacia tortilis	8	2	2	4				5		2				2	4	4			
Acacia xanthophloea	6	7	2	2	2			8	2										
Afzelia quanzensis	1																2		
Albizia amara	1																5		
Albizia gummifera	2															1	2		
Albizia schimperiana	3								2	2	1								
Arundinaria alpina	1															3			
Bauhinia tomentosa	3				2												4		2
Brachylaena huillensis	3			2							1			2					
Brachystegia spi	2																2		
Burkea africana	2																1		2
Cassia abbreviata subsp. abbreviata	1																2		
Combretum constrictum	2																1		2
Combretum molle	6		1	2	2	1			3								6		
Combretum obovatum	3														4		7		3
Combretum schumannii	2																8		2
Combretum ssp.	1			2															
Commiphora africana	2			3				3											
Cordia africana	5								3	1	2	2	1						
Cordia monoica/ovalis	2					1		2											
Croton megalocarpus	9	4	1	2	3	1	2		2	1			1						
Croton macrostachys	4						1		2		1		2						
Dalbergia melanoxylon	2															3	3		
Dichrostachys cinerea	1																3		
Dodonea angustifolia	1		2																
Dombea rotundifolia	1				2														
Erythrina abyssinica	3					4			2										1
Entada abyssinica	1																		2
Euclea divinorum	1								2										
Euphorbia tirucalli	9	7	5	7	5	5			4						5	8			2
Ficus sycomorus	2				2				2										
Ficus thonningii	3					1			2							2			
Gnidia latifolia	4		2			2													
Hagenia abyssinica	1										1								
Kigelia africana	2											1	1						
Lannea schimperi	1				2														
Lannea schweinfurthii var. stuhlmannii	1																2		
Maerua angolensis	2																1		1
Maesopsis eminii	1				2														
Manilkara mochisia	1				2														
Markhamia obtusifolia	1																4		
Olea capensis subsp. welwitschii	1											2							
Pericopsis angolensis	1																1		
Phoenix reclinata	1											2							
Brachystegia spiciformis	2																2		
Rauvolfia caffra	2								5				2						
Ricinus communis	3							2									2		4
Securidaca longipedunculata	1																1		
Senna bicapsularis	1		2																
Senna didymobotrya	2		2		1														
Senna singueana	1		2																
Sesbania sesban	3							7	5		2								
Synadenium compactum	1					1													
Tarenna graveolens	1				1														
Terminalia brownii	5		3	2	2				2				1						
Terminalia orbicularis	1		1																
Terminalia sericea	2																5		3
Trichilea emetica	1											1							
Turraea robusta	1					1													
Zanthoxylum/Fagara chalybeum	1	1																	
Zanthoxylum/Fagara merkeri	1																6		

Legend:

* ☐ = not on the resp. farm; ▒ = not in the resp. zone/country; **1** = 1; **2** = 2-4; **3** = 5-7; **4** = 8-10; **5** = 11-20; **6** = 21-35; **7** = 35-50; **8** = >50<100; **9** = >100**; x** = dried-up; **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA

5.2.1.1.4 Exotic non-fruit trees/shrubs

> "Twenty two species and provenances were introduced in 1996 […] for evaluation in Shinyanga."
>
> OTSYINA et al. on exotic tree species introduction in the frame of the *Agroforestry Research Project* in Shinyanga Region, Tanzania (1998: 25).

In total, 41 different exotic non-fruit tree species have been identified, 24 species in Kenya and 39 in Tanzania. The species diversity with regard to the AEZ is the same in both zones (33); this is also reflected on the farm level. Interestingly, the relation between LPAs and H/MPAs is the same (16:29) as well (see Tab. 16).

Fig. 37: *Grevillea robusta* planted on the ridge of *fanya-juu* terraces on farm 1K-I

The most important tree besides *Azadiracta indica* (found on 12 farms) is *Grevillea robusta*[66] (found on 13 farms; see also Fig. 37) which can be seen also on the high number of individuals; however, this tree only occurs on one farm in the HASHI-ICRAF project area. According to HUXLEY (1999: 133) this tree is well adapted to a wide range of eco-zones, and is now widely spread throughout the tropics.

- In total **41** different **exotic non-fruit trees/shrub species** have been found. The species diversity with regard to the AEZ is the same in both zones (**33**); also the relation between LPAs and H/MPAs is the same (**16:29**). A higher number of species and thus a higher variety has been identified on the farms in Tanzania (**39:24**).

  The most important trees are *Grevillea robusta* and *Azadiracta indica*.

Problems related to the introduction of exotic trees have been outlined in chapter 7.1.3.

[66] This tree has ‚proteoid roots' which have been shown recently that they exude citrate and successfully mobilise normally inaccessible soil phosphorus (HUXLEY 1999: 185).

Tab. 16: Exotic non-fruit trees/shrubs

Exotic non-fruit trees/shrubs*	Sp. No. per farm	1K-l	2K-l	3K-l	1K-m	2K-m	3K-m	1T-l	2T-l	3T-l	1T-h	2T-h	3T-h	4T-l	5T-l	6T-l	4T-m	5T-m	6T-m
Species number in total	41	5	6	1	1	6	9	1	17	6	1	8	1	1	7	8	5	6	5
Acacia augustissima	1													6					
Acacia mearnsii	1						4												
Agave sisalana	9	7	7	3	4	4	5	8							6				8
Albizia lebbeck	1													2					
Araucaria cunninghamiana	1												1						
Araucaria heterophylla	1												1						
Azadiracta indica	1		1	2	4		1		2		1			6	4	2	1	5	2
Bauhinia variegata	3				2			2					1						
Bougainvillea glabra	8			2				1	2		2	2		1		1		9	
Caesalpinia decapetala	1								2										
Callistemon citrinus var. splendens	2											1	1						
Calliandra calothyrsus	6							7	5	1	7	2	8						
Casuarina equisetifolia	3		1					2			2								
Catharanthus roseus	2						5				4								
Cupressus lusitanica	3				2		3						2						
Delonix regia	2										1					2			
Eucalyptus ssp. **	6	4			8	3	8	3	3										
Euphorbia cotinifolia	1			2															
Flemingia macrophylla	4								4		7	6	8						
Ficus benjamina	4	1		1					2				2						
Gliricidia sepium	3								4					5		5			
Gmelina arborea	2																4		2
Grevillea robusta	1	8	7	7	8	2	5	7	4	4	7	2	8					7	
Hibiscus rosa-sinensis	3								7		2		2						
Ipomea arborescens	1								2										
Jacaranda mimosifolia	1			2															
Lantana camara	6		4	5		1	7			4	2								
Leucaena diversifolia	4													8	8	8		5	
Leucaena leucocephala	7				5				4	2	7		8				2		8
Leucaena palida	3													8	8	8			
Manihot glaziovii	9	4		2	3	3	3		3					3	6	2			
Melia azedarach	3																2	7	8
Moringa oleifera	2														1		2		
Nerium oleander	3			5					2									4	
Rosa ssp.	3								2		4		2						
Schinus molle	2				2			3											
Senna siamea	9		2					2	2	1	2	2		3	5	6			
Senna spectabilis	6				5			4	2	4		3	2						
Terminalia mantaly	4			2	1	1							2						
Thevetia thevetioides	2			2										7					
Tithonia diversifolia	2				7							4							

Legend:

* ☐ = not on the resp. farm; ▒ = not in the resp. zone/country; **1** = 1; **2** = 2-4; **3** = 5-7; **4** = 8-10; **5** = 11-20; **6** = 21-35; **7** = 35-50; **8** = >50<100; **9** = >100**; x** = dried-up

** mainly *E. camaldulensis* and *saligna*

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA

5.2.2.2 Distribution and preferences

A contemplation of the distribution of tree/shrub species on different zones in the East-African countries Kenya and Tanzania (see **Tab. 17**) indicates that in total 85 indigenous (19 fruit tree/shrub species, 66 non-fruit tree-/shrub species) and 67 exotic species (26 fruit tree/shrub species, 41 non-fruit tree-/shrub species) occur; thus, in total, 152 different tree/shrub species have been identified.

The number of all species for Kenya and Tanzania is in the relation of 86:127. Due to the variation of the sample sizes of farms in both countries, a comparison on country-level does not give real numbers. However, the number of indigenous fruit tree species (11:12) and exotic fruit tree species (20:22) is almost identical. Within the group of indigenous and exotic non-fruit tree species the numbers are clearly higher in Tanzania (54:33 for indigenous non-fruit trees and 39:23 for exotic non-fruit trees). A comparison on project level reveals that the indigenous fruit and non-fruit tree diversity scores the lowest in the SCAPA-project area, exotic fruit and non-fruit tree diversity scores lowest in HASHI-ICRAF-project area. In total, the farms in the Kenyan project area show the highest species diversity with 10 tree species difference to the lowest scoring project HASHI-ICRAF.

A comparison of AEZ on project level shows that in all LPAs the diversity of indigenous fruit trees is low, the number of indigenous non-fruit trees is the lowest in the HASHI-ICRAF project area, the number of exotic fruit trees is the highest in the Kenyan LPA, the number of exotic non-fruit trees is the highest in the LPA of SCAPA. Concerning the H/MPAs the ranking is the same as outlined above for project level.

As to the AEZs the number of all tree species in total is higher in the H/MPAs (129: 98); the same goes for a comparison on project level. A comparison of indigenous and exotic species indicates that the number of indigenous species is much higher in the H/MPAs (72: 44), whereas the number of exotic tree species in total is only slightly higher (57:54); the number of exotic non-fruit tree species is identical.

The table shows that approximately one third out of all tree species found occur on one farm only (56); this number is more as double as high in the H/MPAs as in the LPAs (38:18). Generally, the number of tree species found one time only is more than three times higher for indigenous tree species than for exotic ones. The difference is extraordinary high in the H/MPAs. Furthermore, only few species occur with a high number of individuals.

On farm level it can also be seen in Tab. 18 that except on four farms (2K-l, 2K-m, 4T-m, 6T-m) the number of exotic species exceeds the one of indigenous species. This indicates the high representation of non-indigenous species at the expense of local trees and shrubs which has to be regarded as a critical factor. Furthermore, Tab. 18 below shows that the highest number of tree/shrub species is found on farm 2T-l, followed by 1K-m and 2K-m.

Tab. 17: Distribution of tree/shrub species concerning agro-ecological zone and country – with regard to species and farms

	Distribution with regard to species groups						
Aspects	indigenous fruit tree species	indigenous non-fruit tree species	indigenous tree species in total	exotic fruit tree species	exotic non-fruit tree species	exotic tree species in total	Total
Number of species	19	66	85	26	41	67	152
LPA - Kenya	3	21	24	15	16	31	55
H/MPA - Kenya	10	22	32	15	29	44	76
Kenya – both zones	11	33	44	19	23	42	86
LPA – SCAPA	2	22	24	9	22	31	55
LPA – HASHI-ICRAF	3	11	14	9	13	22	36
LPA - Tanzania	5	28	33	16	16	32	65
HPA – SCAPA	3	13	16	17	22	39	55
MPA – HASHI-ICRAF	7	25	32	7	10	17	49
H/MPA - Tanzania	8	50	58	20	29	49	107
SCAPA – both zones	5	28	33	19	30	49	82
HASHI-ICRAF – both zones	9	34	43	15	18	33	76
Tanzania – both zones	12	54	66	22	39	61	127
LPA – K + T	8	36	44	21	33	54	98
H/MPA – K + T	17	55	72	24	33	57	129
LPA – number of species only found on one farm	2	8	10	2	6	8	18
H/MPA - number of species only found on one farm	7	26	33	2	3	5	38
Number of species only appearing one time in total	9	34	43	4	9	13	56

Tab. 18: Species numbers on farms

Species number in total on farms[67]	Sp. No. per farm	1K-l	2K-l	3K-l	1K-m	2K-m	3K-m	1T-l	2T-l	3T-l	1T-h	2T-h	3T-h	4T-l	5T-l	6T-l	4T-m	5T-m	6T-m
Species number indigenous fruit trees/shrubs	19	1	0	2	2	8	1	0	2	0	1	0	2	1	1	2	7	0	3
Species number exotic fruit trees/shrubs	26	9	5	8	11	10	13	1	9	4	11	8	12	3	0	7	2	4	5
Species number indigenous non-fruit trees/shrubs	65	9	16	10	13	13	2	10	15	4	6	5	6	3	6	8	23	0	12
Species number exotic non-fruit trees/shrubs	41	5	6	12	12	6	9	10	17	6	13	8	14	10	7	8	5	6	5
Species number in total	151	24	27	32	38	37	25	21	43	14	31	21	34	17	14	25	37	10	25

5.2.1.1 Spatial arrangement

In this chapter the spatial arrangement of trees will be analysed and illustrated. The arrangements also refer to tree-crop interfaces (TCIs) which will be described in detail in chapter 5.2.2.

The spatial arrangement of trees and shrubs can be manifold: one way to categorise agroforestry practices is to indicate whether the woody plants are dispersed/scattered at random on farmland (either protection and management of selected mature

[67] The list of trees/shrubs also includes the naturally growing trees/shrubs on the farms.

trees or planting of new trees) or spaced systematically in a grid; they can also be planted in zones such as rows/lines on farmland, along contours, on soil conservation structures or at farm/field boundaries - e.g. as live-fences and hedges, or grow in (planted) woodlots. Furthermore, trees and shrubs can grow in a big variety of crop-tree-mixtures: they can be intercropped with agricultural crops and/or fodder grasses and/or other trees/shrubs and/or grow on pastures/range land (ROCHELEAU et al. 1988; NAIR 1993; TENGNÄS 1994; BLUME 1997b, 1998; HUXLEY 1999).

Fig. 39 shows that intercropping – trees scattered at random on farmland – is the most common way of tree/shrub arrangement (see also Fig. 38) which was also the outcome of the KWDP project in Kenya (BRADLEY & HUBY 1993: 203), followed by trees along farm/field boundaries (including life-fences) and contours (zonal planting – HUXLEY 1999: 10). Especially in areas with free-grazing livestock (own or neighbours) and wildlife, the establishment of life-fences is highly recommended for the protection of crops and tree seedlings (see also OTSYINA et al. 1998: 35). Tree species used as live-fences are *Agave sisalana*, *Euphorbia tirucalli*, *Bougainvillea glabra*, *Dovyalis caffra*, *Pithecellobium dulce*, *Lantana camara* and *Tithonia diversifolia*. Within the HASHI-ICRAF project area it has been observed that farmers who have limitations on land or who want to secure land rights prefer to establish trees along farm boundaries (OTSYINA et al. 1998: 19). This corresponds with own investigations: farmers asked why they prefer specific spatial arrangements referred to securing of land rights, followed by the aspect of competition between crops and trees on light, water and nutrients and lack of land.

Fig. 38: *Erythrina abyssinica* in combination with contour furrows on farm 2K-m

Hedgerow intercropping or alley cropping is a less common practice, implemented by eight farmers. Interestingly, almost only exotic trees are involved in this system which might be due to the fact that this practice is not an indigenous farming system but has been introduced.

All farmers combine tree plantings with soil conservation structures (see also Fig. 38). This is congruous with TIFFEN et al. (1996: 42) who note: „Research tends to focus on alley cropping, while most farmers prefer to plant trees along boundaries or terrace edges."

Shelter-belts and windbreaks, also a form of a tree-based practice which is, according to the spatial arrangement, woody perennials grown in a zone (in a line to distinguish it from plots or blocks – HUXLEY 1999: 10, 124), have not been found on the farms; of course, 'life'-fences, boundary plantings or alley cropping practices can have the effect of wind protection, but the focus of those zonal plantings lies on other purposes.

Eight farmers (all Kenyan farmers, 1T-l, 6T-m) have established a natural forest and/or a planted woodlot, two farmers (3K-l, 5T-m) have got an orchard (see Tab. 9).

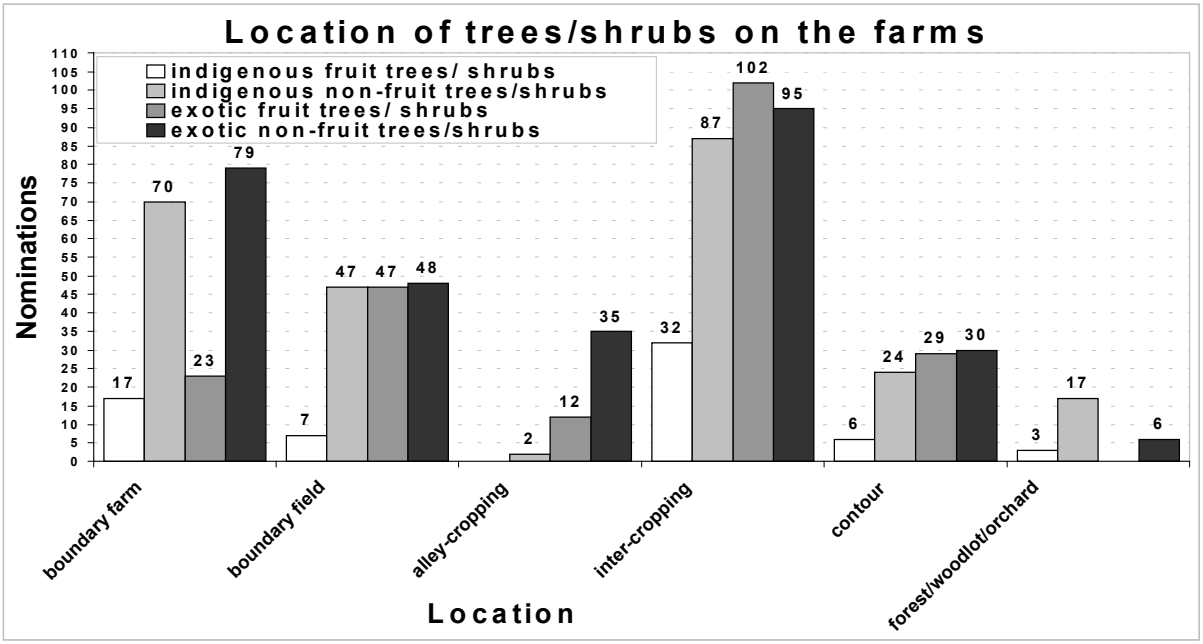


Fig. 39: Location of tree-/shrub species (nominations in absolute numbers) on the farms

5.2.1.4 Use

"All trees are said to be multipurpose; some, however, are more multipurpose than others [...] Simply stated, the term ‚multipurpose' as applied to trees for agroforestry refers to their use for more than one service or production function in an agroforestry system."

P. K. R. NAIR in his book on agroforestry (1993: 172).

"Multipurpose trees (MPTs) are woody perennials (trees, shrubs, woody vines, palms, bamboos) that are purposefully grown to provide more than one significant contribution to the production and/or service functions of the land-use systems they occupy" (HUXLEY 1999: 17; see also OTSYINA et al. 1998: 55). The different purposes of the trees/shrubs found on the farms can be seen in Fig. 40. The main use of indigenous trees/shrubs (nominations counted!) reported by the farmers is firewood, shade and medicine, followed by fodder, ornamental, fruits and mulch, out of which

firewood is the most important factor; concerning exotic trees/shrubs the main use is fruits, firewood and shade, followed by mulch, ornamental and fodder. Concerning indigenous trees/shrubs it can be seen that medicine is an important aspect, fruits and mulch are more important with regard to exotic trees/shrubs. The importance of the medicinal aspect can be elucidated by a quotation of farmer 4T-I: „Miti ni dawa kwa watu na wanyama. Dawa ya asili ni muhimu“ (Trees are medicine for humans and animals. Natural medicine is important). During a survey to identify and prioritise trees used in traditional medicine in Shinyanga Region, Tanzania more than 300 medicinal trees have been identified; this list was narrowed down to 10 Priority Medicinal Trees (PMTs) (OTSYINA et al. 1998: ix; TARDT 2000: 27-28) out of which seven tree species are found on the farms investigated (*Cassia abbreviata*, *Combretum ssp*., *Entada abyssinica*, *Securidaca longipedunculata*, *Terminalia sericea*, *Turraea robusta*, *Zanthoxylum chalybeum*). According to this study out of the exotic tree species identified on the farms only *Azadirachta indica* was highly valued for its medicinal properties (see also OTSYINA et al. 1998: 52).

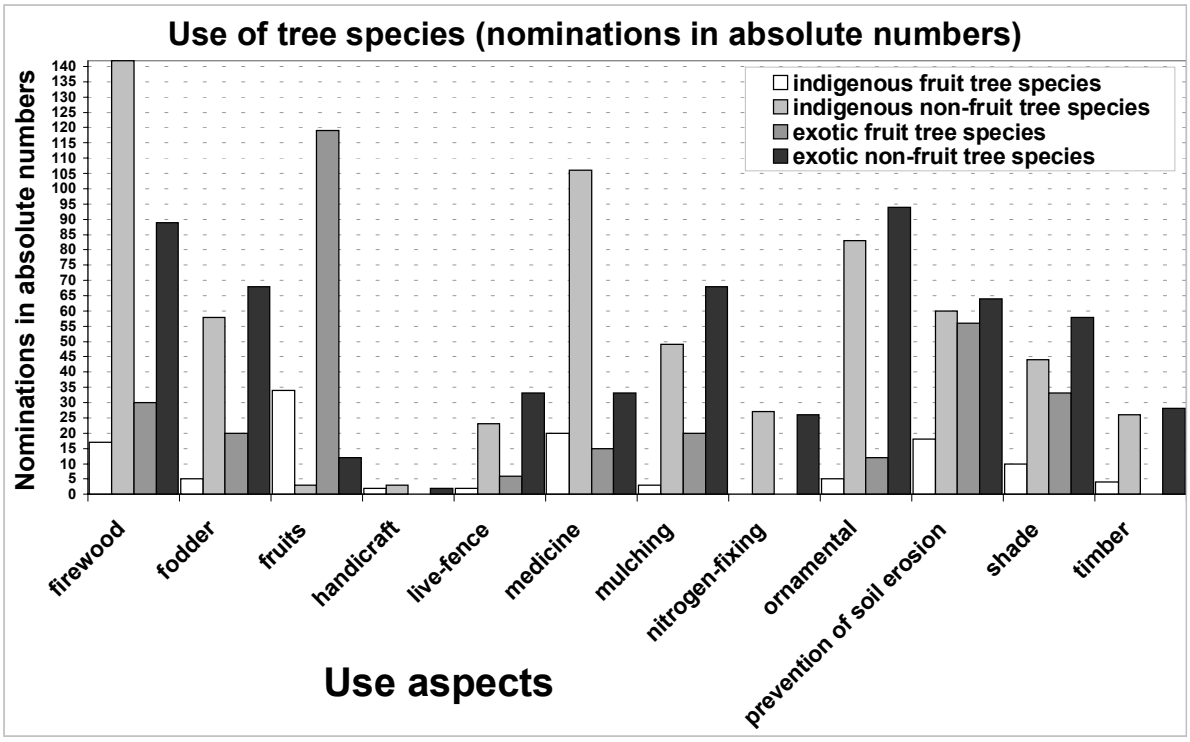


Fig. 40: Use of tree species (nominations in absolute numbers

With regard to all tree/shrub species the most important use aspect named is firewood, followed by shade, fruits, medicine, ornamental and mulch. In a study carried out in Shinyanga Rural District aspects like firewood, medicine, fruits, soil conservation, fodder or timber have been mentioned only by a small percentage of the female respondents (10%); main advantages named were shade, wind-break, boundaries and making cow-sheds. The reason behind is tree *ownership*: as the trees belonged

to the men, women did not bother much about them (SHAO et al. 1992: 127-128). In a study carried out in western Kenya (BUDELMAN 1996: 51) farmers named medicinal use after firewood, timber, handicraft, fruits and shade. Almost all trees/shrubs are used for more than one service or production function (see Fig. 40; see also BUDELMAN 1996: 50).

5.2.1.5 Status

Fig. 41 shows that by far the biggest part of the trees/shrubs is productive bearing, followed by a marginal distance by trees/shrubs in a young non-bearing stage. Only 1/6 are newly planted perennials, overaged trees/shrubs almost do not exist since old trees which become unproductive like e.g. fruit trees are cut and used as fuelwood, timber, and other purposes.

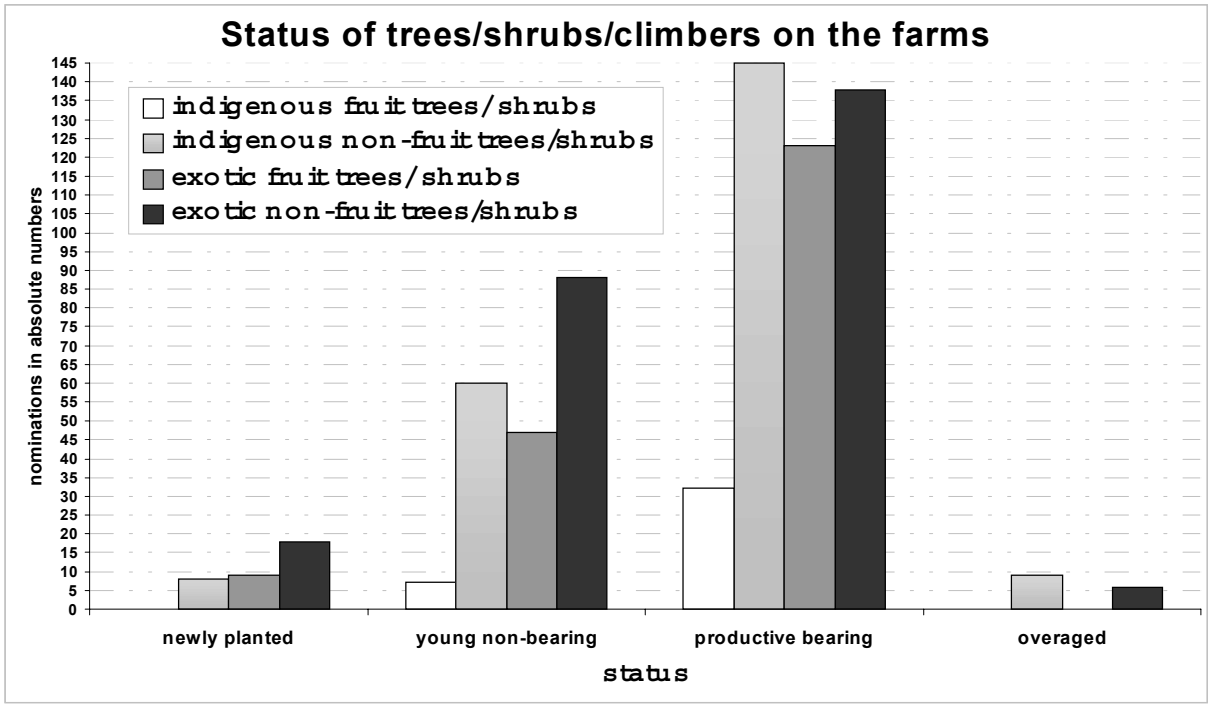


Fig. 41: Status of tree/shrub species planted

5.2.1.6 Tree nurseries

> "The extra effort that is often involved in raising and establishing young trees, especially in drier regions, undoubtedly hinders the adoption of tree-based systems."
>
> P. HUXLEY in his book on tropical agroforestry (1999: 224).

Several studies show that on-farm tree management is still not widely realized, due to different factors: tree management often interfers with other farm activities, especially during the cropping season; furthermore, farmers often lack finances, skills and materials (see e.g. BLUME 1998; see also chapter 9.2.1).

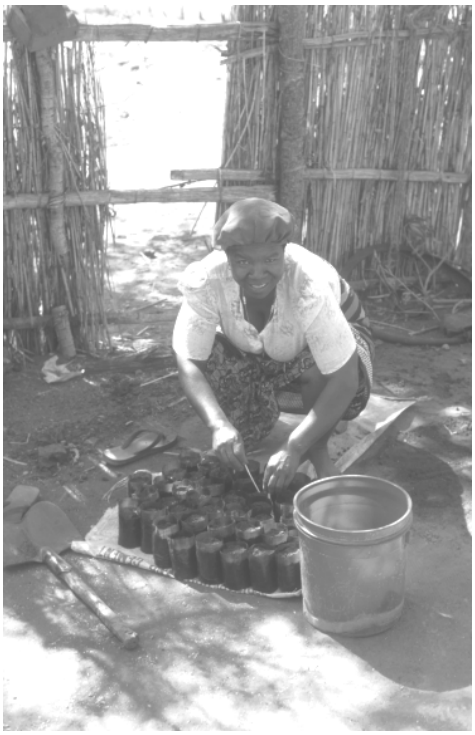


Fig. 42: Farmer 4T-l sowing seeds for raising of tree seedlings on her farm tree nursery

Fig. 43: Tree nursery of women's group 1K-l

Nine farmers tend own tree nurseries (see also Fig. 42), three farmers will start tree nurseries soon (group and on-farm). Interestingly, all nine farmers which raise tree seedlings on their own farm (farmer 4T-m has no seedlings in the moment since the last ones dried up) are also engaged in group tree nurseries (see also Fig. 43 and 44). In the MPA of HASHI-ICRAF, all farmers are engaged in on-farm as well as in group nurseries. The size of the on-farm tree nurseries varies a lot: some farmers only raise few seedlings for their own need, others like farmers 1K-m or 1T-h tend huge tree nurseries for income-generation. Five farmers are only engaged in group tree nurseries[68] (see Tab. 19).

One problem stated by the women was the availability of some indigenous tree seedlings; the availability of common tree seedlings was said not to be a problem since the projects provide at least seeds and, if available, seedlings (600 seedlings from HASHI cost 5.000 Tsh).

Further problems and constraints stated – especially concerning the group managed tree nurseries – were pests and diseases (esp. 2K-l, 2K-m, 3K-m), drought (all farmers in the LPAs), no plant containers for seedlings (esp. 1K-m, 3K-m)[69], no transport (esp. 2K-m), no market for grafted species because the people do not want to pay more money for these seedlings (2K-m), salty water - salty groundwater (2K-l), loan (4T-m – when seedlings dry up like happened that year, the group has no income but still must pay back the credit), not enough time (esp. 2K-l, 1K-m, 2K-m, 3K-m, 1T-h, 2T-l), lack of finances for buying inputs such as pesticides, fertilisers, etc. (see also HUXLEY 1999: 224-225). A survey on tree nursery

[68] The son of farmer 3K-m tends a tree nursery with approx. 160 trees, a.o. avocado, kei-apple, passion fruit, peach.

[69] The cheapest form of plant containers are polyethylene tubes or 'sleeves' which have been introduced in the 1950s and are still widely being used (HUXLEY 1999: 228).

establishment on farms in the frame of KWDP showed that the main reason given was lack of time (BRADLEY & HUBY 1993: 130).

Fig. 44: Women's group in their tree nursery in Kauti, Kenya

A serious threat to young seedlings, whether still in the nursery or planted out in the field, on farm (boundaries), etc. is free-grazing livestock as has been claimed by different farmers (4T-l, 2K-l). Tree protection either through individual protection systems like putting (thorny)twigs around the seedling or implementing live-fences around farm plots are needed, but need labour input (see also HUXLEY 1999: 235).

Tab. 19: Aspects linked to tree nurseries

	Farmers																	
Aspects linked to tree nurseries	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
On-farm tree nursery	●	X	●	X		X	●	X		X			X			X	X	X
Group tree nursery		X	X	X	X	X	X	X	X	X			X		X	X	X	X

Legend:

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; ☐ = not on resp. farm
* = female-headed household; ● = planned (had before)

Tree species preferred have been listed in Tab. 20 below. Preferred species are exotic species like the non-fruit trees *Grevillea robusta* and *Leucaena ssp.* and exotic fruit trees like avocado, lemon, orange, papaya and passion fruit. No indigenous fruit trees are raised. Farmer 1T-h has the highest variety of (indigenous) species, among the on-farm- as well as among the group tree nurseries. In the Kenyan tree nurseries no indigenous tree species are raised.

Some farmers like 3K-l and groups (2K-m, 1T-h) are engaged in grafting fruit trees such as mangoes or avocados. According to farmers 2K-m and 3K-m there is a high demand especially for grafted fruit trees due to higher yields, faster and more stable growth. Farmer 4T-l is especially interested in planting fodder trees; this interest has also to be seen in the light that fodder tree promotion is a special interest of the HASHI-ICRAF-project.

Tab. 20: Tree/shrub species raised in (on-farm) tree nurseries

Tree/shrub species	Farmers																	
	1K-l	2K-l	3K-l[1]	1K-m	2K-m*	3K-m*	1T-l*[1]	2T-l	3T-l*	1T-h	2T-h*	3T-h	4T-l*	5T-l	6T-l	4T-m	5T-m*	6T-m*
Fruit trees																		
Avocado		x		x		x				x								
Avocado (grafted)					x				x									
Banana										x								
Coffee										x								
Guava		x		x					x	x							x	x
Lemon		x							x	x								
Lemon grafted to oranges		x																
Key-apple		x				x				x								
Mango			x											x				x
Mango (grafted)					x													
Orange				x					x	x							x	x
Papaya		x		x					x								x	x
Papaya (grafted)					x													
Passion fruit				x		x												
Peach						x												
Pithecellobium dulce																	x	
Tamarind										x								
Tree tomato										x								
Non-fruit trees																		
Acacia angustissima													x			x		
Acacia crassicarpa																x		
Acacia mellifera																		x
Acacia ssp.														x	x			
Albizia schimperiana								x		x								
Albizia ssp.																x		
Bougainvillea glabra								x		x							x	
Burkea africana																		x
Calliandra calothyrsus								x		x								
Catharanthus roseus										x								
Combretum constrictum																		x
Cordia africana										x								
Cypress				x													x	
Eucalyptus ssp.				x	x													
Flemingia macrophylla										x								
Gliricidia sepium								x					x	x	x			
Gmelina arborea																x		
Grevillea robusta			x	x	x	x	x	x									x	
Lannea stuhlmannii																		x
Leucaena ssp.		x		x				x		x			x		x			
Melia azedarach																x		
Neem				x										x	x	x	x	
Ornamentals (except *Bougainvillea*)								x									x	
Rauvolfia caffra								x										
Senna spectabilis				x										x	x			
Sesbania sesban							x	x		x								
Terminalia catappa																	x	
Terminalia sericea																		x
Trees for firewood, timber, medicine																	x	x

Legend:

[1] planned, newly started; **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; ☐ = not on resp. farm; ▒ = not in the resp. zone/country; * = female-headed household

5.2.1.7 Future tree plantings and management

"Miti ni uhai" (Trees are life).

Farmer 3T-h and motto of a school in Ufala, Shinyanga District, Tanzania).

All farmers want to plant more trees on their farms (farmer 2K-l has already prepared several planting holes). The purposes differ, however, all farmers want to plant trees for firewood. 3T-h said: "What if my car brakes? Then I am in big trouble. That's why I need to have firewood on my own shamba."

Grevillea robusta is an important tree for firewood or timber and has been mentioned by eight farmers. Additionally, the farmers in the LPAs in Kenya as well as farmers 2T-l, 3K-m, 1T-h and 2T-h want to plant fruit trees. The farmers in the HASHI-ICRAF project area who keep livestock prefer fodder tree species. Furthermore, different multi-purpose trees have been named. The trees will mainly be planted in combination with physical soil and water conservation measures.

Asked whether they prefer exotic or indigenous trees/shrubs farmers 3K-m and 1T-h said that they prefer exotic trees because they grow faster. Farmer 2T-h stressed that she prefers indigenous trees; asked why she said: „They are very important, and they are even stronger than exotic trees like Grevillea. Exotic trees fall down if there is strong wind." The other farmers said to like both exotic and local trees as they serve different purposes and needs. Farmer 3T-l said that she likes *Senna spectabilis* since this tree grows very quick.

Farmer 1T-h prefers exotic species, although living close to a natural forest, thus, in an area where the natural potential is still relatively high; this shows the dominance of other factors on species preferences like population pressure, necessitating the intensification of farm management, or historical and current extern impacts like introduction of exotics by colonialists or development aid projects. To the opposite, farmer 5T-m fears that natural trees grow too big and that they might interfere with the neighbours. She lives in an area where the natural potential is already very low. This fact is also likely to support negative beliefs/biases concerning indigenous tree species.

With regard to tree seedlings for tree nurseries different species are preferred for firewood (mainly *Grevillea robusta*), fruit production (new species introduced by farmer 1K-l will be grapefruit, *Diospyros fischeri* – African ebony by farmer 6T-m), especially grafted fruit trees, but also multi-purpose trees such as *Leucaena l.* or neem. The projects should put emphasis on the propagation and spreading of indigenous (fruit)tree species.

5.2.2 Tree-annual plant management → tree-crop interfaces

> "The impact of TCIs on the system as a whole will depend both on the extent and degree of the environmental interactions that occur, as well as the extent and number of different TCIs present."
>
> P. HUXLEY in his book on tropical agroforestry (1999: 122).

An important agroforestry practice is to grow trees and shrubs in a big variety of crop-tree-mixtures. The different measures are described in the following chapters. All measures are listed in Fig. 62.

5.2.2.1 Intercropping

> "[…] Traditional intercropping systems consist of growing agricultural crops under scattered or systematically-planted trees on farmlands, the former being far more extensive and common under smallholder farming conditions"
>
> P. K. NAIR in his book on agroforestry (1993: 146).

Fig. 45: Intercropping of bananas and (mango)trees between millet on a farm near Kisumu, western Kenya

Intercropping refers to the horizontal dimension within the spatial scale (see Fig. 45). Planting e.g. maize and beans in alternating rows, intercropped with coffee, bananas and multi-purpose trees, is a common *agroforestry* practice (ROCHELEAU et al. 1988: 17; THOMAS 1997: 47; NAIR 1993: 156). Beneficial effects from single, scattered trees are well documented, e.g. trees planted in managed grass/legume swards may help to increase nodulation and nitrogen fixation in the legumes (HUXLEY 1999. 44). Studies on e.g. *Acacia tortilis* and *Adansonia digitata* have shown that even scattered (mature) trees significantly enrich the topsoil with nutrients (ibid.: 272). On the other hand, partly severe reductions of crop yields due to competition have been observed in on-farm trials within HASHI-ICRAF project (OTSYINA et al. 1998: 11, 14).

Intercropping is practised by all farmers. NAIR (1993: 147, 150) summarises: "A large part of the agricultural landscape under subsistence farming conditions in the tropics (as in Africa), is characterized by dispersed trees. [...] Intercropping under scattered

trees is the simplest and most popular form of agroforestry. It has been, since time immemorial, an essential type of smallholder farming, and it will continue to be so. There is a great need and opportunity for increasing the productivity of these widespread practices."

5.2.2.2 Hedgerow intercropping/alley cropping

> "Alley cropping entails growing food crops between hedgerows of planted shrubs and trees, preferably leguminous species."
>
> P. K. NAIR in his book on agroforestry (1993: 123).

Hedgerow intercropping (alley cropping) defines arranging coppiced/pruned trees in lines on farmland. It can be utilised for different purposes like fodder production, soil fertility improvement (alley cropping) and providing a live barrier against soil and water erosion, then called barrier planting/hedges or 'sloping agricultural land technology' (SALT) (ROCHELEAU et al. 1988: 17, 92-103; NAIR 1993: 123-139; Young 1995: 45; HUXLEY 1999: 12-13, 59; see also Fig. 46). This practice, e.g. integrating tree species like *Leucaena ssp*., *Gliricidia sepium, Grevillea robusta*, *Flemingia macrophylla* or *Tithonia diversifolia*, has been found on eight farms (2T-l, 4T-l, 5T-l, 6T-l, 1K-m, 3K-m, 1T-h, 3T-h). In general, alley cropping is of marginal interest to the farmers. This practice has been found only on farm 1T-h to a big extent as the land is small and steep, and animal fodder is needed. For them, the farmer said, hedgerow intercropping along the contour is a satisfying method, absolutely fulfilling their demands. After HUXLEY (1999: 34, 280), current evaluations have shown that alley cropping is not as promising for soil improvement as thought first. Furthermore, farmers claimed lack of land as one constraint besides lack of knowledge about this technology (see also WILLIAMS 1996: 6).

Fig. 46: Alley cropping of *Leucaena l.* on a farm in a LPA, western Kenya

5.2.2.3 Multistorey cropping → homegardens

> "In a home garden, where 'verticality' is being fully exploited, all the plants are usually mixed and scattered, each occupying its own niche […]."
>
> P. HUXLEY in his book on tropical agroforestry (1999: 12).

Multistorey cropping, also referred to as multistorey homegardens (see Fig. 47) refers to the vertical dimension within the spatial scale. It is practised by eight farmers (1K-l, 1K-m, 2K-m, 2T-l, 1T-h, 2T-h, 3T-h, 6T-l) (see Fig. 62).

The farmers support general findings that homegardens are sustainable. They said that the intense mixture of crops and trees (and animals) provides them with all the necessary products 'just around the corner'. Thus, viable time can be saved and used for other purposes.

Fig. 47: Homegardens like on Mt. Meru, Northern Tanzania, involve multistorey cropping of a big variety of woody and annual plants

The findings of this study underline the quotation of NAIR (1993: 147) that "[...] as the rainfall in a given region increases, the species diversity and system complexity increases. Thus, we find a proliferation of more diversed multistoried homegardens in the humid areas and less diverse, two-tiered canopy configurations (trees + crop) in drier areas."

5.2.2.4 Woodlots, orchards and natural forests

Generally, especially tree management practices like the establishment of wooded areas are directly linked to the farm land available: only when areas expand beyond a certain threshold land is commonly allocated to woodlots, bush or orchards (see also CROWLEY et al. 1996: 14). Eight farmers (all Kenyan farmers, 1T-l, 6T-m) have established a natural forest (see also Fig. 48) and/or planted a woodlot (this aspect is not illustrated in Fig. 62 but can be looked up in Tab. 9). Only exotic trees/shrubs are planted in woodlots.

Furthermore, two farmers (3K-l, 5T-m) have established orchards, mainly for fruits. The orchard of farmer 3K-l consists of in total eight different mango tree species. Fruits are produced for the international and national market. Farmer 5T-l tends an orchard with various fruit tree species like papaya, banana, orange, citrus. Both farmers only crop exotic species. Farmer 6T-l had an orchard of various fruit trees (orange, citrus, papaya, banana, coconut, grenadine) but they died in 1998 due to a drought.

Fig. 48: Natural forest on a farm in Kahama District, western Tanzania mainly for medicinal purposes

Many woodlands, depending on the site, have achieved a balance of nutrient inputs and outputs over time and thus contain a relatively abundant store of nutrients in the system (HUXLEY 1999: 267).

Also joint activities for forest implementation have been observed, especially in the HASHI-ICRAF project area (see also Fig. 49): in Ufala village, a 6,5 acre piece of degraded land has been set aside by a school which shall function as forest reserve with special emphasis on the medicinal purpose of trees and shrubs. The pupils together with the teachers have e.g. collected seeds from the nearby forests, raised seedlings and planted them on parts of the land to support the natural tree re-growth (the soil is very sandy and exposed to erosion and drought).[70]

Fig. 49: Newly established school forest on degraded land in Ufala, Shinyanga District, western Tanzania

[70] A school in Nyambula, 8 km west of Kahama in Kahama District, Shinyanga Region, Tanzania has set aside 0,5 ha for tree plantings which started in February 1999 under support of the CCM. Furthermore, the school has got 4 ha of natural forest. Another village near Kahama (Mwendakulima) has a communal forest of 105 ha, consisting of *Brachystegia* woodland.

5.2.2.5 'Bush fallow' and rotational woodlots (*ngitiri*)

"The rotational woodlot is a technology, which emphasizes planting of trees in crop associations to promote tree survival and reduced labor for tending and tree management. At the same time farmers continue to benefit from yields obtained from the associated crop in the first phase."

The Tanzania Agroforestry Research and Dissemination Team (TARDT) in the frame of their evaluation on agroforestry research and development in Tanzania (2000: 267).

These practices – also referred to as 'in-situ regeneration systems' (SHAO et al. 1992: 165) – have to be distinguished from simultaneous practices where various crop-tree combinations are grown during a single cropping season (HUXLEY 1999: 10).

Fig. 50: Fallow strips of natural forest on farm 1K-l

Three Kenyan farmers (1K-l, 2K-m and 3K-m) practise 'bush fallow' on some parts of their farm (see Fig. 50).[71] After HUXLEY (1999: 10), usually some form of continuous rather than intermittent land occupancy is desirable if soil erosion is not to occur.

Improved fallow, thus integrating woody (or herbaceous) species with nitrogen-fixing potential and/or economic value (e.g. *Leucaena ssp*., *Crotolaria*, pigeon peas, *Gliricidia s*., *Tithonia t*., *Sesbania s*. or several *Acacia* species), has not been observed, although this practice is a sustainable and profitable technology because it is labour- and land-saving, shown by many experiments (ROCHELEAU et al. 1988: 16, 114-122; CROWLEY et al. 1996: 2; HUXLEY 1999: 268; LODOEN 1999: 22-23; PENDER et al. 2001: 118; see also chapter 5.2.5). TARDT (2000: 19) note that herbaceous legumes could significantly reduce the cost of production and increase the value of fallows which is especially important for resource poor farmers. Research on improved fallows of *Sesbania sesban* and *Tephrosia vogelii* in Tabora Region, Tanzania, and improved fallows of *Sesbania sesban* and *Ca-*

[71] ROCHELEAU et al.(1988: 115). write: „However, fallowing is also practiced in the subhumid miombo woodlands of Southern Africa and the dry savannahs and highlands of East Africa. In many cases, the fallow period presents an opportunity to produce useful goods with a minimum of labour. OTSYINA et al. (1997a: 4), however, note: „The traditional shifting cultivation system, with long fallow periods, was practiced by the Sukuma by the turn of the century. [...] Recent observations show increasing trends towards permanent cultivation in most parts of the region."

janus cajan in Shinyanga Region have shown to significantly improve maize yields due to its influence on the soil nutrient status and the water holding capacity; these effects are especially important on sandy soils. (OTSYINA et al. 1997b: 51, 1998: ix).

All farms in SCAPA and HASHI-ICRAF project areas practise permanent cultivation only (reasons mentioned were lack of land and of knowledge about this technology), except farmer 6T-m whose family has established a rotational woodlot on the farmland (see also Fig. 51). This system, also known as *ngitiri*, is deeply rooted in the traditional land-use practices of the Sukuma in Shinyanga Region, Tanzania: "The fact that individual and communal reserve areas "ngitiri" – to be used for fuelwood and livestock grazing – still exist adds weight to the preposition that a well-established management system existed" (SHISCAP 1992: 2). HASHI-ICRAF is highly engaged in the support of a revival of this traditional system (see e.g. HATIBU & MTENGA 1996: 29). OTSYINA et al. (1997: 16, 36) mention: "Rotational woodlot systems, which integrate crop production, fodder, fuelwood and eventual soil fertility restoration are becoming more and more popular in Shinyanga. [...] The rotational woodlot system has shown good promise and potential in alleviating the problems of fuelwood, fodder and soil fertility in Shinyanga region." Rotational woodlots are a low input and cost effective agroforestry technology and are characterized by three distinct phases: establishment, fallow and cropping (OTSYINA et al. 1997a: 30; 1998: 14). This technology integrates fodder and crop production systems. During the fallow period fodder production and tree development are possible simultaneously (ibid. 33; TARDT 200: 4-5). The authors only refer to established RW's with exotic trees. However, the ones observed during the field research were established through natural tree regeneration.

Fig. 51: Two years old individual rotational woodlot in Kahama District, western Tanzania, protected by a signboard, saying the owner's name and that neither cutting nor burning is allowed

In the following, two examples of individual/farm, and communal rotational woodlots resp. *ngitiri*-systems shall be given.[72]

[72] In the past, *ngitiri* was meant for livestock pasture, but due to environmental degradation this system is nowadays also for provision of fuelwood (SHAO et al. 1992: 165).

In Kahama District, Shinyanga Region, rotational woodlots, set aside by families, have been observed: A farmer couple has established a family-owned rotational woodlot of 7 acre. This woodlot (natural forest) is kept for 5 years out of any use (signboard!), then the farmer cuts some trees for firewood, etc. and establishes another plot. He wants to practise bee-keeping. His wife uses secondary forest products such as mushrooms.

Farmer 6T-m has set aside 2 acre as a rotational woodlot too, for the purpose of woodfuel, seedlings and secondary forest products like medicine, small animals, etc.

Fig. 52: Village environmental committee; in the background an area under protection as to the traditional *ngitiri* in Ufala, western Tanzania

In Ufala, a village situated approx. 7 km south of Kahama in Kahama District, Shinyanga Region, Tanzania the villagers have revived the traditional communal *ngitiri* system (see Fig. 52), especially for the management of forest resources since the availability of firewood and other forest resources forms a serious problem in the region, but for a grazing area, too. For this reason, the village government together with the Village Environmental Committee (VEC), consisting of 18 members (5 women) which has been established under the advice of HASHI, decided to set aside 15 acres as village reserve. For 5 years no permission is given for cutting trees, making fire or graze cattle in this area to allow the young trees to re-grow (at the time of the visit this area was under protection since two years). Signboards in Kiswahili have been erected at the two main entering points of the reserve (no cutting of trees, no fire, no grazing). After five years the reserve will be divided into two sections. One section will be closed for any use, while in the other section, the villagers will be allowed restricted cutting of firewood, grazing and collection of secondary forest products like plants and parts of trees (leaves, bark, etc.) for medicinal purposes, fruits, mushrooms, little animals, etc. from December till the end of July. Between August and November any use is prohibited. After a certain period of time – depending on the intensity of use – this section will be closed for any use and the other one will be opened. For a fee, people from nearby villages will be allowed to cut firewood, collect secondary forest products and graze their cattle (see also SHAO et al. 1992, OTSYINA et al. 1998, TARDT 2000).

Members of the VEC and the village government, together with traditional committees like the village elders (village security committee under the supervision of the *sungusungu* - the traditional military force) and the *wasalaama* (local village guards) supervise the following of the bylaw. In case of trespassing a fine (money or animals) will have to be paid depending on kind and intensity of destruction.

This community-based, indigenous land tenure and resource management system, under the management of local organisations, provides the farmers with adequate security while being sustainable and should be strengthened by the government (see also PENDER et al. 2001: 119). TARDT (2000: 9) mention that meanwhile, policy-makers show "[…] great interest in rotational woodlots and are looking for ways in which they can work with researchers to promote wider adoption of the woodlot technology."

Like the allocation of land to bush or permanent woodlots the implementation of these practices is linked to the farm sizes: the bigger the farm area the more likely farmers establish one of these technologies as it is required that other portions of land are available for food production for a certain period of time (see also CROWLEY et al. 1996: 14, 16).

5.2.2.6 Natural tree regeneration on fields

> "Knowledge of species, in particular, is the basis for improvement, for example, through natural regeneration and management; not substitution, for example, through exotic tree planting."
>
> E. G. C. BARROW in his book on local participation in tree management in the drylands of Africa (1996: 234).

Also ROCHELEAU et al. (1988: 78) regard natural tree regeneration as a valuable method: "In the Sahel and East Africa, trees in cropland originate mainly from natural regeneration or from seedlings. [...] Where natural regeneration occurs, it may not be necessary to plant seedlings."

After ROCHELEAU et al. (1988: 78) long-term research has shown that the protection of young natural stands of *Acacia albida* and *A. senegal* is better than planting nursery stock. Yield improvement of crops has not only been reported for these trees, which occur naturally on farms in the LPAs (HUXLEY 1996: xvi) but for *Borassus aethiopum*, a palm tree found on the farms in the HPAs in Shinyanga Region, Tanzania, too (see ROCHELEAU et al. 1988: 79-80). And HUXLEY (1996: xvi) concludes: "Local communities need technical help finding ecologically sensible ways to encourage natural tree reproduction rather than to be given tree seedlings of species they do not need, which may be ecologically untested, and which may well not survive productively anyway."

Fig. 53: Natural tree regeneration on farm 4T-m; in the middle *Borrassus aethiopum*

Natural tree regeneration, a form of 'in-situ regeneration' (SHAO et al. 1992: 165), is practised on ten farms (1K-l, 2K-l, 1T-l, 2T-l, 4-6T-l, 2K-m, 4T-m, 6T-m) with a higher portion on farms in the low potential areas. The highest variety of tree species and tree density has been found on farm 4T-m (see also Fig. 53).

Projects should put emphasis on an enhanced integration of this technique since it is not only the most cost and labour saving agroforestry strategy with fast regeneration, but additionally relies on and stabilises the natural vegetation potential in the respective area. Furthermore, it is likely that more people participate in this strategy since it is part of land-use systems in many cultures which eases adoption rates and ensures sustainability (see also SHAO et al. 1992: 165).

5.2.2.7 Contour strips

> "The establishment and maintenance of horizontal strips of vegetation on sloping ground is one of the most direct, cost-effective and ecologically sound erosion control-interventions."
>
> D. ROCHELEAU et al in their book on agroforestry in dryland Africa (1988: 26).

After HUXLEY (1999: 55) contour strips have proved to be very successful; the author continues (ibid.): "Stable, long-term and in some cases productive forms of barrier planting on the contour across slopes, using woody plants, can both change the slope ('self-forming terraces') and reduce the flow distance."

The easiest and most cost and labour saving form of a biological conservation technique is contour cultivation (see HUDSON 1984: 104) which is carried out on all eleven farms situated on sloping ground (all Kenyan farms and all farms in the SCAPA project area except 3T-l).

Nine farmers plant crops and/or grasses and/or trees along or in waterlines such as channels, ditches, or rivers) as can be seen in Fig. 54 (all Kenyan farmers, 2T-l, 2T-h, 3T.h).

Furthermore, on all farms where contour cultivation is carried out three different types of contour (vegetation) strips (ROCHELEAU et al. 1988: 84-92; TENGNÄS 1994: 103-105)[73] have been implemented, consisting of a big variety of different woody perennials, crops and grasses (see Fig. 55).[74] On three farms (3K-l, 1T-l, 2K-m) small naturally growing contour grass strips as natural barrier against soil erosion have been found (see also HUXLEY 1999: 56). According to HUXLEY (1999: 57) too little attention has been given so far to finding suitable combinations and appropriate management practices for grasses in smallholder land-use systems.

Fig. 54: Bananas planted in a ditch on a farm in a LPA in western Kenya

Only one farmer (3T-h) uses trash lines (see ROCHELEAU et al. 1988: 128 and Fig. 56). However, advantages are clear: "Though trashlines are not a long term conservation measure, they act as barriers for a few seasons and have the advantage of improving soil fertility after the trash rots" (MOALDM 1998: 3).

The vegetation strips not only indirectly contribute to the betterment of livelihood conditions through reducing soil erosion and by this the productivity of the land, but also directly through increasing soil fertility (nitrogen-fixing plants, litter and mulch, increase and stability of soil humidity), providing fodder (tree leaves, grasses and herbs), firewood, timber, medicine, vegetables, material for handicraft,

Fig. 55: Contour vegetation strips of napier grass and mainly *Grevillea robusta* on farm 3T-h

[73] NILL et al. (1996: 47) refer to them as *buffer-* or *filterstrips*; HUXLEY (1999: 59) refers to *barrier planting*.

[74] During a visit of C-MAD, a project situated in western Kenya, lines of stones/stone walls, partly in combination with different vegetation (mostly grasses) along contours to control soil erosion and storm runoff have been observed on several farms.

Fig. 56: Trash line between rows of maize on a farm in a LPA in western Kenya

etc. The resulting enhancement of the whole farming system – and by this the improvement of the farmer-families' economic situation – positively influences the conservation of natural resources; this again has a positive impact on the farm level and so on. This example shows that each measure and strategy for a sustainable farm management has an impact on the situation in a whole. It also demonstrates the interrelation of different levels; furthermore, it is an encouraging example for the fact that even small changes on the very micro-level have a direct effect on higher levels. That is why even on farms where only few measures are carried out, a decisive betterment of the living situation through an enhanced use of natural resources can be recorded.

However, it has to be reminded that the betterment not only depends on ecological and physical measures in the real meaning of the word, but on socio-cultural, political and 'ideological' criteria like restrictive customs and traditions, education or participation in public decision-making, etc. as well. Since these main categories are closely connected, special attention will be paid to empowerment-related aspects in chapter 6.

5.2.3 Annual plant management → crop-crop interfaces

5.2.3.1 Mixed cropping

> "Cropping practices such as [...] mixed cropping, which improve the density and duration of plant cover, have a major impact in reducing soil and water losses"
>
> D. B. THOMAS in his manual on soil and water conservation in Kenya (1997: 71).

A big variety of mixed cropping patterns and species combinations has been found on the farms (see also Fig. 57 and 58) This practice means growing two or more crop species simultaneously on the same field (THOMAS 1997: 44-45). Ideally, the plant species 'complement' one another in their use of environmental resources (HUXLEY 1999: 121).

Three farmers do not practice mixed cropping but plant their crops on separate fields resp. terraces (1K-l, 3T-l, 3T-h). Six Tanzanian farmers (2T-l, 4T-l, 5T-l, 6T-l, 1T-h, 2T-h) intercrop resp. mix different vegetables like e.g. onions with tomatoes/carrots

/amaranthine/ black nightshade. Farmer 4T-l mixes okras with *Corchorus trilocularis* (and maize).

The most common practice is intercropping of nitrogen-fixing plants and legumes with cereals; commonly found is a mixture of beans and/or cow peas / ground nuts / Bambarra ground nuts with maize and/or different millet species. Also sweet potatoes and cassava are intercropped on some farms (2T-l cultivates sweet potatoes in alternating rows with napier grass and intercrops a variety of different crops) (see Fig. 57).[75] Farmer 4T-l intercrops okras with *Corchorus trilocularis* and maize, farmer 6T-l intercrops maize, groundnuts, green gram, beans and cow peas in rows. On-farm tests on integrated farming systems like polycultures such as cassava-beans-maize, cassava-tomato-maize, and sweet potato-maize by a Cubanian NGO showed that the productivity of these systems were 1.45 to 2.82 times greater than the productivity of monocultures (ALTIERI et al. 2001: 126; see also DE JAEGER 2001: 42). More attention to legumes will be paid in connection with soil fertility improvement in chapter 5.2.4.

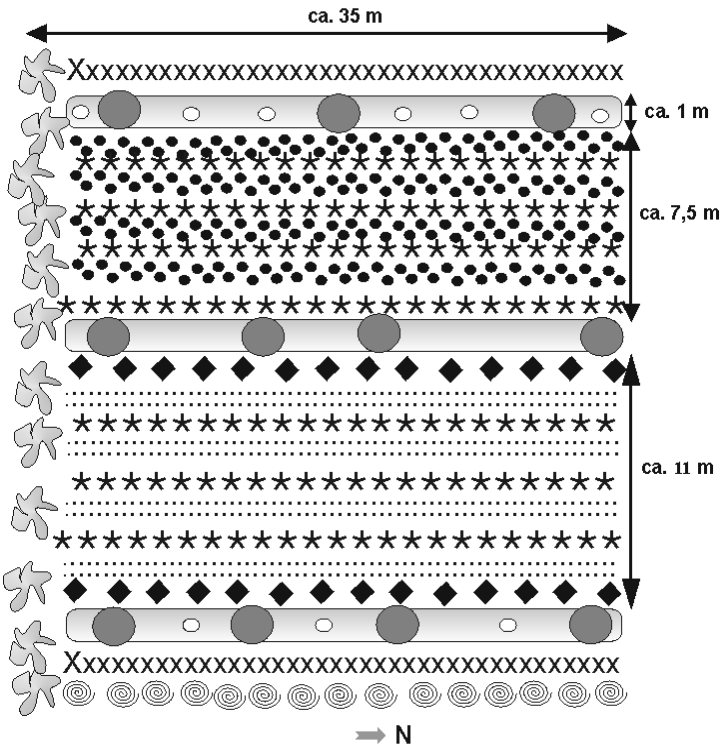


Fig. 57: Mixed cropping pattern on farm 2K-m

Fig. 58: Mixed cropping on a farm in a LPA in western Kenya

[75] „Common examples of intercropping are maize with beans, peas, groundnuts, cow peas, pigeon peas or sweet potatoes; cotton and beans and kales and beans“ (THOMAS 1997: 44). „The main crop grown throughout the districts (in Kenya - note by the author) visited is maize, either as a pure stand or inter-cropped with beans or cowpeas“ (MoALD & M 1998: 7).

Generally, crop diversity helps to reduce risks associated with single crops and promotes household self sufficiency by providing a wider range of goods (see also CROWLEY et al. 1996: 14).

5.2.3.2 Crop rotation

All farmers practise crop rotation, which entails growing different crops in sequence (THOMAS 1997: 44) (see Fig. 62). The main rotation combination found is maize/ millet species after beans/pigeon peas/cow peas/ground nuts due to the fact that the last named species belong to the *Leguminosae* which means they are nitrogen-fixing and enrich the soil with this essential nutrient (FRANKE 1997: 130 ff.).

5.2.3.3 Cultivation on raised beds

Fig. 59: Raised bed cultivation on farm 4T-m

Fig.60: Typical cropping pattern (cassava, ground nuts and sweet potatoes on mixed beds in Kahama district, western Tanzania

Seven farmers (all farmers in the project area of HASHI-ICRAF, 1K-m, 3T-h) cultivate crops and vegetables on raised beds; this practice is the (meanwhile – see chapter 3.3.1) traditional land use technique in the HASHI-ICRAF project area, especially in the HPAs; here, wide areas are dominated by this cropping pattern with high variations of crop mixtures; main crops involved are sweet potatoes, maize, ground nuts, beans, cassava and millet which can be mixed or cropped in rows in different species combinations, always containing a leguminous plant component (see Fig. 59, 60 and 61). The beds are

between 30 – 70 cm high, at the basis they are between 50 and 70 cm wide with a distance of ~ 30 cm between the rows. A related cultivation pattern, but with a strong soil fertilising aspect, exists in the Northern Province of Zambia; this so-called '*fundikila system*' involves the technique of inverting grass turves and laying them over small heaps of plant trash and/or ashes (HUXLEY 1999: 276).

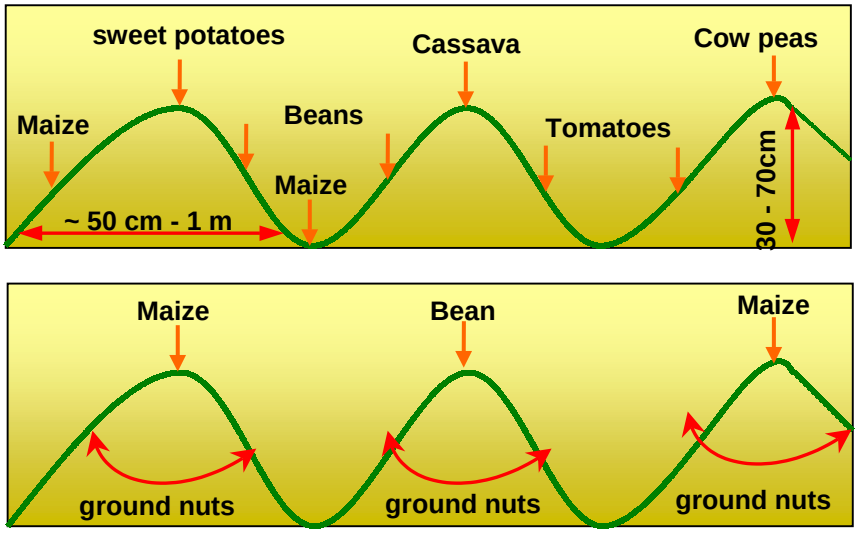


Fig. 61: Two typical cropping patterns on raised beds

All biological soil and water conservation measures carried out on the farms are demonstrated in Fig. 62 below. It can be seen that the most diverse biological measures have been established by farmer 2K-m, the lowest diversity is found on farm 3T-l. Generally, a higher diversity of measures is found on the Kenyan farms.

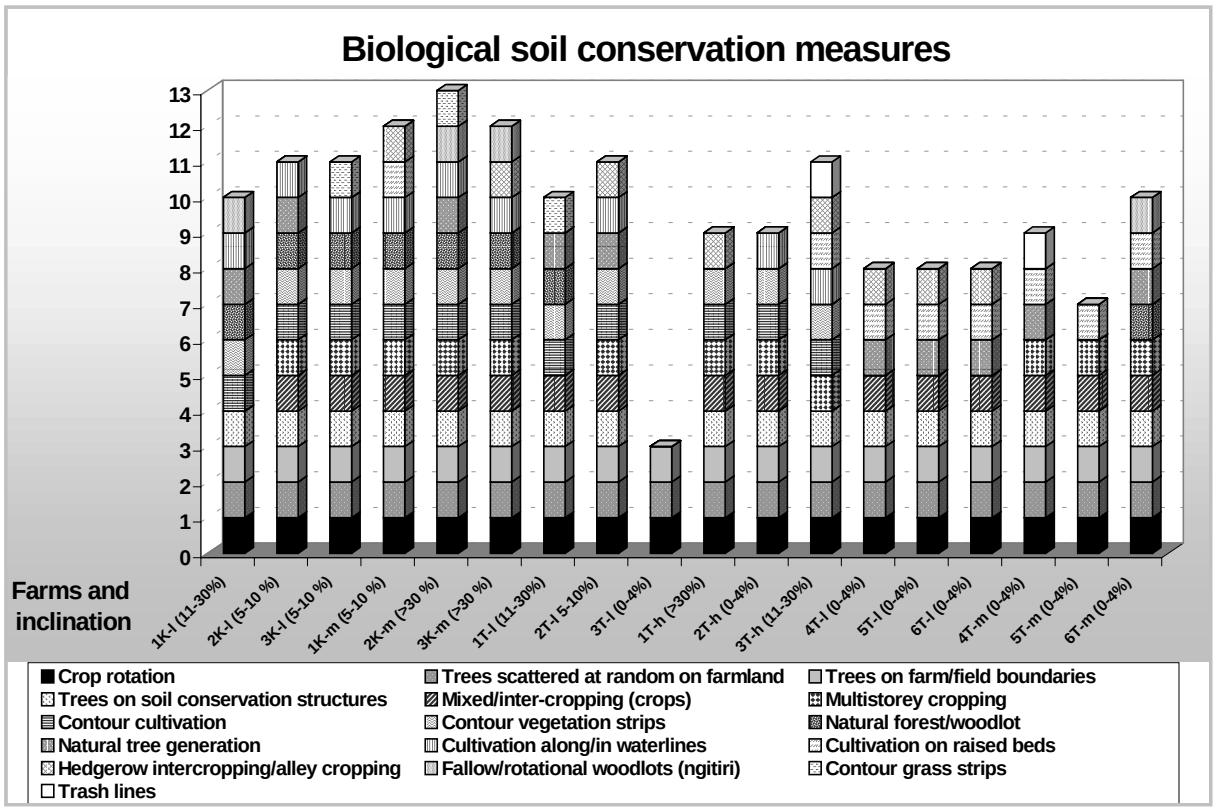


Fig. 62: Biological soil and water conservation measures

5.2.4 Soil fertility improvement

> [Organic farming] "can substitute external (imported) inputs with local ones and with an improved on-farm or local nutrient cycling. Both at the farm level and at the national level OA techniques can contribute to economic viability of agriculture in cases where imported chemicals are not available or affordable."
>
> R. P. WITTE in the frame of a comparison of farm systems (1998: 76).

Depending on plant components, arrangement and management, organic materials are able to maintain or increase available nutrients; at least they can help to diminish nutrient loss (HUXLEY 1999: 278). Fig. 68 shows the different practices for soil fertility improvement. All farmers carry out mulching (see also Fig. 63) with crop residues and leaves (within the project area of HASHI-ICRAF it is a common practice to use groundnut shells and rice chaff), however, to a different extent: seven Tanzanian farmers bring out only little mulch on their fields, mainly because the plant material is needed as fodder. Mulch not only increases soil fertility: HUXLEY (1999: 267) notes: "[…] the *cover* provided by mulch can drastically improve soil and water conservation, and ameliorate soil surface temperatures […]. Mulch residues can also help reduce weed competition […]."

Fig. 63: Mulching on a farm near Thika, Kenya

Good farm planning takes into account the beneficial effects of maintaining a plant cover and tries to avoid long periods of bare ground. Even when plant residues are no longer residing on or in the soil as plant matter (leaves, etc.), the soil organic fractions into which they have been transformed play an essential part in stabilising the soil surface and improving infiltration rates (HUXLEY 1999: 55-56, 58).

Seasonal herbaceous (leguminous) cover crops which might be the most successful method of restoring soil fertility in the topsoil by fixing nitrogen, besides protecting the soil from erosion (HUXLEY 1999: 220), are only common in the SCAPA-project area: three Tanzanian farmers cultivate plants such as e.g. *Desmodium ssp*. for green manuring; farmers 3T-l and 2K-l plough in the residues of beans and cultivate maize afterwards. Farmer 2K-l uses upcoming weeds as natural soil moisture protection.

HASHI-ICRAF carries out research on the herbaceous legumes *Clitoria ternatea*, *Lablab purpureus (Dolichos lablab)* and *Macroptillum atropurperium* and came to encouraging results concerning soil fertility improvement and fodder production (TARDT 2000: 14-19; see also FRANKE 1997: 138, 404). Legumes improve the physical and chemical characteristics of the soil and can effectively brake the cycle of insect-pest infestations (ALTIERI et al. 2001: 126). Generally, the practices of mulching and green-manuring are also effective to preven soil erosion (HUXLEY 1999: 55). More opportunities should be made to incorporate legumes into integrated land use practices (see also ibid.: 220). The application of green manure is also useful to improve the soil fertility in combination with cash crop production; this has been shown for leguminous trees like *Leucaena ssp*. which increased tobacco yields in Tabora Region (OTSYINA et al. 1997b: 67) or *Sesbania sesban* and *Cajanus cajan* which increased cotton yields in Shinyanga Region (both western Tanzania). The results show the advantage of improved fallow species over inorganic fertilisers (OTSYINA et al. 1998: 42).

Except farmer 1T-l and all farmers in the LPA of HASHI-ICRAF all farmers use compost (see also Fig. 64) which is in more or less all cases not stored appropriately (often not in holes, not covered), leading to a high percentage of nutrient loss through leaching.

Fig. 64: Farmer checking status of decomposition in his compost, western Kenya

All farmers who practise composting also recycle the ash from the stoves by mixing it with the compost.[76]

Especially farmers in densely populated areas like on the slopes of Mt. Meru effectively use manure from livestock for soil fertility improvement (see also Fig. 65). All farmers use farm yard manure which is just piled up and thus exposed to a high rate of leaching. Farmer 4T-m collects manure from free grazing cows and mixes it directly with the soil; the amount, however, is not too high).[77] HUXLEY (1999: 41) men-

[76] A common way to receive organic fertiliser in the areas where (partly) free grazing is practised is to keep the livestock in a pen without roof during the night where they stand on a bed of litter formed from grass, weeds, leaves, maize stalks, banana stem residues, etc. The plant material mixes with the dung and urine and gradually rots down. The contents are removed now and then, piled up (problem of leaching!) and transported to the fields (see also ROCHELEAU et al. 1988: 101).

[77] In former times farmer 2K-m kept goats; before they were taken away by the second wife of her husband, she used the manure. Farmer 2K-l gives her residues to the cattle of a friend and neighbour who come to feed on her plot so that she can keep the manure in return.

Fig. 65: Farmyard manure piled up on a terrace on farm 1K-m. The manure will be spread (in the furrows) and mixed with the top soil

tions: “Animals can play an extremely important part in nutrient recycling. This will depend on what they are fed, where they are kept and what happens to their dung and urine.” Reasons for not applying enough manure on the fields is limitation due to high labour requirement for collection, transport and application in the field (manure is extremely heavy!) resulting in declining crop yields; also quality of manure plays a role (TARDT 2000: 9, 27; see also WILLIAMS 1996: 6). Furthermore, in cases where farmers have to buy manure lack of finances can be a problem. Most farmers also apply ash as natural fertiliser on the fields.

Fig. 66: Collection of (liquid) manure by means of a cemented channel on a farm in a LPA in western

Three farmers in Tanzania use liquid manure (mainly cow urea) which is particularly applied in the vegetable garden (2T-l, 3T-l, 2T-h). On farms within the project area of C-MAD in western Kenya the collection of liquid manure through cemented channels has been observed (see Fig. 66). On some farms, the manure flows directly in a hole where the manure can decompose; some farmers keep liquid manure in clay pots to decompose and mix it with water (and herbs) to be used as fertiliser on vegetables or as natural pesticide (see chapter 6.2.6.3). Urea has been shown in on-farm trials in western Tanzania to significantly increase rice yields (BUDELMAN et al. 1996: 35).

Main reason why farmers do not - or only to a little extent - practise composting, mulching or green manuring is that they feed the residues to their livestock; farmer 4T-m throws the kitchen residues away for the neighbour’s livestock.

Fig. 68 also shows the use of chemical fertilisers on the farms. All farms in the high potential areas within the project area of SCAPA and all farmers in Kenya except farmer 1K-l apply inorganic fertilisers. Farmers who do not use inorganic fertilisers (1K-l, 1T-l, 3T-l) said that it is a matter of money available - they simply cannot afford to buy fertilisers (see also OTSYINA et al. 1998: viii); this is congruous with TARDT (2000: 12) who note that the removal of subsidies in Tanzania on fertiliser has resulted in reduced fertiliser use. Farmer 2T-l and her husband said that they produce sufficient organic matter. The farmers in the HASHI-ICRAF project area said to refuse the use of chemical fertilisers on their fields since they believe that these fertilisers destroy the soil fertility in a long-term perspective; similar reasons have been named by farmers within the research area of WILLIAMS (1996: 5) in western Kenya. These farmers as well as farmer 2T-l show a high affinity to organic farming methods and are aware of negative effects. In the HASHI-ICRAF project area this awareness is the result of the traditions of ecological sound land use practices still kept alive.

OTSYINA et al. (1998: ix) recommend to explore alternative sources to expensive inorganic fertilisers like rock phosphate which is extremely cheap and locally available.

More information is needed as to the improvement of soil fertility through practices of organic farming, e.g. with regard to plants which can be used to produce green manure like the wild sunflower (see Fig. 67).[78] Trials in western Kenya on biomass transfer systems with this plant have shown significant increases in crop yields (NIANG'A et al. 1998: 3). The potentials of organic agriculture in developing countries have been listed in LAMPKIN (1994). After LANDECK (in WILSON 2001: 105) the ideal agriculture is that which does not incorporate any synthetic fertiliser as chemical use will not be viable in the long run (reaching yield plateaus). Organic fertiliser use could mean less energy input, making them cheaper than synthetic fertilisers.

Fig. 67: *Tithonia diversifolia* (wild sunflower)

Farmers have since long appreciated the value of organic materials to support plant production. Mulches, manure, green manure and composts all play a part in indigenous productive farming systems (HUXLEY 1999: 274). Accordingly, the implementation of measures is due to farmer's own skills as well as to project interventions.

2T-l and 2T-h use the biggest variety of organic fertilisers. The farmers in the MPA of the HASHI-ICRAF project region and 1T-l have established two measures only.

[78] For further information see THOMAS (1998: 66-67, 267-268) and KENDALL & VAN HOUTEN (1997). Only farmer 2T-h knows about the property of this plant.

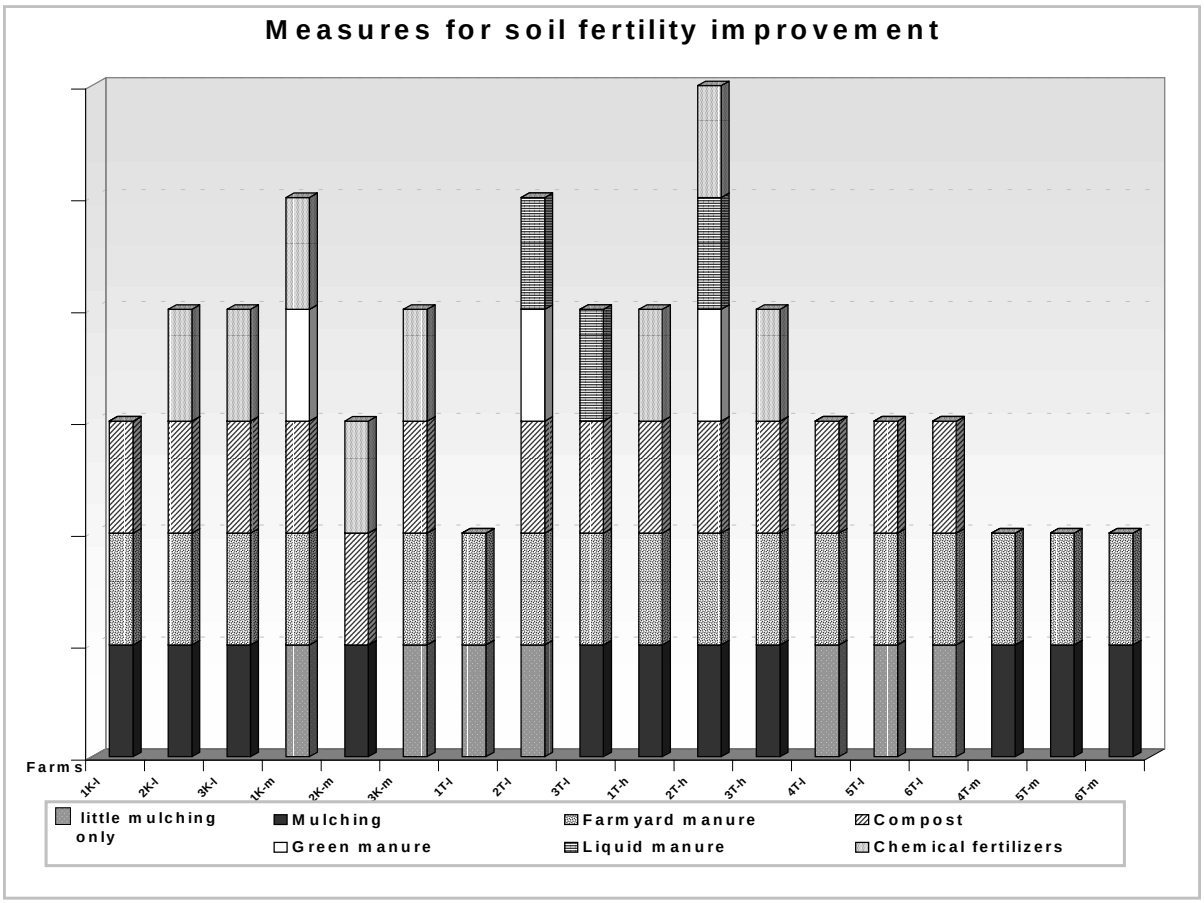


Fig. 68: Soil fertility improvement

5.2.5 Field trials

> "Clearly, there is a vast amount of investigation that can only be carried out on-farm and with farmers if they and their systems are to be understood"
>
> P. HUXLEY in his book on tropical agroforestry (1999: 299).

Field/on-farm trials which use the farmer as a researcher (HUXLEY 1999: 300) can be viable within the frame of the integration of new technologies in land use patterns. Some male and female farmers within the research area said to regard experimentation as a way to increase understanding, to arrive at grea-

Fig. 69: Field trials with different fodder grasses and –plants in a LPA in Tanzania

ter clarity on how things work and as tool to judge between practices and treatments. In the following, different examples shall be given, also from projects which have been visited within the context of a study tour in 1998.

Farmer 2T-I and her husband carry out field trials with fodder grasses/-plants in cooperation with SCAPA (see Fig. 69). Since they receive study tours this measure is of high educational value. The grasses/herbs used are listed below:

Grasses: *Brachiaria decumbens, ruziziensis, ssp.*; *Cenchrus ciliaris*; *Centroxma pubescens*; *Chloris roxburghiana*; *Eragrostis superba*; *Melinis minutiflora*; *Panicum maximum*; *Panicum trichocladum*; *Pennisetum ssp.*; *Setaria sphacelata* (*anceps*); *Setaria splendata*; *Tripsacum laxum*; *Vetiveria zizanioides*; *Bothriochloa insculpta/Sporobolus pyramidalis.*

Herbs: *Canna edulis*; *Symphytum peregrinum, Desmodium intortum*, *Desmodium uncinatum*, *Medicago sativa.*

Fig. 70: Farmer in his field near Maseno, western Kenya, explaining field trials

In 1987, the *Maseno Research Centre* has been established together with KARI and ICRAF and with KEFRI as the lead institution to carry out research on the crop-based land-use system around Maseno, western Kenya. Surveys had shown that the major problems are a decline in soil fertility as well as shortages in firewood and fodder. Within the on-farm programme which started in 1990, the farmer in Fig. 70 intercrops different nitrogen-fixing plants (a. o. *Tephrosia vogelii, Clitoria ternatea*) on his fields (see TENGNÄS 1994: 166-167) to observe the nutrient status of the soil and plant interactions (tree-root symbionts).

Fig. 71: Demonstration plot of SACDEP showing a. o. traditional food plants

SACDEP, a project located in Thika, a town to the northeast of Nairobi, Kenya, has a demonstration plot where different sustainable farming practices are shown to (farmer) study tours. Part of the programme is awareness-creation on traditional food plants (see Fig. 71).

On a farm near Kendu Bay in western Kenya, an experiment on the intensity of soil erosion, measured on different parcels under different conditions (only stone walls, stone walls with two different types of grass, grass only and bare sand), is carried out in cooperation with C-MAD and KARI as can be seen in Fig. 72 below:

Reasons why farmers do not engage in experiments are related to lack of interest, lack of time, land, tools, long-term results (see also BOSCH 1993: 49-50).

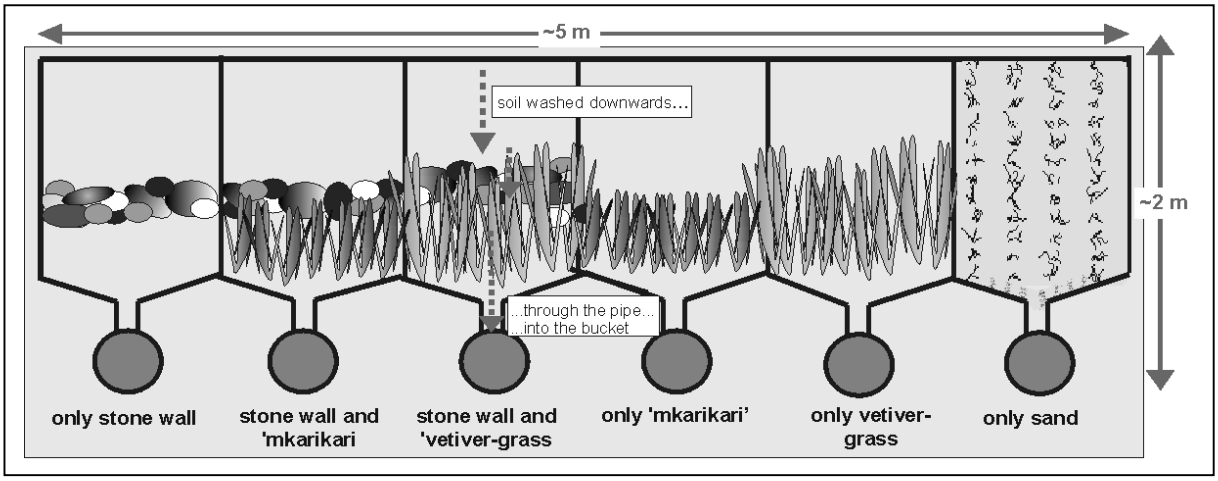


Fig. 72: Soil erosion field trial

5.3 Measures related to animal husbandry

5.3.1 Keeping

"The farm animals may sometimes be kept at home, or they may be grazed elsewhere, perhaps on common land, or lent out, and so on. […] The level of confinement and control of movement of animals has a number of important implications that apply equally to agroforestry practices."

P. HUXLEY in his book on tropical agroforestry (1999: 42, 12).

Fig. 73: Zero-grazing unit (for a dairy cow and calves, goats, sheep, chicken and rabbits) on farm 1T-h

Different forms of keeping livestock are discussed in the following (see also Tab. 12 and chapter 4.3.3).

According to Tab. 21 three farmers out of 14 farmers who keep cattle practise free-grazing.[79] Out of these farmers 6T-m lets the cattle graze on common land, farmers

[79] Aspects related to labour intensity are described in chapter 5.2.3.

1K-l and 1T-l keep their cattle on own grazing areas. The other farmers practise zero-grazing (see also Fig. 73), out of which seven farmers practise zero-grazing exclusively, three farmers (3K-l, 1K-m, 3T-h) have got big zero-grazing units and additionally keep cattle on their own land. Farmers 3T-l and 6T-l have got zero-grazing units and additionally keep their cattle on common land.

Ten farmers keep goats, but only three farmers (2T-l, 1T-h, 3T-h) keep them in stables, farmer 1K-m partly practises zero-grazing. Three farmers (1K-l, 3K-l, 1T-l) keep their goats free on their own land, two farmers let them graze (6T-l, 6T-m) on common land, and farmer 2K-l ties them in the governmental forest.

Seven farmers keep sheep, out of which four (2T-l, 1T-h, 2T-h, 3T-h) keep them in zero-grazing units; farmer 1K-m partly keeps the sheep in stables, and farmers 1K-l and 3K-l practise free-grazing. All farmers except 4T-m keep chicken, but only farmers 1T-h and 2T-h partly practise zero-grazing. Rabbits are kept in stables. Donkeys, ducks and guinea-fowls are kept free on own farm land; pigeons are kept free as well.

The following quotation of farmer 3K-l refers to the common problem of free grazing goats: "Sipendelei sana mbuzi kwa sababu ya kuingia sana kwa shamba langu la matunda" (I don't like goats too much because they like to much running around in my orchard).

Tab. 21: Keeping of livestock

	Farmers																	
Keeping (in absolute numbers)*	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Cattle	7		3	3		1	6	2	1	1	1	3	1	1	5			5
Goats	7	9	7	3			6	1		1		1			10			10
Sheep	7		7	3				1		1	1	1						
Donkeys							6											
Chicken	7	7	7	7	7	7	7	7	7	4	4	7	7	7	7		7	7
Ducks				7				7										
Rabbits								1		1			1					
Guinea fowls												7						
Doves													10		10			

Legend:

***** **1** = zero-grazing; **2** = z-g & tied own; **3** = z-g & free, own; **4** = z-g, free own & com.; **5** = z-g & free, com.; **6** = grazing area & free, own; **7** = free, own; **8** = free, own & com.; **9** = tied, com.; **10** = free, com.
☐ = not on the resp. farm; ☐ = not in the resp. zone/country; **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; ***** = female-headed household

5.3.2 Fodder

"For example, fresh grass, rice straw and leavy tree fodder have, respectively, declining feed quality levels, even though tree fodder is often high in protein"

P. HUXLEY in his book on tropical agroforestry (1999: 41).

Fig. 74: Fodder bank on a farm near Kisumu, western Kenya

The different fodder practices are demonstrated in Tab. 22. All farmers feed their livestock with crop residues[80] which are generally an important source of feed for animals in the tropics, sometimes leading to conflicts between using them as fodder or as mulch to improve soil fertility; this conflict is reflected in the case studies: seven farmers only use little mulch since some of them are in need of the residues as fodder source, especially during the dry season (see also HUXLEY 1999: 44-45).

All farmers except three (3K-m, 1T-h, 2T-h) feed their livestock with local grasses. Napier grass is fed to all animals except on the farms in the HASHI-ICRAF project area. Farmer 2K-l has planted napier grass to fix soil conservation measures and to exchange it for milk from the neighbour's cow. Other fodder grass species like Kikuyu grass and Rhodes grass are of marginal interest.

Fig. 75: Russian comphrey on farm 3T-h

Herbaceous fodder plants (legumes) such as *Desmodium ssp*., Alfalfala or Russian Comphrey are only used in the SCAPA project area, but a propagation of these fodder species is highly recommended. Generally, all projects should focus on the integration of a wide range of different fodder species for risk reduction and economic purposes.

All farmers who practise zero-grazing keep fodder banks (see Fig. 74-76) – either of grasses/herbaceous plants and/or tree species (15 farmers).

[80] HUXLEY (1999: 46) reports that Tanzanian farmers bury crop residues and, when termites have begun to feed on them, they are uncovered so that poultry can increase their protein intake; this practice has not been observed during the field research.

Tab. 22: Fodder related aspects (only cattle, sheep and goats)

Fodder	Farmers																	
	1K-l	2K-l	3K-l	1K-m	2K-m*	3K-m*	1T-l*	2T-l	3T-l*	1T-h	2T-h*	3T-h	4T-l*	5T-l	6T-l	4T-m	5T-m*	6T-m*
Grazing (all livestock)	x	x	x	x	nl		x		x			x			x	nl	nl	x
Local grasses*	x	x	x	x			x	x	x			x	x	x	x			x
Residues from harvest	x	x	x	x		x	x	x	x	x	x	x	x	x	x			x
Maize chaff													x	x	x			
Cotton husk/seed cake													x	x	x			
Rhodes grass								x			x	x						
Kikuyo grass								x			x				x			
Napier grass	x	x	x	x	x	x	x	x	x	x	x	x						
Greenleaf Desmodium								x	x	x	x	x						
Silberleaf Desmodium								x			x							
Lucerne/Alfalfa								x			x							
Russian comphrey												x						
Acacia ssp.- leaves/pods	x	x	x	x			x	x	x				x	x				
Azadiracta i. - leaves				x				x		x			x	x	x			
Banana - stems/leaves				x		x		x	x	x	x	x	x					
Calliandra c. - leaves								x		x								
Flemingia m.- leaves								x		x	x	x						
Gliricidia s. - leaves/pods**								x						x	x			
Grevillea r. - leaves	x	x	x	x		x	x				x	x						
Leucaena ssp. - leaves				x			x	x		x	x	x	x	x	x			x
Mangifera i. - leaves	x		x	x														x
Sesbania s.- leaves							x	x		x								
Senna s.- leaves							x	x	x	x			x	x	x			
fodder bank – grasses/herbs	x	x	x	x		x	x	x	x	x	x	x			x			
fodder bank – trees							x	x		x	x	x	x	x	x			x

* A valuable grass is *Cynodon plechtostachyum* – star grass
** has to be used carefully since twigs, bark and roots are poisonous

Legend:

= not in the resp. zone/country = not on the resp. farm	**K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; **nl** = no livestock; * = female-headed household

Tree leaves/pods are an important supplementary feed source, in particular for protein supply which is of special relevance in dairy production to increase milk yields (see TENGNÄS 1994: 52-57). Trees and shrubs are either lopped, pruned, pollarded or coppiced (ibid.: 87-94), and leaves and small branches are fed to livestock; *Acacia ssp*. is important in the LPAs and the most important indigenous fodder tree species in general (see also HUXLEY 1999: 405); *Leucaena ssp*. is the most important fodder species amongst the exotic trees/shrubs (see also HUXLEY 1999: 405), followed by *Grevillea robusta* which is planted in the NSWCP and SCAPA projects, but only on one farm in the HSHI/ICRAF project area (5T-m).[81] Here, cotton husks/seed cake play an important role as supplement, especially during the dry season. According to OTSYINA et al. (1997a: 54) this kind of fodder is applied by 90 % of farmers in the urban and peri-urban areas. The cotton seed cakes still contain 6-16 % oil and 23-44% protein and are thus a valuable fodder source (FRANKE 1997: 164), giving the highest milk yields in dairy farming (TARDT 2000: 25). *Senna*

[81] However, main use of this tree is fuelwood and timber.

Fig. 76: ***Flemingia macrophylla*** **between coffee and bananas on farm 3T-h**

siamea is an important fodder tree species almost exclusively in the LPA's of Tanzania. *Azadiracta indica* is – besides medicinal aspects – also relevant as fodder source. Banana stems/leaves are of interest, too. *Calliandra c.*, *Sesbania s.*, *Gliricidia s.* and *Flemingia m.* (see also Fig. 76) are used also, but on few farms only.

On the two farms where fish farming is practised (2T-l, 1T-h), fish is fed with fresh plant material, including leaves from trees.

Botanical and English names of fodder grasses and –plants are given in appendix 6.

5.4 Energy related aspects

„Adopting improved fuelwood stoves would increase the efficiency of fuelwood use, hence reducing the rate of deforestation. In addition, women workload of fetching fuelwood would be reduced while conserving the environment."

OTSYINA et al. in the annual report on the *Agroforestry Research Project* in Shinyanga Region, Tanzania (1998: ix).

Within the context of a sustainable use of the natural resource wood, energy-conservation forms a crucial aspect as e.g. in Africa, people rely to 70 % on wood as source of energy (BMZ 2000: 245). Energy-saving- or improved cooking stoves are an effective method to reduce the demand in firewood, time spend for fetching or money for buying (OTSYINA et al. 1998: 61, 68).

Half the world's population prepare their food with traditional biomass fuels like wood, charcoal, dung and crop residues. Procurement and consumption of these fuels define the character of everyday life in many developing countries (KAMMEN 2001: 1). The burning of alternative sources of firewood like crop residues, manure, pods, etc. is a problem as many sources are only seasonally available, while their use may have serious consequences in terms of sustainability of land-use practices when used in significant quantities due to often inferior caloric values (BUDELMAN 1996: 62).

In rural areas, many women and children spend several hours a day collecting firewood, contributing to deforestation and soil erosion. Moreover, respiratory diseases caused by the choking smoke from indoor wood fires (see Fig. 77) are one of the leading health hazard in developing nations (KAMMEN 2001: 1). The amount of benzopyrene, a poisonous gas from burning fuel, inhaled is equivalent to twenty packets of cigarettes a day. Other effects include eye diseases, bronchitis, pneumonia, cancer, etc. (SHAO et al. 1992: 10).

Fig. 77: Smoke from an indoor cooking fire in the house of farmer 6T-m

Since the energy crisis of the 1970s, international aid organisations have targeted the improvement of cooking practices as a simple and affordable way to address environmental, economic and energy issues with varying success and failures (e.g. promoting dilapidated wind pumps or photovoltaic power systems that either did not work or could not be repaired with local materials, modernised woodstoves were often too bulky or saved fuel only when used under ideal conditions, cookstove training courses were sometimes offered only to men, etc.). Over the past decade government programmes, development assistance groups and community-based organisers have undertaken a thorough review of the requirements for a successful dissemination of cooking stove technologies. Efforts in East Africa encompass the promotion of the "improved" cookstove – a more efficient adaptation of the metal or clay implements on which many of the world's families cook their daily meals – and village training programmes (grass-root educational campaigns) in which women's groups learn to build and maintain their own stoves (KAMMEN 2001: 1-2).

A case history that traces the progress of stove development from early misstep to ultimate acceptance can be found in Kenya: Whereas an open cooking fire may yield efficiencies of as little as 10 % (see also Fig. 77 above) and the traditional metal stove delivers only 10 to 20 % of the heat generated to a pot (the largest loss of heat, about 50 to 70 %, occurs from radiation and conduction through the metal walls) (see Fig. 78), the Kenya ceramic *Jiko* (Sw = stove), consisting of a metal casing with a ceramic lining (see Fig. 79) and which is used by almost one million households in Kenya, directs 25 to 40 % of the heat from a fire to a cooking pot (KAMMEN 2001: 3).

Fig. 78: Traditional metal stove of farmer 6T-l; a metal pipe is put on top to increase the heat

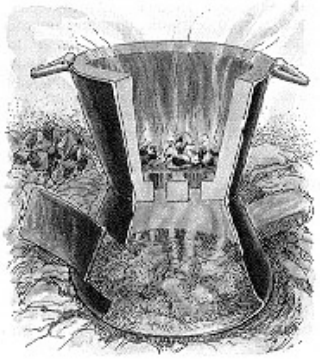


Fig. 79: Kenya ceramic *Jiko* (source: KAMMEN)

The success of the ceramic stove in Nairobi and Mombasa did not go unnoticed by many women's groups that had been organised in rural areas. An alliance developed between leading government and aid organisations in Nairobi and women's groups, most notably *Maendeleo ya Wanawake* (SW = *Women's Development*). From these efforts has come a simplified and affordable variant of the ceramic Jiko. A pot placed on top of the stove heats almost as quickly as one on a Kenya ceramic Jiko; indoor smoke is reduced considerably through more efficient combustion. Further, a *Maendeleo* stove is usually placed near a wall so that the smoke can climb along the wall to find its way outside (KAMMEN 2001: 3).[82]

Fig. 80: *Kuni Mbili* stove on farm 4T-m

This rural success story helped to spawn a third-generation cookstove, the *Kuni Mbili* (Sw = two-stick) *stove* with a larger firebox to accommodate wood instead of charcoal (see Fig. 80) (KAMMEN 2001: 3-5). Meanwhile, a big variety of different types has made its way also to other countries like e.g. Tanzania (see Fig. 81 below). The name refers to the amount of firewood needed and indicates the high energy-saving criterion, namely two sticks instead of usually five on an open fire place (see also DEMBÉLÉ & DEMBÉLÉ 2000: 16).

Fig. 81: Different types of improved cooking stoves (Shinyanga, Kahama and Arusha Districts, Tanzania

[82] "The ceramic Jiko has had a considerable impact on household finances. Typical savings of 1,300 pounds of fuel a year frees up about $ 65 per household--up to a fifth of the annual income for urban dwellers" (KAMMEN 2001: 4).

Five Kenyan farmers (all except 1K-l) and three Tanzanian farmers (1T-l, 2T-l, 4T-l) use an improved cooking stove for firewood, two farmers (1K-m, 4T-l) additionally dispose of an improved cooking stove for charcoal (see Tab. 23).

All farmers use firewood (see also Fig. 82) and additionally charcoal (except four farmers); the latter is prioritised in areas with increased distances to firewood sources due to transportation advantages (SHAO et al. 1992: 131; OTSYINA et al. 1998: 68). Collection of firewood is done mostly by women (and children), mainly in the form of headloads resp. on the back; a bundle weighs between 8 – 20 kg, sometimes even up to 35 kg (see also SHAO et al. 1992: 131). Only farmers 1K-l and 2T-h spend less than 30 min walking time. Tab. 23 also shows that no farmer prefers wood from indigenous trees only. Five Tanzanian farmers and one Kenyan farmer (1T-l, 2T-l, 3T-l, 1K-m, 1T-h, 2T-h) like wood both from indigenous and exotic trees/shrubs, five farmers prefer the wood of indigenous species and of *Grevillea robusta* (all farmers in the LPAs in Kenya as well as farmers 1T-h and 2T-h); 3K-l prefers wood from indigenous trees and from *Eucalyptus ssp*., and farmer 3K-m prefers wood from the wattle tree*, Eucalyptus ssp*. and *Grevillea robusta*, but added that she uses it because there are no natural trees left. Some trees are valued for their development of high temperatures like *Pericopsis angolensis* in Kahama District (HASHI-ICRAF project area).

Fig. 82: Two bunches of firewood collected in the on-farm natural forest of farmer 1K-l

Tab.: 23: Firewood related aspects

	Farmers																	
Aspects	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Species preferences**	4	4	4	3	3	3	3	3	3	3	3	4	1	1	1	1	3	1
Walking time***	1	2	2	2	2	2	2	2	2	3	1	2	3	3	3	2	3	3
Improved cooking stove		x	x	x	x	x	x	x					x		(x)	(x)		
Improved cooking stove (charcoal)				x									x					
Use of charcoal	x		x	x		x		x	x	x	x	x	x	x	x	x	x	
Price for charcoal (bag/Ksh)	200	200	200	200	200	220	350	350	500	570	320	320	300	250	250	100	100	120

Legend:

** **1** = (firewood): indigenous; **2** = exotic; **3** = indigenous and exotic
*** **1** = < 30 min, **2** = < 1 hour; **3** = > 1 hour < 2 hours; **4** = > 2 hours
☐ = not on resp. farm; ▒ = not in the resp. zone/country; * = female-headed household
K = Kenya; **T** = Tanzania; **l** = low potential area; **h** = high/mid potential area; **(x)** = soon

Prices for charcoal vary according to the availability which depends on the season (charcoal and firewood are cheaper in the dry season since these products are produced resp. collected during this season – see also SHAO et al. 1992: 133) and distance to the place where it is produced. The last aspect is responsible for the high price farmer 1T-h has to pay. The prices are similar for firewood (per bundle).

Farmer 1K-m also uses a solar cooker which works quite well. Farmers 2T-h and 3T-h want to establish biogas cookers as soon as money is available, farmer 6T-l has already started with the installation. The propagation of this energy source has been recommended by several authors, not only for Shinyanga Region in western Tanzania (see e.g. SHAO et al. 1992: ix-x; HATIBU & MTENGA 1996: vii; NEDA 1997: 14).

As has been stated by OTSYINA et al. (1998: 68) different types and models of improved firewood stoves have been developed to suite to the variety of conditions and habits. These different types can be copied and spread to other areas to increase people's choices, leading to reduced negative aspects and enhanced adoption rates.

Farmer 4T-l constructed an improved cooking stove with a friend living in the neighbourhood which can be used for firewood *and* charcoal; she wants to teach group members, friends and neighbours how to construct it (see Fig. 83).

A study within the HASHI-ICRAF project in Shinyanga Region, Tanzania revealed that socio-economic (behavioural) and technical factors influence the adoption and diffusion of improved firewood stoves. The factors included lack of awareness, lack of adequate skills in making them, lack of material, availability of alternative sources of energy, nature of the kitchen, short live span of the stoves, limited pot size, workload, individual initiation, demonstration limited to groups, animal/human damage, social taboos and values (beliefs), husbands restricting their wives, disliking shape and working with clay, cooks too fast (OTSYINA et al. 1998: x, 64-67). A study in Sudan found similar problems named by the women which led to the rejection of the stoves (NEDA 1997: 14). Whereas short life span has been named as the main problem in the study within the HASHI-ICRAF project (ibid.: 66) lack of material and high costs for buying have been named most frequently by farmers in the own research area (see also chapter 6.2.2.2).

A study in Senegal has shown that improved wood-saving ovens can even lead to increased firewood consumption because the better cost-benefit ratio enabled many women to start preparing ready-made meals for the market (NEDA 1997: 14). These aspects have to be considered by the projects when propagating improved stoves, and impact studies have to be conducted.


Soil is mixed with water ...


... and smoothened ...


… a string of clay is formed ...


… stones stabilise the edges ...


… a grating is put on top ...


… and integrated with clay.

Fig.83: The pictures show the construction of an improved cooking stove for firewood in Lubaga, Shinyanga District, Tanzania

5.5 Water harvesting for domestic, livestock and irrigation purposes

Especially in the low potential areas water is one of the most restricting factors for a sustainable land use; this problem is becoming more acute during the dry season (see also HYUNA 1989: 45). In recent years, droughts and severe failures or delays of rainfall have increased in Kenya and Tanzania; severe water problems have been stated already by SHAO et al. (1992: 169), mainly due to deforestation. At least all farmers reported a change of rainfall patterns in their home areas during the past ~10 years. In particular, the years after the extraordinary heavy rainfalls in late 1997 and at the beginning of 1998 were characterised by high losses of harvests in wide

areas of Kenya due to partly the complete failure of rainfalls. Many regions still depend on food supply from outside (FAO 2001). Water scarcity has many negative effects: as to name only the most important, women have to walk long distances to find water (for instance, in Shinyanga rural and Kahama District many wells dry up during the dry season), the water quality is partly disastrous (due to scarcity human beings and animals share the same water sources which are used nowadays in many places for domestic purposes, washing, bathing at the same time; diseases coming up in connection with water pollution are a. o. bilharzia, diarrhoea, cholera, worms, amoebaosis, typhus, etc.), decline of hygienic conditions in general, decline of food quality and quantity (see also SHAO et al. 1992: 134-138). HYUNA (1989: 45) reports that water scarcity is the major problem throughout the ten villages visited during her research in Shinyanga Region, Tanzania. Water scarcity is also a serious problem when it comes to watering of tree seedlings. In the research area of *this* study main problems named were scarcity, bad quality, distance and prices.

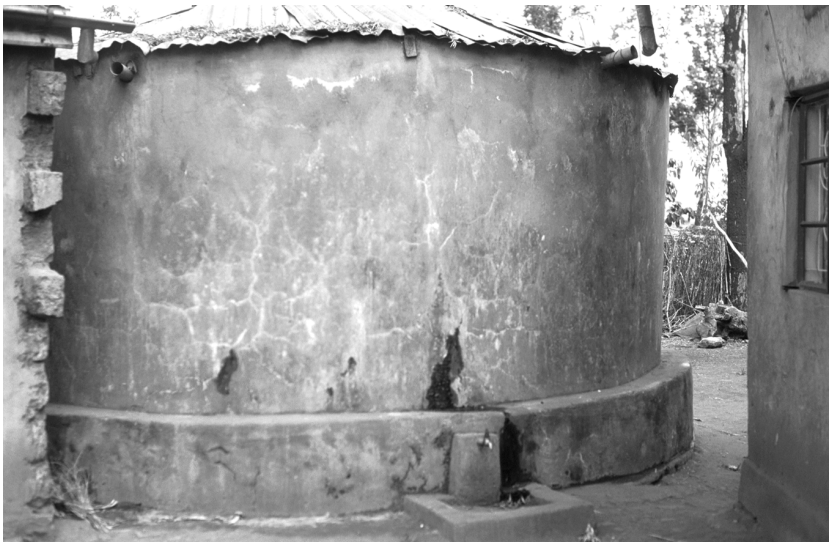


Fig. 84: Water tank on farm 1K-l

Five different measures for water harvesting can be distinguished (see Fig. 85 below). There exists a correlation between the fact that all Kenyan farmers as well as farmers 1T-l and 3T-h practise roof harvesting and that the same farmers except 2K-m dispose of a water tank (see Fig. 84). Four farmers in Shinyanga Region harvest water with buckets only as they do not have gutters.

Five farmers use channels, and five farmers have got their own pond. A public dam is available for two farmers only (2K-l, 1T-l). Three Tanzanian farmers carry out irrigation activities.

The fewest conservation/harvesting activities are carried out by the farmers in Shinyanga Region. HASHI-ICRAF should put more emphasis on this important factor.

The different sources of water supply and harvesting methods have been illustrated in Fig. 85 below. For a better understanding of linkages between water shortages and measures, it is necessary to pay attention to the other sources of water supply:

Wells, particularly public/neighbour wells, are the most important source for water supply in total; they are especially important for the farmers in Shinyanga Region and some Kenyan farmers as well. However, wells are not a solution to water problems, but often contribute to lowering of the water table, saltification, etc. (see also SHAO et al. 1992: 171). Five farmers are supplied with water through an own tap; additionally, farmer 4T-m as well as 3T-l have access to a public tap. (Periodically flowing) rivers form a water source for six farmers (1K-l, 2T-l, 3T-l, all farmers in the HPAs of Kenya). All farmers use at least two sources for water supply.

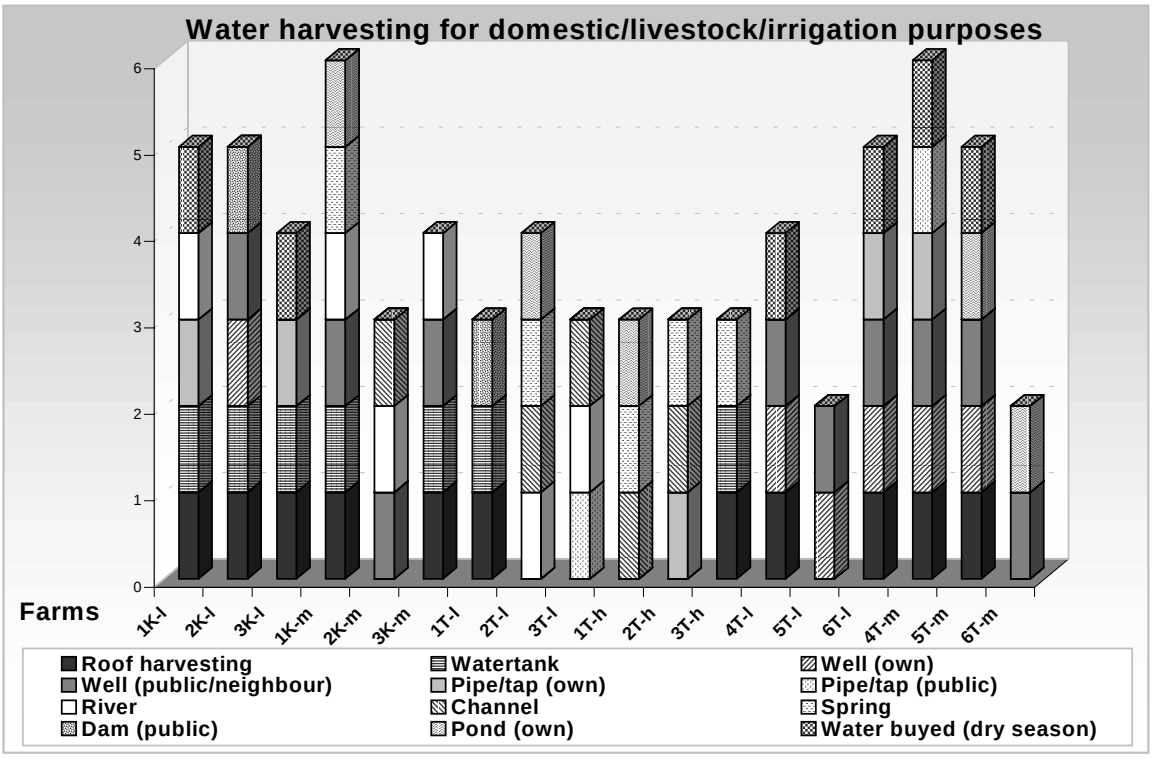


Fig. 85: Water supply and -management on the farms

Five farmers use spring water (2T-l, 1K-m, all farmers in the HPAs of Tanzania); this aspect leads to the aspect of spring protection, another important water conservation activity. In the tradition of the Wasukuma, the predominant tribe in the HASHI-ICRAF project area, springs were under the authority of the elders/chiefs and were protected (SHISCAP 1992: 2). Spring protection forms also an important water conservation activity within the frame of NSWCP and SCAPA projects (see a. o. MOALDM 1999: 4, 12): The water quality of a public spring near the house of farmer 1K-m has been improved through fixing the access with stones and cement. Near the farm of farmer 2T-h a public spring had run dry. In the past, natural vegetation growing around water sources like springs, rivers and wells generally was protected, but due to mainly population pressure, trees have been cut with the effect that water sources dried up. Farmer 2T-h describes the conservation efforts of the VSCC concerning the rehabilitation of a spring: „The area was suffering from severe tree

cuttings; e.g. the forest who surrounded the spring was almost cut, so the spring dried up. 10 years ago the VSCC started a tree planting activity: Trees (a lot of natural, too) were planted with manure. Already some 2, 3 years later the spring carried little water, and now it can supply many people with water."

Farmer 3K-I has started to construct an irrigation system on the farm, consisting of several water tanks, placed approx. 2 m above the surface so that water can be distributed widely through tubes.

5.6 Summary

As has been demonstrated, a wide range of different measures for a sustainable management of natural resources is carried out by the farmers, according to and depending on individual preferences, needs and possibilities. Preferences on household level as well as on AEZs, project area and country-level are elucidated.

Farmer's strategies, measures and activities are manifold: they are related to soil and energy conservation, water harvesting, herbaceous and woody plants as well as to animal husbandry. Within this context, physical/material and ideological strategies/activities can be differentiated; they can be divided into two types: individual and community-based/joint activities.

Farmer's and group strategies are location specific (see also DHARMAWAN & MANIG 2000. 2): accordingly, individual and joint activities are reflecting the different socio-cultural, economic and ecological conditions and their interrelations on the various scales (farm, community, area/region, country) as well as individual/communal preferences and interests like, for instance special patterns of land-use systems amongst the Sukuma in Shinyanga District, Tanzania. On the other hand patterns of differences and correspondences as well as interconnections can be identified along specific factors and indicators.

Interconnections of those measures are obvious: agroforestry aspects like tree plantings, crop management and fodder banks are closely interwoven and can be linked directly to physical structures which in turn serve as measures for water harvesting, soil moisture and soil fertility improvement. Those measures in turn directly influence animal husbandry and energy management and vice versa: grasses and herbs planted on fodder banks and leaves from tree cuttings serve as direct feed resources for livestock kept in stables; zero-grazing has got the decisive benefit of protecting the environment from damage caused by free grazing animals. Tree plantings provide energy for cooking; improved cooking stoves reduce the amount of firewood and charcoal. Knowledge about traditional food and medicinal plants helps to preserve natural resources from extinction. Furthermore, people are provided with

nutritious food on a sustainable basis as well as with cheap and effective medicine for human or livestock treatment. Natural pesticides and insecticides are ecologically sound and cost-saving measures. Generally, these measures have got a direct impact on the enhancement and stability of the economic situation.

When looking at the distribution of conservation measures on the farms, the factors 'behind' have to be taken into account; reasons for implementation resp. omission can be manifold: some measures are part of a tradition in a respective area and are thus found more often than in other regions or they are only found in that specific area. Some farmers only implement few physical structures, because their land is flat, they do not have enough financial resources or simply concentrate more on biological measures like tree plantings, etc. A farmer may not be allowed to plant trees on the hired plot or his/her land is too small so that trees would compete with crops; some farmers may have knowledge about how to make an energy saving stove, but cannot start this activity due to lack of resources, etc. The great variety of possible interconnections contribute to a facet-rich picture of farmer's strategies, problems and potentials.

Does it make sense to put emphasis on socio-economic and cultural aspects which are directly linked to natural resources management? Does the socio-cultural background determine how resources are tackled? Are economic aspects in turn direct results of the management approach? These questions will be dealt with in later chapters.

Although all activities are regarded under the aspect of the conservation and sustainable management of natural resources, we have to keep in mind that they have to meet the daily needs of the people; efforts for securing and stabilising livelihood conditions will receive attention first. Livelihood strategies can be defined as diverse economic actions which are oriented towards meeting complex and interrelated needs, ranging from natural resources manipulations using specific techniques up to constructing institutional regulation mechanisms at different levels of a social system of a community (see e.g. DHARMAWAN & MANIG 2000: 2-3).

The farmers focus on diversification within the entire farming system: the higher the diversity of all components involved (crops, trees, fodder grasses/plants and livestock) the higher the economic and agroecological stability.

In general, all activities are carried out on the farms with visible success, corresponding to the selection criteria described in chapter 1.3.2. However, some differences between the farms have been observed and will be described together with the general effects of these measures in chapter 7).

6 Empowerment-related aspects

Empowerment, most strongly manifested in decision-making processes, is not readily observable, necessitating the use of proxy indicators. But using variables like e.g. changes in income and education levels as proxies still does not shed much light on decision-making dynamics or the mechanism of impact. Furthermore, empowerment is a cultural and personal concept. Participant as well as researcher may have differing notions of what empowerment means and how it is expressed. These aspects illustrate the methodical problems underlying the idea of 'assessing' empowerment (SHARMA 2001: 199).

Despite these shortcomings, the aspects selected can help to estimate empowerment influences by analysing the single proxies as well as their interrelations.

6.1 Farm-economy

> "Systems will only remain sustainable if there are equitable rewards for labour, and economic incentives for the economic choices available."
>
> P. HUXLEY in his book on tropical agroforestry (1999: 26).

In the following chapters aspects related to economy like (off-)farm income generating, credits, labour division and standard-of-living (farm budget) are elucidated.

6.1.1 Income generating activities

Generally, farms dispose of four different major sources of income: farm produce sales, income from wages and micro-enterprises, remittances and gifts, and other sources including bride prices, loans, etc. Cash income is crucial to success in farming: it contributes directly and indirectly to increased harvests, better land husbandry and food self sufficiency (see also CROWLEY et al. 1996: ix, 21). In the following three chapters attention is paid to farm and off-farm income sources and related aspects as well as to credits.

6.1.1.1 Marketing of farm produce

The data listed in Tab. 24 show that all households depend more or less upon sales of farm produce deriving from the own farm for some of their income: "[…] for many women, their sole source of income is the extra and high value produce such as tomatoes, papaya and avocados from their farms that they sell at the market" (WILLIAMS 1996: 4). This is true especially for the women-headed households as six out of the eight households managed by a female farmer do not dispose of off-farm

income. Income-generating farm activities include selling of crops, fodder grasses/ plants (also seeds - 2T-l), livestock, milk, eggs, meat, trees for firewood and/or timber, fruits, vegetables, seeds and seedlings.

All farmers market farm produce more or less regularly, farmers 3K-m and 6T-l sell farm products to people who come to their farms. The main market outlets are local. Out of five farmers who sell their products to a middleman farmer 3K-l produces mangoes also for national and international markets. Farmer 3K-m sells her products to a middleman/broker only.

Tab. 24: Marketing- related aspects

	Farmers																	
Marketing- related aspects	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Products marketed[1]	**1**	**1**	**3**	**2**	**1**	**4**	**1**	**1**	**2**	**1**	**1**	**1**	**1**[2]	**1**	**4**	**1**	**2**	**2**
Distance local market[3]	**2**	**3**	**1**	**1**	**3**		**5**	**4**	**2**	**6**	**4**	**4**	**2**	**2**		**3**	**1**	**2**

Legend:

[1] **1** = local; **2** = local & middleman; **3** = local & national/international market; **4** = people come to her farm
[2] Milk and livestock only
[3] **1** = less than 15 min; **2** = >15-30 min; **3** = >30-45 min; **4** = >45-60 min; **5** = 1-2 h; **6** = > 2-3 h; **7** = 3-4 h
K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household; ☐ = not on the resp. farm

Four farmers are members of a farmer's co-operative for marketing coffee (1K-m, 3K-m, 1T-h, 3T-h); additionally, farmer 3K-m is a member of a marketing group for French beans (see also Fig. 86).

Accessibility of markets reflects one important aspect (labour input) as long distances hinder the opportunities for farmers to sell their products (see e.g. HYUNA 1989: 51). After OBERMAIER (1986: 4) and BARTH (1986: 19) the main part of rural transport in the so-called 'developing countries' takes place on the heads and backs of women.[93]

Fig. 86: Farmer's horticulture group in Machakos District, Kenya

[93] Loads are between 20-30 kg (BARTH 1986: 20) respectively up to 40 kg; recommended maximum load is 20 kg (DGIS 1990: 7; SHAO et al. 1992: 10). On the average, the distances in Tanzania are between 0,2-8 km in the rainy season and 1,5-10 km in the dry season; time spend for fetching water are 1 1/2 hours (rainy season) and 3 1/2 hours (dry season) (BARTH 1986: 20).

Three farmers take less than 15 min to the market place, five farmers walk between 15 – 30 min. Three farmers take up between 30 – 45 min and three farmers take one hour to the market, but 2T-h takes a bus or pick-up. Farmer 1T-l walks more than one hour, and farmer 1T-h has the farthest distance to walk (2,5 hours). Five farmers usually take a transport (2K-l, 2T-l 2T-h; 1K-m and 3T-h have their own car), farmer 4T-m goes by bicycle. Farmer 6T-m sells her products also to a market in another village (goes by pick-up).

All farmers (except 2K-l, 3T-l, 1T-h, 4T-m) live more or less close to the main road, but only five farmers (3K-l, 3K-m, 2T-h, 5T-m, 6T-m) live close to a tarmac road. The other farmers said that the transport situation is difficult during the rainy season as busses and cars may get stuck. This has been observed in the research area of HYUNA (1989: 50-51) as well. TIFFEN et al. (1996: 71) mention: „[...] roads are vital in providing access to market. If farmers can sell their output better, they get both the motivation and the means to improve their land.“ WASWA et al. (2000: 185) conclude for their study area in Kenya: “Poor rural infrastructure (roads) undermined local trade and provision of other essential social services with the effect of reduced possibilities to accumulate financial capital and falling quality of social capital” (see also SHAO et al. 1992: x-xi; PINSTRUP-ANDERSEN & PANDYA-LORCH 2001: 273).

The products marketed by the women have been listed in Tab. 25. It has to be noted that generally, many crops/vegetables/fruits are not grown exclusively for marketing (like e.g. maize, beans and cassava); often, just the surplus food crops are sold. Especially in recent times, the crops stored are used for home consumption due to the increase of the delay of rains and droughts. However, vegetables are cultivated more often for the purpose of income generation.

Tab. 25 indicates that 13 different kinds of fruits, 14 different kinds of vegetables (incl. the cash crop French beans) and 7 different kinds of cereals and tubers are marketed. Furthermore, the farmers sell animals and their products (milk and meat), coffee and cotton, fodder grasses/plants and seeds as well as tree seedlings and firewood. Cotton, coffee and French beans are the only ‘real’ cash crops cultivated. Additionally, on some farms, bananas (1K-m, 2T-h, 3T-h), mangoes (1K-l) and vegetables (1K-m) are cultivated mainly for income production.

Fruits are only sold by few farmers in the HASHI-ICRAF project area, and five farmers do not sell fruits at all. Most fruits are sold by farmers 1K-m and 2T-l. Papayas are sold most, followed by oranges and mangoes.

Seven farmers (all in the LPA of HASHI-ICRAF project area as well as 1K-l, 2K-m, 1T-l, 4 T-m) (almost) do not market vegetables. Farmers 3K-m, 3T-h and 5T-m are the main marketers of vegetables. Vegetables sold most are tomatoes, followed by beans and onions.

Among the cereals and tubers, maize is sold most, followed by cassava and sweet potatoes. Four farmers (2K-m, 4T-l, 4T-m, 5T-m) do not sell these crops. Farmers 2T-l, 6T-l and 6T-m sell most.

Only the farmers in the MPA of Kenya and in the HPA of Tanzania market (and crop) coffee, farmer 2K-m to a little extent only due to increasing unsafe climatic conditions. Cotton is only marketed by farmer 6T-m.

Fodder grasses/plants and seeds are marketed on four farms only (2K-m[94], 2T-l, 2T-h, 3T-h).

Animal products and livestock are important farm enterprises, especially dairy keeping. All farmers except five (2K-l, 2K-m, all farmers in the LPA in HASHI-ICRAF project area) rely on milk as cash income (outputs vary between 1-2 l/d for local breeds and up to 12 l for high breed species, depending also on type of fodder and the season), and 12 farmers sell meat or livestock.

Only farmers 1K-m and 3K-m sell firewood, although seldom. Tree seedlings are sold by six farmers (2K-l, 1K-m, 3K-m, 2T-l, 1T-h, 5T-m).

In general, more cash crops are cultivated in the high/mid potential areas or on the partly irrigated farms (2T-l, 3T-l, 2T-h).

A serious problem named by all farmers except 3K-l and 6T-m as to the marketing situation were low prices, especially after a good harvest and during the rainy season (5T-l) (see also HATIBU & MTENGA 1996: 40), a. o. due to the involvement of middlemen as this results in very high costs of inputs in relation to crop prices (see also NYAKI 1998: 66). Another constraint named was high competition due to low crop diversity: „The marketing situation is bad. Sometimes I sit the whole day on the market place and earn 200 Tsh only. Many people have cultivated a lot of vegetable - like this year tomatoes. But there is no market. So many look for a job in Arusha or dig for Tanzanite because the vegetables rot on the fields“ (2T-h). Another problem named by the farmers in HASHI-ICRAF project region is the milk market: either there is no marketing facility (4T-l) or the prices are low (5-T-l, especially during rains - 6T-l, 5T-m). TARDT (2000: 26) mention: “Development of markets and marketing channels for dairy products would create valuable opportunities for adoption of livestock and fodder technologies” (see also CROWLEY et al. 1996: 24).

A correlation between cash crop growing and size of land which CROWLEY et al. (1996: 14) stated for their research area in western Kenya cannot be confirmed; this might be due to the small number of cases and the very heterogeneous sample selection.

[94] She barters napier grass for milk and has marketed French beans in former times.

Tab. 25: Crops, fruits, animal products and firewood marketed on farms

Products	1K-l	2K-l	3K-l	1K-m	2K-m*	3K-m*	1T-l*	2T-l	3T-l*	1T-h	2T-h*	3T-h	4T-l*	5T-l	6T-l	4T-m	5T-m*	6T-m*
Fruits (incl. coffee and sugar cane)																		
Avocado	X			X		X		X		X	X	X						
Bananas				X				X		X	X	X					X	
Guava	X		X	X		X		X	X						X			
Java plum	X			X				X							X			
Kei-apple		X	X			X				X								
Lemons	X		X	X		X		X									X	
Mangoes	X		X	X				X	X			X			X			X
Oranges	X		X	X		X		X		X	X	X			X			
Papaya	X		X	X		X		X		X	X	X			X		X	X
Passionfruit	X				X			X		X	X	X						
Peach						X												
Pomegranate												X			X			
Sugar cane				X								X						
Vegetables																		
Beans	X		X	X			X	X	X	X	X	X		X				
Cabbage		X	X			X			X			X					X	
Carots			X			X		X		X							X	
Chinese cabbage								X									X	
Eggplant						X			X								X	X
French beans						X												
Kale		X	X	X		X			X	X		X						
Okras												X					X	X
Onions		X	X	X		X				X	X	X					X	
Pumpkins		X				X						X			X		X	X
Red pepper						X		X	X	X		X						
Spinach												X						
Tomatoes		X	X	X	X	X		X	X	X	X	X				X	X	X
Tree tomato						X				X								
Cereals and tubers																		
Cassava		X				X		X	X	X	X	X		X	X			X
Coco-yam								X				X						
Ground nuts				X										X	X			X
Maize	X		X	X		X	X	X	X	X	X	X		X	X			X
Potatoes				X		X		X		X								
Rice								X							X			X
Sweet potatoes		X				X		X	X		X	X		X	X			X
Pure cash crops																		
Coffee				X	X	X				X	X	X						
Cotton																		X
Fodder grasses/-plants																		
Fodder grass					X			X			X	X						
Fodder plant seeds								X			X							
Fodder plants								X										
Animal products																		
Milk	X		X	X		X	X	X	X	X	X	X	X	X	X			
Livestock/meat	X	X	X	X			X	X	X	X	X	X			X			X
Tree products (except fruits)																		
Firewood				X		X												
Tree seedlings		X		X		X		X		X							X	

Legend:

= not in the resp. zone/country; = not on the resp. farm; **K** = Kenya; **T** = Tanzania
l = LPA; **m** = MPA; **h** = HPA; * = female-headed household

The statement at the beginning of this chapter stresses the necessity of access to markets. Studies agree that one future goal is to develop efficient, effective and competitive markets to buy the agricultural inputs farmers need in the production process and to sell what they produce as well as to develop and maintain appropriate infrastructure - including transportation, storage and marketing infrastructure –

particularly in rural areas (CROWLEY et al. 1996: xv, 53; PINSTRUP-ANDERSEN et al. 2001: 15, 272). Furthermore, farmers should be able to sell their products directly to the buying centres instead of marketing through middlemen (NYAKI 1998: 66).

However, caution has to be exercised as well: incorporation of farmer communities in encroaching markets as an opportunity to new income generation can also have negative side-effects: for instance, the growing industry of horticulture, notably that of tomato production, as well as tree use for medicinal purposes can be directly linked to declining forest reserves as has been shown by BUDELMAN (1996: 61-62) for western Tanzania: sticks used for propping up tomato plants are taken from trees, and some trees like *Securidaca longipedunculata* have become extremely scarce, partly because of the fact that medicine is made out of the roots.

6.1.1.2 Off-farm income generating

> "A woman who is self sufficient is respected in the community and is even feared by the husband."
>
> Quotation by a women's group in the research area of J. A. OTSYINA in western Tanzania (1998: 32).

It has been stated in the literature that a large number of households is involved in off-farm income generating activities as they form an integral part of farming systems in general and that its importance to smallholder livelihood is growing (see e.g. HYUNA 1989, CROWLEY et al. 1996, WILLIAMS 1996, BRYCESON 1997, TELLEGEN 1997, van VUUREN 2000). Reasons are the state of the national economy and the economic crisis following the government's failure to meet social needs. Furthermore, it is linked to women's empowerment (see also OTSYINA 1998: 40). Especially off-farm income is a critical means to pay for farm inputs and other farm investments like purchasing land. Furthermore, access to off-farm income allows farmers to save on their own labour and to educate their children. Off-farm income in the form of wages can be divided into three basic subtypes of employment: salaried skilled professions, semi-skilled employment (micro- and small enterprises - MSEs) and casual labour (CROWLEY et al. 1996: ix, 13, 50).

In the case of this study Tab. 26 shows that out of the 18 farmer families 11 farms are engaged in regular off-farm activities; out of these farms three households are female-headed (2K-m, 3K-m, 1T-l). Seven husbands work off-farm (1K-l is retired); out of the eight former husbands/lovers five farmers had an off-farm engagement. Out of the in total eight male-headed households engaged in off-farm income-generating activities additionally three female farmers (2K-l, 3K-l, 6T-l)[95] contribute to off-farm income (income-generating through group activities is excluded here and will

[95] Farmer 6T-l has woven blankets also for selling, but stopped this activity in the moment since she cannot get the material in the area.

be discussed separately in chapter 6.2.2). Tab. 30 in chapter 6.1.2 additionally shows that the Kenyan husbands receive a clearly higher salary than the Tanzanian husbands.[96]

Out of the seven women who received a training (see chapter 4.2 for more details), three Kenyan women are engaged in a job related to the training received; out of the five women farmers who have been trained as teachers (2K-l, 3K-l, 2K-m, 1T-h, 4T-m), only farmer 2K-m has a paid job, farmer 3K-l is retired, but earns the highest amount of off-farm income through various small enterprises (see Tab. 26 below); farmers 2K-m and 6T-l are engaged in micro-enterprises as well. Farmer 5T-m kept a small shop but had to close it because of theft. Farmer 3K-m works as a *District Community Development Assistant*. Farmer 1T-l works as an untrained labourer on a coffee plantation since the money deriving from farm activities is not enough. This resource poor farmer is an example for the observation that employment as casual agricultural labourer is necessary to obtain the meagre cash required to purchase food and other basic necessities, although it often delays poorer farmers from tending their own farms quickly (CROWLEY et al. 1996: 12). Farmer 2K-l (irregularly) buys potatoes and cabbage in Nairobi (where her husband works in an insurance company) and sells them on the local market. No woman within the Tanzanian H/MPAs is engaged in off-farm income activities.

Six husbands are employed in skilled professions and receive regular salaries. 5T-l works as a fireman and husband 6T-l works as casual labourer and additionally as livestock trainer for which skills are needed.

The analysis shows that the number of female farmers engaged in off-farm activities is clearly higher in Kenya; accordingly, four Kenyan farms belong to the highest income group (see chapter 6.2.2). In Kenya, off-farm employment is an important source of family income, also shown by the fact that only one family depends on farm income exclusively (1K-l, retired) compared to six families in Tanzania.

With regard to income generating through small-scale/petty business (e.g. making of baskets, strings, mats, pots)[97] the conditions have been said by the farmers and group members to be unfavourable concerning access to markets, transport, time, etc. Most of the activities carried out by the women are within the women's groups (see chapter 6.2.2.2).

The main problems concerning handicraft activities can be illustrated with the following quotation of a group member, friend and neighbour of farmer 1K-l:

---

[96] In contrast to the wide-spread opinion the male income not necessarily contributes to the family income since in many so-called ‚developing countries' the European model of the marital community of goods is unknown (OBERMAIER 1986: 4-5; see also DONNER-REICHLE 1986: 10; ROTT 1987: 64; BLISS & GAESING 1992: 39; HANAK 1995: 337).

[97] The traditional *Kamba*-baskets are called *kiondoo*.

"Additional income through e.g. making baskets and selling them in Machakos does not pay - transport is too expensive; furthermore, there is so much work to be done that we hardly can find time."[98]

Tab. 26: Job activities of female farmers and (former) husbands/lover

	Farmers																	
Off-farm activities	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Female farmer[1]		4	4,6		1	2	3								5			
husband[2]	x	3	2	4	*	*	*		*	9	*	10	*	7	8	1	*	*
former husband/lover[2]	-	-	-	-	1	5		-		-	5	-	6	-	-	-	6	

Legend:

[1] **1** = teacher, **2** = District Community Development Assistant; **3** = labourer (coffee plantation); **4** = small-scale trading with bought farm products; **5** = tending own tea room; **6** = renting mill, sewing machines, kiosk, houses
[2] **1** = teacher; **2** = medical advisor; **3** = insurance agent; **4** = AIC Immigration officer; **5** = police officer; **6** = commercial assistant; **7** = fireman; **8** = labourer, livestock trainer; **9** = Ward Secretary; **10** = librarian; x =retired truck driver
***** = female-headed household; **/** = never married; **-** = married; **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; ☐ = not on the resp. farm; ▒ = not in the resp. zone/country

All farmers said to (irregularly) receive kin gifts (not only from family members but also from neighbours and group members) in form of goods or money which is especially important for resource poor households (see also CROWLEY et al. 1996: 26). However, six farmers said that these contributions are low in frequency and amount (2T-l, 3T-l, 1T-h, 3T-h, 4T-m, 6T-m). On the other hand, two farmers (5T-l, 1T-h) have to completely support the husband's mothers, and farmer 4T-m has to support her parents.

A substantial number of farms has got a very differentiated mix of income sources which is also congruous to the HASHI-ICRAF report (OTSYINA et al. 1998: 67; see also CROWLEY et al. 1996: ix). The findings directly lead to the question which role off-farm income plays within the context of the enhancement of livelihood as well as ecological conditions. The findings of this study show a clear correlation between the factors livelihood conditions and financial resources. Off-farm income helps to reduce dependency on natural resources; by this, it also directly contributes to an enhancement of ecological conditions since e.g. conservation measures like making terraces can be afforded more easily.

Within the literature we find the discussion on *de-agrarianisation* as a solution strategy to the current problems (see e.g. BRYCESON & JAMAL 1997). A differentiation of the data after gender and head of households shows that working off-farm is more relevant to males, although the difference is low (eight males versus six females), and that three farmers only out of eight female farm managers work off-farm. VAN

[98] A small string of sisal - ~ 2,5 m - is sold for 3 Ksh, a big one (~4-5 m) kosts 5 Ksh.

VUUREN (2000: 28) who carried out a study on female-headed households in Tanzania has got similar research outcomes. But it can be seen also that the money received through off-farm activities is higher than through farm activities. In general, regarding skills received and actual work occupancy of the women the situation has to be described as vulnerable, especially in Tanzania since only three Kenyan women have got/had a job related to their training. This outcome is according to VAN VUUREN (2000: 27) who mentions that more women (50%) than men (25%) perform unskilled jobs. PARKER & TORRES (1994: 39) note that as a rule, people tend to enter business with low skill and cash requirements and other low barriers, but markets for these tend to be over-saturated. Hence, we can ask whether rural small-scale enterprises in the case of women really contribute to their empowerment *per se* or whether it can even have the opposite effect. Strengthening more skilled enterprises and 'enterprise-niches' might be a solution to come to a more stable situation.

Summing-up, the findings partly support the hypothesis of the importance of off-farm generating activities in Africa. For getting closer to the question on whether de-agrarianisation really could form a solution strategy more studies and their comparison are needed for the verification of this hypothesis.[99] Existing small enterprises as well as the set-up of new MSEs are to be fostered; activities may include management training and learning technical skills in cash management and investment like simple record keeping, accounting, financial planning, investment analyses and quality control. Furthermore, market potentials for new products and services are to be assessed to assist farmers in finding out which farm and off-farm businesses are profitable and which are not (see also CROWLEY et al. 1996: 54). Initiatives should not only depend on governmental action, but the private sector itself has to take activities as well. The high diversity of micro-enterprises established by the farmers, not only in the frame of farm-related aspects, shows the high demand in diversification of income sources: whether they can be successfully implemented and sustained depends to a wide extent on the above named factors. However, also negative side-effects have been mentioned by OTSYINA 1998: 43, 48-49): combining all the different activities (agricultural production, domestic work, child care, income earning, etc.) is very time consuming and can result in the fact that women are overworked. Many men, in the moment they realise that their wives have their own income, withdraw financial support or even beat their wives for money. Some men even become jealous and harass their wives which feel like loosing their dignity and continue to be weak, sick and unhappy. These factors show negative effects on the whole family, especially on the children.

[99] The problem of discrimination of women in wage-labour has to be mentioned within this context (see TGNP 1993: 61-62; ANDORFER 1995: 29, 65). DANKELMAN & DAVIDSON (1988: 14) write: „When rural women do participate in the wage-labour economy, they face discrimination and lower wage rates. In countries which are trying to meet rural needs through the development of agroindustry, discrimination in job classification and wages is especially intense."

6.1.1.3 Credits and loans

> "For poor rural families in developing countries, access to credit and savings facilities such as banks has the potential to make the difference between grinding poverty and an economically secure life."
>
> M. ZELLER & M. SHARMA in their article on rural financial services for poverty alleviation (2001: 191).

The statement above summarises the general benefit of credits; further benefits will be outlined at the end of this chapter.

Especially in the rural areas of most so-called 'developing countries', financial services such as credit and saving systems are sadly inadequate. This situation is also reflected in the case studies since there is no assistance concerning credits or funds for female small-scale farmers through the projects. However, the farmers mentioned several institutions giving loans to female small-scale farmers (but some only for groups/~members).[100] Formal institutions like banks have been named as well, but the farmers referred to complications like strict collateral requirements, high transaction costs („If you lend 200.000 Tsh you have to pay 30.000 Tsh per year to the bank" - 1T-l) as well as time spent in travel and doing paperwork (see also ZELLER & SHARMA 2001: 191-192). V. BÜLOW et al. (1994: 10) mention gender-related problems when commercial bank loans are signed without making clear who bears the legal responsibility for it; husbands simply fear to loose their property on account of their wife's loans.

The informal sector - groups, friends and relatives – is asked for small amounts only (see also CROWLEY et al. 1996: 24-25). Some farmers mentioned institutions who give loans to groups: Church (1K-l), SIDA (1K-m), City Council (2T-h and 3T-h).

Often, to obtain a loan, a farmer must be a member of a group or a co-operative as donor agencies and banks prefer to deal with groups instead of individuals; the rationale behind this model is that the groups act as surety where there is no or little collateral. They make sure that unreliable projects are not started and function as pressure to guarantee that loans are repaid in time (v. BÜLOW et al. 1995: 4).

Farmers 4T-l and 6T-l have received and paid back a credit (farmer 4T-l has received 100.000 Tsh for buying a dairy cow in 1999 and has paid it back in six months - 4.000/week). 3K-l, 2K-m and 5T-l have applied for a credit (see Tab. 27).

[100] *Kenya Women Finance Trust* (3K-l), a governmental society/co-operative named JAMI that gives loans in case of sickness and for school fees. The money has to be paid back by the children after finishing school and having found a job (2K-m), Ministry (3K-m), Oxfam (1T-h), SEDA, PRIDE (4T-l, 6T-l; HPI (5T-l), SIDO (6T-l), *Ustaji Wa Jami* (4T-m), World Vision (5T-m, 6T-m). Information on some of the institutions named above can be found in TEMU (1995: 18-19)

Tab. 27: Credit situation

	Farmers																	
Aspects related to credit	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Farmer applied[1]			**1**		**1**								**2**	**1**	**2**			
Group applied[1]	**2**			**2**						**1**	**1**	**1**						
Use[2]	**4**		**3**	**5**	**7**					**1**	**1**	**2,3**	**6**	**6**	**6**			

Legend:

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; ☐ = not on resp. farm; ▒ = not in the resp. zone/country; * = female-headed household
[1] **1** = yes; **2** = applied and received
[2] **1** = oil press; **2** = mill; **3** = shop; **4** = water pump; **5** = tractor; **6** = dairy cow; **7** = school fees

Generally, group-based activities by women have been shown to serve as important catalysts of change in Africa (SHARMA 2001: 201). Five groups - the ones in the HPAs of SCAPA, Tanzania (1T-h, 2T-h - oil press; 3T-h - mill, shop) and two Kenyan groups (1K-l - water pump; 1K-m - tractor) have applied and received a credit. Problems mentioned in general are repayment (1K-m and 2K-m), long time till allocation (1T-h) and no response (3T-h). According to Tab. 27 the low potential areas in Tanzania show the less favoured conditions. In general, it can be said that most income-generating projects should be seen as survival activities fulfilling basic needs within the family; however, some farmers and groups (1K-l, 3K-l, 1K-m) keep qualified business activities running.

A problem reported is that women's groups and participants see the loans as a gift and not as a crredit to commercial loan conditions (v. BÜLOW et al. 1994: 10).

The women said that the credit situation is the same for the male farmers. All farmers would like the projects to integrate credit programmes as being fundamental to empowerment- and development-related activities. NYAKI (1998: executive summary) stresses the necessity of credits especially for the procurement of improved agricultural inputs. He recommends that farmers may be assisted through formal training, seminars and workshops on the procedures required to form viable savings and credit associations or farmer groups to promote access to credit facilities and better markets for their products (see also CROWLEY et al. 1996: xvi, 48). Furthermore, they help to establish micro-enterprises (ibid.). A future goal has to be to remove institutional barriers to the creation and expansion of small-scale rural credit and savings institutions and to make them available for small farmers as well as traders, transporters and processing enterprises (PINSTRUP-ANDERSEN et al. 2001: 15). Micro-finance can be used as a vehicle for women's empowerment. Studies have shown that micro-finance programmes, especially targeting women, are an effective tool, not only to improve a woman's status by enhancing her control and influence in household decision-making processes as well as gaining knowledge and social capital, but in enhancing the overall household welfare (SHARMA 2001: 197-199). A

promising approach is the support of innovative micro-finance institutions such as NGOs which combine credit services with e.g. literacy programmes, training in enterprise management and education in health and family planning. Lack of capital is simply not the only factor keeping poor rural households from improving their welfare. Group-based systems seem to be promising in the case study areas. However, there is no single blueprint for success: programmes must be designed to harness a community's particular strengths, taking criteria such as local resources, ethnicity, occupational patterns, historical experiences, etc. into consideration. Furthermore, caution is demanded since receiving a loan is not an automatic guarantee that this will allow women to retain control over its use. Also on these aspects governments, donors, practitioners and research institutions have to work closely together if empowerment effects are to be significant and lasting (see also SHARMA 2001: 200; ZELLER & SHARMA 2001: 194-196).

Within this context, women form an especially vulnerable group. It can be summed up with SHARMA (2001: 201): "Over the short run, micro-finance programmes provide a handy, potentially cost-effective, and politically feasible tool for moving toward gender equality."

6.1.2 Standard-of-living: farm budget

Inputs and expenditures have been estimated to find out the total *net* farm income. Expenditures counted are all costs related to farm inputs (fertilisers, manure, seeds [see also Fig. 87], seedlings, pesticides, medicine for livestock, fodder, labourers, hired tools[101], rent for land, etc.) and household expenditures (water, firewood and charcoal)[102] (see Tab. 28). Expenditures like for daily needs such as soap, grinding maize, firewood (big bunch 10 ksh, small 5 ksh) or charcoal, tools, etc., for rents, credits, school/university fees, costs for medicine, etc. and financial contributions given to family members living outside the household have to

Fig. 87: Kale plant on farm 3T-h; the seeds will be recycled

[101] Costs for ploughing of land vary even within a small area: 2.500-3.000 Tsh/acre (5T-m), 3000 Tsh/acre (6T-m), 5.000 Tsh/acre (4T-m), 6.000 Tsh per acre (4T-l, 6T-l), 9.000 Tsh per acre (5T-l).

[102] There is a considerable difference between the prices to be paid for charcoal: Farmers 2T-h and 3T-h pay between 3.000 – 3.400 Tsh per bag; farmer 3T-l buys one bag for 5.000 Tsh, farmer 1T-h, however, has to pay 5.6/700 Tsh per bag, because the charcoal is produced in the lowland (Karangai); farmer 3K-m buys charcoal for 250 ksh/bag, in the dry season for 180 ksh only.

be taken into consideration as well. However, an exact estimation of all costs was almost not possible due to many variables such as short-time changes and the fact that the farmers normally do not record their expenditures. CROWLEY et al. (1996: x) summarise the difficulties experienced: “Income data is notoriously difficult to elicit. Farmers frequently find it difficult to calculate expenditures over a broad time frame, and many farmers claimed that they could not make a gross estimate or a round approximate figure of how much income they made or what their expenditures were. Furthermore, farmers prefer to hide illegal sources of income or certain expenditures which are associated with social stigma […], particularly if others are present […]. Finally, there are many piecemeal sources of income or expenditures […] that are difficult to reckon” (see also KIRONDE & KAYUZA 1996: 14). The average farm income has been estimated after calculating mean and highest income.

Tab. 28 only lists the various kinds of expenditures without expression in terms of money due to the difficulties described above. However, rough estimations have been made on the basis of concrete data available. Household-related expenditures have not been listed as they occur in all households. Farmer 1T-l scores by far the lowest rate of expenditures, 2K-l and 3T-l have got the highest rate of expenditures.

Tab. 28: Expenditures

	Farmers																	
Expenditures	1K-l	2K-l	3K-l	1K-m	2K-m*	3K-m*	1T-l*	2T-l	3T-l*	1T-h	2T-h*	3T-h	4T-l*	5T-l	6T-l	4T-m	5T-m*	6T-m*
Chemical fertilisers		x	x	x	x	x				x	x	x						
Pesticides[1]	1	1	4	4	1	3		2	2	4	1	5				2	3	3
Manure															x	x	x	x
Seeds bought[2]		4	1	2	3	4		5	x	5						1	4	4
Tools (plough, oxen, tractor)		x							x				x	x	x	x	x	x
Land/flat		x							x								x	
School/university fees		x	x		x	x	x	x	x	x	x	x	x		x			
Fodder	x			x					x				x	x				
Firewood, charcoal	x	x	x	x		x		x	x	x	x	x	x	x	x	x	x	
Water	x		x								x	x				x	x	
Animal treatment	x	x	x	x		x		x	x	x	x	x	x	x	x			x

Legend:

[1] **1** = only if money or if no other choice; **2** = only tomatoes; **3** = vegetables, **4** = vegetables & cash crops; **5** = vegetables, cash crops & against weeds
[2] **1** = vegetables irregularly¸ **2** = beans and maize irregularly; **3** = beans regularly; **4** = vegetables regularly; **5** = all seeds bought
☐ = not on the resp. farm; ▒ = no use in resp. zone/country, **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household

Six farmers have employed permanent labourers, and twelve farmers have employed casual labourers (see Tab. 29). The farmers in the LPAs within SCAPA project have not engaged farm employees. Farmer 1K-m has employed the highest number of permanent as well as casual labourers (5 and 4). The salary for a permanent labourer is to the amount of 1.000 - 2.000 Ksh/m; a casual worker is paid ~50 Ksh/d (6

am - 4 am). Casual labourers are mainly employed for farm activities like cultivation and harvesting. Permanent labourer employment is relatively high on the Kenyan farms compared to the Tanzanian farms (4 out of 6 compared to 2 out of 12).

Tab. 29: Aspects related to labourers

	Farmers																	
Labourers	1K-l	2K-l	3K-l	1K-m	2K-m*	3K-m*	1T-l*	2T-l	3T-l*	1T-h	2T-h*	3T-h	4T-l*	5T-l	6T-l	4T-m	5T-m*	6T-m*
Labourers permanent in total	2	1	4	5								1			3			
Labourers perm. - **house**			1	1														
Labourers permanent - **farm**	1	1	3	4								1			3			
Labourers permanent – **house & farm**	1		1															
Labourers casual in total	1	1		>5		2				1	1	2		1	2	1	1	1
Labourers casual - **house**															1			
Labourers casual - **farm**	1			>5						1	1	2	1	1	1	1	1	1
Labourers casual – **house & farm**		1				2								1				

Legend:

= not in the resp. zone/country = not on the resp. farm	**K =** Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household

The various aspects pertaining to income have been listed, and a ranking has been conducted as can be seen in Tab. 30. As far as possible, kin gifts and financial contributions from persons not living within the households have been incorporated; however, an exact estimation is difficult to give since these contributions only form an irregularly source of financial supply.[103] Decision-making about the financial incomes is discussed in chapter 6.2.3.1).

The highest farm income is earned by farmer 3T-h, followed by farmer 1K-m (see Tab. 30). The other farms earn far below 100.000 Ksh. The average farm income on these farms is 31.600 Ksh. According to T'Hart (1992) in Shinyanga Region, Tanzania the average annual income of a women farmer is ~ 230.000 Tsh (~21.000 Ksh); a study carried out in Bukoba District, Tanzania found that the average household income is ~ 155.000 Tsh (~ 15.000 Ksh) (KIRONDE & KAYUZA 1996: 23). Hence, the average farm income on the farms of the present study is clearly higher.

Tab. 30 also shows the relation between expenditures related to farm income and net income: accordingly, the highest output can be found on farms 1T-h and 3K-m.

The highest off-farm income among the female farmers is earned by 3K-l, the lowest by farmer 2K-l; among the husbands, the male Kenyans receive the highest salary.

The highest rank as to total amount of income is hold by farm 1K-m, followed by 3T-h and 3K-l. The next income-group is formed by farmers 2K-l, 1T-h and 3K-m. The other farms have got an annual income below 100.000 Ksh out of which farm 6T-m has got the lowest income in total. Since farmers 3T-l and 6T-m do not have additional sources of income at their disposal they rank at the bottom of the income list.

[103] ~80 Ksh = 1 $; ~780 Tsh = 1 $ (January 2000)

Tab. 30: Aspects related to income

	Farmers																	
Project	**NSWCP**						**SCAPA**						**HASHI-ICRAF**					
Income/year	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Off-farm income – ff (except group) in Ksh[1]		5	96		60	60	36								8			
Off-farm income – husband in Ksh[1]		180	120	180						42		60		14	30	60		
Off-farm income – other members in Ksh[1]						19				20	15		10					
Kin gifts	?	?	?	?	?	?	?			?	?	?			?		~7	
Farm income net in Ksh[1]	45	12	62	180	2	50	0.25	45	28,7	77	25	251	30	23	15	25	42	23
Expenditures in Ksh[1]	5.5	3	19	30	1	3		8	5	4	3	35	3.5	10	5,5	11.5	5	5.5
Relation expenditures - income	1:9	1:5	1:3	1:6	1:3	1:17	1:1	1:6	1:7	1:20	1:9	1:8	1:11	1:4	1:4	1:3	1:9	1:4
Total income in Ksh[1]	45	197	287	360	62	129	38.5	45	28,7	139	40	310	40	37	53	85	49	23
Ranking (best = 1)	**11**	**4**	**3**	**1**	**8**	**6**	**13**	**11**	**15**	**5**	**12**	**2**	**12**	**14**	**9**	**7**	**10**	**16**

Legend:

[1] **=** Add three zeros! ~80 Ksh = 1 $ (January 2000)
K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; **ff** = female farmer; * = female-headed household; **f** = female, **ma** = male; ☐ = not on the resp. farm; ▒ = not in the resp. zone/country

The analysis shows that the amount of off-farm income in total is clearly higher in Kenya; accordingly, four Kenyan farms belong to the highest income group. In Kenya, off-farm employment is an important source of family income, also shown by the fact that only one family depends on farm income exclusively (1K-l, retired) compared to six families in Tanzania. Even more striking is the fact that out of the six Tanzanian families five are female-headed farms who additionally belong to the lower and even lowest income group (6T-m, 3T-l, 4T-l, 2T-h, 5T-m).

To come to a true reflection of the real standard-of-living-situation the income has not only to be correlated with aspects like farm- and household-related inputs and expenditures but also with the number of household members (and dependants!). The correlation given in Tab. 31 shows that only 2K-m and 2T-h have undergone bigger changes in their ranking position, 2K-m ranks lower and 2T-h ranks higher. Out of the eight female-headed households six households still belong to the lower resp. lowest income group. In total, a realistic reflection of the situation concerning money available is given by this correlation. The shift of farmer 3K-l to place No. 1 is justified, although the income difference is not as high as it seems since the couple has to support the university education of two children.

Tab. 31: Aspects related to estimation of real standard-of-living-situation

	Farmers																	
Income/year	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Total income in Ksh[1]	45	197	287	360	62	129	38.5	45	28,7	139	40	310	40	37	53	85	49	23
Ranking	**11**	**4**	**3**	**1**	**8**	**6**	**13**	**11**	**15**	**5**	**12**	**2**	**12**	**14**	**9**	**7**	**10**	**16**
Household members[2]	**5**	**5**	**2**	**5**	**9**	**6**	**6**	**6**	**4**	**8+1**	**4**	**7**	**5**	**5+ 1**	**6**	**5+2**	**5+2**	**8**
Income per capita	**9**	**39,9**	**143,5**	**72**	**6,9**	**21,5**	**6,4**	**7,5**	**7,1**	**10,7**	**10**	**44,3**	**8**	**6,2**	**8,9**	**12,1**	**7**	**2,9**
Ranking (best = 1)	**9**	**4**	**1**	**2**	**15**	**5**	**16**	**12**	**13**	**7**	**8**	**3**	**11**	**17**	**10**	**6**	**14**	**18**

Legend:

[1] Add three zeros! ~80 Ksh = 1 $ (January 2000)
[2] number of family members completely supported, the added number indicates relatives occasionally living in the household
K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; **hh** = household
* = female-headed household

Finally, the standard of living has to be related to kind and number of possessions of a household like kind of house[104], car, bicycle, radio, furniture, agricultural tools, etc. (see Tab. 32). As BRADLEY (1991: 230, 234) notes, documenting the assets of a household (physical structure of the house and its contents) gives a coarse indication of financial resources, thus, of the relative success of the farm and even gives some insights into traditional and modern tendencies within the family.[105]

Although being poor, farmer 1T-l has a fenced grazing area which has been established by her later husband. Ox-carts are only owned by six farms, and only six farms dispose of a plough (farmer 1K-l possesses three ploughs). Especially ox-carts and ploughs seem to be indicators for the living-standard of a household as these items are mainly found in the well-off-households (see also T'HART 1992: 42). Bicycles form an important means of transportation and are found on 14 farms – farmer 6T-l has got two bicycles. However, six female farmers do not use the bicycle themselves, either the husband needs it (2K-l, 3T-h) or they do not want/are not able to ride a bicycle (1K-l, 3K-l, 1K-m, 6T-l). All farms without a bicycle are female-headed. Interestingly, all farms except the three poorest (female-headed) households dispose of a radio. It can be summarised that the estimation of possessions reflects the living-standard situation of the households: farmer 3T-h has the best situation, followed by 1K-m and 3K-l. Furthermore, it seems that female-headed farms have got less possessions (see also T'HART 1992: 51).

[104] However, after BRADLEY (1991: 234) in the densely populated western part of Kenya corrugated metal roofs cannot be used as a reflection of wealth since in many cases, the pressure on land is so high that traditional grasses can no longer be found. After HATIBU & MTENGA (1996: 48-49) witchcraft is said to be the cause for low quality houses in Shinyanga, Tanzania (see also SHAO et al. 1992: 143.

[105] Farmer 6T-m lives at her father's place, but has got her own house and fields. She shares the farm resources with the family (crops, etc.) which makes it difficult to separate her household completely.

Tab. 32: Estimation of possessions

	Farmers																	
Possessions (in total numbers)	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Kind of house[1]	3	3	1	1	3	3[4]	5	2[4]	5	4	3[4]	1	3	6	4	4	3	6
Car				1								1						
Bicycle	1	1	1	1				1	1	1		1	1	1	2	1	1	1
Ox-cart	1		1	2				1				1			1			
Plough	3	1	1	1				1				1						
Wire fence	x		x	x		x	x	x		x	x	x			x			
Furniture[2]	3	3	1	1	3	3	3	3	4	3	3	1	4	4	3	3	2	4
Radio	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	
Household appliances[3]	3	2	1	1	3	3	4	3	4	3	3	1	3	4	3	3	1	4

Legend:

[1] **1** = completely cement – big; **2** = completely cement – small **or** bricks, cement floor & inner walls – big; **3** = bricks, cement floor & inner walls – small; **4** = only bricks – big or bricks & cement floor – small; **5** = traditional/low standard; **1 – 5** with iron sheets; **6** = traditional, grass thatched/ low standard

[2] **1** = good quality & more than basics (table, chairs, cupboards, etc.); **2** = good quality & basics; **3** = standard; **4** = below standard

[3] **1** = high diversity & amount; **2** = upper standard; **3** = standard; **4** = lower standard

[4] have begun to built new/extend old house

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household; ☐ = not on the resp. farm; ▩ = not in the resp. zone/country

Fixed capital in form of cattle has to be considered, too as e.g. pastoralists like Masai or Sukuma might be poor in terms of possessions, but can have a lot of wealth in form of cattle. A comparison of livestock numbers given in Tab. 12, chapter 4.3.3 shows no big variations but rather a confirmation of the situation as e.g. farmers 1K-m and 3T-h rank the highest regarding number and quality of livestock.

Like has been outlined by van VUUREN (2000: 2) different studies carried out on the status of female-headed households come to contradicting results; accordingly, this study contributes to the disparity: concerning the Tanzanian farms it supports the findings of SMITH & STEVENS (1988: 564), SENDER & SMITH (1990: 63) and MBUGHUNI (1994: 219) that the poorest households are predominantly female-headed. The outcome furthermore is in line with the findings of HASSAN (2000: 6) who carried out a study on rural households in Botswana. On the other hand, it is interesting that the two female-headed farms in Kenya belong to the first third within the ranking on financial resource availability and, incorporating financial resources per capita, farmer 3K-m belongs to the first five farmers. This fact shows that it cannot generally be assumed that female-headed households are always disadvantaged relative to male-headed households. Since the number of samples is too small for making generalisations the two different results shall be exposed to further discussions, e.g. on the criterion whether the findings might be related to the fact that the farm samples derive from different countries.

Within this context the term *poverty* has to be discussed briefly because this term is a multi-dimensional concept (VAN VUUREN 2000: 5). It is in fact a multi-faceted phenomenon: besides income and consumption it also includes vulnerability, powerlessness, isolation, social inferiority, physical weakness, lack of decision-making power, lack of assets, insecurity, discrimination, inequality, exclusion from educational possibilities, etc. (see e.g. BAGACHWA 1994, RAHNEMA 1995, MANSHARD & MÄCKEL 1995, LINDBERG 1996; MUKANGARA & KODA 1997: 16).[106] Poverty is often associated with lack, deficiency or deprivation of particular material means, the 'non-availability of the minimum of 'necessaries' required for economic or biological survival, as defined by one's particular culture […]" (RAHNEMA 1995: 160). This perception has its roots in history: In 1948, for the first time entire nations and countries came to be considered as poor when one of the first reports of the World Bank correlated global poverty with the countries national gross products, and countries with an average income per capita less than $ 100 were postulated as poor and underdeveloped per definition. "Consequently, national income was introduced as a new global measure for expressing the various stages of economic development" (RAHNEMA 1995: 161).

UNDP has developed a Human Development Index which combines indicators of real purchasing power, health aspects like life expectancy and educational attainment (KIRONDE & KAYUZA 1996: 2; OTSYINA 1998: 5). However, it was recognised that material things which define a minimum standard of living are relative to various societies, and that perceptions of poverty differ according to cultures which means that "[…] there are also cultural criteria which cause each community and person to define their quality of life in a different way with shifts in accents and time" (VAN VUUREN 2000: 7). Yet, it was assumed that economic growth and prosperity were the key to eradicate poverty (RAHNEMA 1995: 160, 163). But, "[…] in most developing countries, neither the production of economic resources and commodities, nor the extension of social services have ultimately served the poor. […]. […] what the poor need […] is rather the recovery of their actual capacity to tap their own vernacular, locally available resources – which are totally different from what economists call resources" (ibid.: 166-167). And he explains further (ibid.: 168): "The overwhelming majority in the world still shape and satisfy their needs thanks to the network of human relationships they preserve within their vernacular spaces, and thanks to the many forms of solidarity, co-operation and reciprocity they develop within their communities." It is due to these networks that these people are able both to induce changes and satisfy their needs. Modern economy, the author argues, devalues these activities and even forces people to abandon them (ibid.). Thus, the author concludes (ibid.: 171): "[…] the answer to imposed forms of material poverty has to be found in the people's own ethical and cultural approach to poverty."

[106] Vulnerability (in German ‚Verwundbarkeit oder Risiko- bzw. Krisenanfälligkeit einer sozialen Gruppe) is based on the dynamic of processes. It describes the lack of possibilities to avert emergencies, reaching from natural hazards to political crises (MANSHARD & MÄCKEL 1995: 31; see also CHAMBERS 1989).

How do the farmers regard poverty? Individual discussions with diverse persons within and outside the different households researched as well as group discussions showed that the people perceive poverty as a state in which people lack basic goods such as food and clothing or education, and the means to acquire them. Sometimes, poverty can also refer to a person who is wealthy after the common definition (material goods, education) in the respective community, but who lacks 'common sense', thus, who is selfish and unable to put the wealth to good use. The view on poverty can vary among the different sexes. Regarding the aspect of how a poor man is perceived, women especially referred to aspects like lack of care-taking for the family, e.g. due to alcohol, or lack of willingness to/openness for change. Interestingly, the view on poor women was almost the same among both men and women. Both stressed the aspects lack of decision-making power, assistance and high workload. This aspect demonstrates that men are well aware of restricting factors for women, and that poverty is not just lack of material things. Moreover, female poverty is closely connected to how patriarchal relations serve to disempower women – from the view of the participants (see also OTSYINA 1998: 28-29).

This study attempts to demonstrate and explain the manifold approaches of farmers to use their local resources in a sustainable way, among others empowered through solidarity networks, supporting and enhancing ecological, socio-cultural, political - and by this – economic stability.

CROWLEY et al. (1996: 13) mention that the significance of off-farm income as an indicator for wealth and success in farming is growing. A comparison of the relevance of farm and off-farm income by means of the total yearly amount on each farm shows that in seven households (2K-l, 3K-l, 2K-m, 3K-m, 1T-l, 6T-l, 4T-m) out of eleven households engaged in off-farm income generating activities off-farm income is more relevant in terms of income than farm income; on farm 1K-m off-farm and farm income are the same. Only for 3T-h farm income is clearly more important than off-farm income.

Even more striking is the fact that among the six households ranking at the bottom of the income list (only income) only farmer 1T-l has got an off-farm employment (casual labourer, a job ranking the lowest among the different types of off-farm income sources classified in chapter 6.1.1) which indicates that poor households are least likely to be involved in off-farm activities and that access to off-farm income is associated with wealth. This directly corroborates findings of CROWLEY et al. (1996: 38-43) in western Kenya. Furthermore, five out of these households are female-headed out of which four households are located in Tanzania. Summing up, it can be seen that there is a correlation between the factors being resource-poor, female-headed household and off-farm income.

6.1.3 Labour division

> "For most women in the countryside, an ordinary day starts with a trip to search for firewood, then going to the well for the day's water supply, cooking ugali, a stiff porridge which is a staple of the Sukuma diet, walking to the market for supplies or grinding corn at the mill. Children help their mothers with the day's chores, such as going to the local well for water or sweeping the family compound."
>
> M. H. C. BESSIRE with regard to the Sukuma in Tanzania (2001: Internet).

The assessment of tasks, labour division, support and workload is important within the context of this study as high workloads and multiple responsibilities can form a decisive hindrance for women's empowerment, restricting them from participation in social, economic and political life as well as engagement in environment-related activities (see also SHAO et a. 1992: 162; OTSYINA 1998: vi).

In the so-called developing countries, and especially in Tanzania, big differences between gender-related labour division aspects are present, but are poorly researched (SCHMIED 1993: 163; ANDORFER 1995: 106-107). Only few statistical data are available about economic activities since often only wage labour is assessed. OOMEN (1992: 55) mentions that before 1960 no specific data have been assessed in Africa on head of households; in 1979 only 13 of 36 African countries had assessed data on this aspect. Often women are categorised in the national statistics as 'unpaid labourers'. Also cultural norms can prevent details on off-farm activities and by this contribute to distortions of the reality (CECELSKI 1985: 27; FAO 1985: 84; DONNER-REICHLE 1986: 7; DANKELMAN & DAVIDSON 1988: 5). After official data, only 5 % of the Tanzanian women were engaged as wage labourers in the agricultural sector (MCCALL 1987: 207).

A comparison of the labour division patterns given in Tab. 33 shows a heterogeneous situation with regard to the division of household- and farm-related activities because many different actors (women, children, males, groups, labourers) and resulting various combinations of sharing labour among different groups of actors can be found; this makes it difficult to give a clear statement as to gender-related labour division. Many women are assisted by labourers or groups since their husbands work off-farm which contributes to a different situation as well. However, the table shows that almost all married women are assisted by their husbands (or labourers, group) with regard to farm-related activities, on an almost equal basis; this is according to T'HART (1992: 24, 35) who found out in her research on gender issues in two districts in Shinyanga Region, Tanzania that men and women work together in a high percentage of the sample households. Furthermore, it can be seen that household- and reproductive-related tasks are mainly carried out by women and (female) children. These findings are according to HATIBU & MTENGA (1996: 48) who conducted a study in a village in Shinyanga District, Tanzania (see also T'HART 1992: 29). Gen-

erally, the men spend less time in domestic chores (see also HYUNA 1989: 38).[107] However, three farmers (2T-l, 6T-l, 4T-m) are assisted by their husbands concerning all household-/farm activities. When interpreting the data one has to keep in mind that many husbands work off-farm and thus cannot contribute to a wide extent to farm- or household activities but provide financial support instead.[108] Seven farmers (1K-m, 3K-m, 2T-h, 3T-h and all farmers in the LPAs in Kenya) get assistance from labourers with respect to household-/farm activities. Additionally, three Kenyan farmers, and one Tanzanian farmer (1K-l, 2K-l, 1K-m, 1T-h) are at least partly supported by their husbands. Furthermore, these Kenyan farmers as well as farmer 1T-l are supported by group members, but only as to farm activities.

The only mechanised farm activity is tillage, done mainly by oxen. Six farmers (1K-l, 3K-l, 1K-m, 2T-l, 3T-h, 6T-l) use their own equipment (farmer 1K-m uses a group-owned tractor) whereby this activity is done mainly by the male household/family members or by male labourers (see also T'HART 1992: 25). The other farmers have to pay labourers with equipment which depends on the availability of finances. The same goes for the transportation of the harvest as the same farmers dispose of an own ox-cart. Like processing and storage activities this is more a women's task (see also T'HART 1992: 25). The same goes for activities related to zero-grazing. Grazing, however, is done by labourers or male children/adults (see also T'HART 1992: 26-27). Interestingly, the application of manure on farm 1T-l is done by children only.

Fig. 88: Women and children wielding the hoe near Kahama, western Tanzania

Marketing (not listed in the table) of agricultural products seems not to have a distinctive gender-related component: the married women even sell cash crops, especially where the men are engaged in off-farm

[107] After GEIER (1990: 377) the average working day of women in the rural areas of the so-called ‚developing countries' has 14-16 hours respectively 16 hours (OBERMAIER 1986: 4). Other studies estimate 11 – 14 hours (and 8-10 hours for men), saying also the physical effort for women to be higher as the one of men (DGIC 1990: 7). Concerning this aspect BOSERUP (1986: 22-23) gives some details on kind and intensity of the work. For Sub-Saharan Africa up to 18 working hours per day are given (DONNER-REICHLE 1986: 7). HANAK (1995: 50, with reference to UNO 1991) gives the same numbers for women in Tanzania, mentioning furthermore that on the average women work 12-13 hours more per week than men. ANDORFER (1995: 107) simply mentions that the working day of women in Tanzania is as double as long as the one of men. The estimations are, however, rather problematic since it cannot be seen which parameters and factors have been considered within the studies so that they have limited meaning and show general tendencies only.

[108] However, farmer 1K-m reported that her husband (before he retired) worked the whole week in Nairobi, came home *every* Friday late evening on his bicycle (80 km) and then started ploughing by moonlight until dawn.

activities. Selling of meat or cattle can also be done by the women; no husband claimed special rights for selling products related to livestock.

Generally, the female farm managers 3T-l and 2K-m face the most unfavourable conditions as they receive support from their children only (see also Fig. 88 above).[109] Furthermore, the farmers within HASHI-ICRAF project area generally do not resp. only to a little extent get assistance from group members or labourers.

Tab. 33: Labour support and –division

	Farmers																	
Labour division**	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Household	6	6	5	6	2	6	16	3	2	2	6	6	2	2	3	3	2	2
Transport of manure	7	13	5	4	2	6	16	3	2	3	6	6	2	3	3	3	2	2
Application of manure	9	13	5	11	2	6	1	3	2	3	6	6	2	2	3	3	2	2
Tillage	13	13	5	7	2	7	14	3	2	3	6	6	7	7	7	7	7	8
Sowing/planting	11	13	5	12	2	6	15	3	2	3	6	6	2	3	3	3	2	2
Weeding, watering	11	13	5	12	2	6	16	3	2	2	6	6	2	3	3	3	2	2
Watering	11	13	5	12	2	6	16	3	2	3	6	6	2	3	3	3	2	2
Harvesting/transportation	11	13	5	12	2	7	3	3	2	2	6	6	10	3	10	3	2	10
Processing, storage	11	13	5	12	2	6	16	3	2	3	6	6	2	3	3	3	2	2
Cleaning stable, fodder, water, milking	7	2	5	7		2	16	3	2	3	6	6	2	3	3			2
Vegetable garden	7	13	5	5	2	6		3	2	3	6	6	2	2	3	2	2	2
Workload: increase, **d**ecrease, **c**onstant	c	i	d	i	i	i	c	i	c	i	i	i	c	i	i	i	i	i
Distance to farthest field in km (/ = at house)	2	/	100	100	/	4	/	/	4	/	/	12	7	1	2	4	3	7
Busiest period of the year (month)	3, 10	3, 10	3, 10	3, 10	3, 10	3, 8/9	1-3	3-4	4-5	7-8	3-4, 9	8-9	12-3	1	11-5	11-7	11, 6	12-6

Legend:

****1** = children; **2** = she & family members (except male adults); **3** = whole family (incl. husband); **4** = labourers; **5** = she & labourers; **6** = she, children & labourers; **7** = labourers & family; **8** = group; **9** = she & group; **10** = family & group; **11** = she, group & labourers; **12** = she, children, group & labourers; **13** = she, children, husband (partly), group & labourers; **14** = only males; **15** = only adults; **16** = children & women

☐ = not on the resp. farm; * = female-headed household; **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA

Households are highly dynamic systems with high variations of labour availability as a household passes through different stages during it's development process (life cycle dynamics): young households ('growth phase') and old households ('dispersion phase') face more labour constraints than mature households which are in the 'expansion phase' and are said to dispose of enough family labour (MAFURU 1989: 4-5). A comparison of household-related data from Tab. 6 in chapter 4.2 shows that seven Tanzanian families (1T-l, 2T-l, 3T-l, 1T-h, 6T-l, 5T-m, 6T-m) and family 1K-l face the most unfavourable conditions concerning relation adults – children below the age of 14.

[109] After observations of T'HART (1992: 26) children in households with few adults (especially in female-headed households) are more involved in farm- or household-related activities.

On the whole, the busiest period of the year varies as to the natural conditions (seasons) and the farming system: whether a farmer has to harvest coffee (3T-h), is busy with planting beans (3T-l), etc. It also has to do with personal estimations whether the period of harvesting or planting is regarded as more labour-intensive. However, it is interesting that the highest agreement is reached among the Kenyan farmers.

Accessibility of land is crucial when it comes to labour aspects: except 4T-m and 5T-m all farmers have got at least one field close to the homestead. Six farmers, especially the ones within SCAPA project area, do not have other fields (2K-l, 2K-m, 1T-2, 2T-l, 1T-h, 2T-h). The distance to the farthest field varies: two farmers dispose of plots ~ 100 km away, looked after by a labourer (3K-l, 1K-m). The other farmers cultivate their fields themselves and walk up to 12 km (farmer 3T-h uses a car).

13 farmers said that the workload is increasing (out of which five are female-headed), mainly because of children and new technologies.[110] Farmer 3K-l was the only farmer who said that her workload decreases. Labour shortage can be an important hindrance for a sustainable management of the whole farming system (see also CROWLEY et al. 1996: 13; WILLIAMS 1996: 4). Asked what do if the workload is too heavy the farmers referred to a. o. hired labour in case of money available (3K-l and 1K-m, 2K-m, 3K-m, 4T-l), the group (1K-l) and children (2K-m, 3K-m, all farmers in HASHI-ICRAF project area). Farmer 1T-h said that the children have to grow up; farmer 1T-l referred to the tradition of the Masai: "If the workload is too much, the husband has to marry another wife."

Nine farmers (2K-l, 3K-l, 1K-m, 3K-m, 1-3T-h, 4T-l, 5T-l) said that the workload is increasing through zero-grazing, but the farmers in the HPA of SCAPA project and farmers 4T-l and 5T-l stressed the importance of and improvement through this practice, also regarding environmental aspects; farmers 2T-l and 3T-l referred to positive effects only. This is according to a study on the impact of zero-grazing in the HPAs of Kenya; here, for the women the improved food and health situation as a major benefit counterbalanced the much higher labour input (NEDA 1997: 17, 33).

Both, boys and girls have to help with household- and farm activities, some activities are related to gender roles: fetching firewood and washing dishes is a typical duty for the girl children, whereas looking after cattle is a typical task for boys. However, it has been observed that where there are only boy children in the family they are entrusted with all tasks like fetching water, looking after cattle, going to the market, setting up and cleaning the table, wiping clean, washing clothes, etc.[111]

[110] In general, the farmers wake up between 5.00-6.00 a.m., start the daily work, have breakfast between 6.30-8.00 a.m., lunch between 12.00-1.30 a.m., dinner between 7.30-9.30 p.m. and go to bed between 9.00 and 10.30 p.m.

[111] A study in Burkina Faso showed a decisive difference between the daily duties of boys and girls, having a direct correlation to gender-specific discrepancies in education (DONNER-REICHLE 1986: 6). BRYCESON (1995: 57) mentions that in times of economic crises especially boys are involved in petty trading, with the effect that they attend schools less regularly than girls.

Summing-up, the table shows that labour division concerning farm-related activities is almost equally shared among the couples (or labourers, group considering off-farm activities of the husbands). Household-related activities, however, are more women-specific although three farmers completely share these activities with their wives. Especially the female-headed farms generally face more problems as to labour shortage because they often lack financial resources to employ labourers.

6.2 Socio-cultural and political aspects

6.2.1 View on education

> "[…] education helps create more productive workers and thereby improves income equity. It helps people participate more meaningfully in political and civic life. It improves overall economic growth and leads to greater care of the environment. And it helps people adapt to the demands of globalization and to shape it" (FRITSCHEL & MOHAN 2001: 215).
>
> H. FRITSCHEL & U. MOHAN on girls' education (2001: 215).

Education forms one of the most important factors for the betterment of life conditions of the people as well as concerning economic aspects of a country as a whole (see e.g. BRADLEY 1991: 233; LE GRAS 2000: 45; FES 2001: 46). For instance, in the research area of CROWLEY et al. (1996: 19) in western Kenya and OTSYINA (1998: 28) in western Tanzania, farmers identified education as an indicator for success in farming and as the key to life.

The analysis of data related to education allows to draw a positive conclusion as to the farmer's views on the role of education in general. The quotation by HASSAN (2000: 10) who carried out research in rural Botswana can be applied to summarise the outcomes of the analysis: "Education, as a means of attaining a job and income, remains a key strategy […] for maintaining and increasing the general welfare of individuals and families." Consequently, the women (and their husbands as well) strive for a high degree of education which corresponds to the statement of BMZ (2000: 277) that there is a rapidly increasing demand for children's education by parents, children and communities.

All farmers liked going to school very much and said that education holds a key position within the context of women's development and empowerment. Farmer 2K-I illustrates this aspect: „If I would not have received education, and would - because of my education - not have my job, how would I have been able to do all this?"

This quotation refers to the assumption that "[…] as jobs and wages for women increase, parents may close the education gap and invest more in their daughters' education" (QUISUMBING, cited in FRITSCHEL & MOHAN 2001: 217). This will also posi-

tively effect the economy. not only on the local level (family, community), but even on the country-level (ibid.; see also BONGAARTS & BRUCE 2001: 64). Some quotations are listed in Tab. 34 below:

Tab. 34: Quotations of some farmers with regard to education

3K-l	"To learn is to develop."
1K-m	"Endelea ni vizuri" – to grow is good, "the more the better."
2K-m	"Education is the key."
3K-m	"Education means empowerment and development."
1T-l	"Elimu ni muhimu" – education is important.
2T-l	"Education is the key to everything. Education is No. 1, helps to get a good job. Education can never be enough."
3T-l	"Bila elimu maisha ni shida" - without education life is a problem.
1T-h	"Elimu haina mwisho" – to learn has no end.
4T-l	"Bila elimu hakuna maendeleo." - without education no development.
4T-m	„Wengi hawajapata elimu, si ndyio? Lakini, elimu ni muhimu kwa sababu unajifunza mingi. Vile vile elimu ni taa, kioo, mwanga. Kwa mfano, if you know about agriculture you know what to plant on which soil. Altogether we are learning" – Many did not receive education yet, isn't it? But, education is important because you learn a lot. Equally, education is like a lamp, a mirror, light.

Asked about their opinion with regard to education and sex, all women said that education is important for boys and girls in the same way. However, the quotation of farmer 3T-l elucidates that girls/women are still in a disadvantaged position when it comes to education: "Education is important for both boys *and* girls, but still, women don't receive enough education. It's still them who do a lot of work, more than men." Farmer 2K-m supports this statement and refers to the aspect that girls/women need education to have the possibilities to empower themselves: "There is no difference, but the people in this region in general differentiate between boy and girl. Education, especially for girls and women, is the central problem and focus in this region."[112]

Fig. 89 stresses these two named facets by showing that the number of boys going to school is much higher than the one of girls; on the other hand, the number of pupils in total is decreasing rapidly from classes 1 to 4, reflecting the financial and labour situation of the region.

This outcome also reflects the global situation of still more boys than girls going to school - especially in Sub-Saharan Africa, and that the number of illiterate persons is higher among female adults than among men (BMZ 2000: 217, 277). Also in Tanzania and Kenya, education shows a strong gender-related aspect. Girls often do not go to school or drop out early as they are a source of wealth and labour; hence, they

[112] The farmer has grown up in another region where, after her opinion, the differences between boys and girls concerning education are less distinctive.

Fig. 89: ***‚Elimu ni maisha‘*** **(education is life) - motto of a school near Maralal, Northern Kenya**

are married off early, and sending them to school means wasting money. Accordingly, girl's early marriages are the major sources of illiteracy; this has been stated e.g. for the Wasukuma in western Tanzania and a research area in western Kenya (SHISCAP 1992: 4; SHAO et al. 1992: 151-152, 175; HATIBU & MTENGA 1996: 59; CROWLEY et al. 1996: 45, OTSYINA 1998: vi). Another important aspect is lack of financial resources.[113]

SHAO et al. (1992: 175) mention that very little data exists on adult education. Four women (3K-l, 2K-m, 1T-h, 6T-l) in the research area are engaged in adult education. They mentioned lack of time, especially during the planting season/cultivation periods, as one major constraint for the farmers to attend the courses. Asked, how they motivate them, they said that they tell them that education is the key to better living conditions. Another important constraint mentioned was lack of (sufficient) salary (see also SHAO et al. 1992: 175).

I was requested several times by women‘s group members to talk about education in general as well as with regard to my own biography. Especially farmer 2K-m was very engaged and functioned as a mediator between me and the women. Again and again she pointed out that women's empowerment is directly linked to education: „Without education where would I be? Let's go and see the group and tell them that you would not be here without education. This makes them think, it will motivate them."

The data do not show a correlation between education and reduction of pregnancies which is one of the benefits shown by several studies: one additional year of female education reduces fertility by 5 to 10 % (see FRITSCHEL & MOHAN 2001: 216). This is because of the fact that the women stay longer in school and simply start later with giving birth as well as due to increased opportunities, e.g. regarding economic criteria (MANSHARD & MÄCKEL 1995: 19; LE GRAS 2000: 44-45). Furthermore, an IFPRI study has shown that women's education as one of the underlying determinants (besides status, health environment and food availability) accounts with 43 % for the

[113] The farmers said that they did not go to secondary school because their families had no money; famer 3T-l noted that her father did not see the importance to send a daughter to secondary school since she will marry and thus, the education will be for nothing. This aspect fits to findings in other study areas like in Mozambique and Mexico (FRITSCHEL & MOHAN 2001: 219).

total reduction in child malnutrition in the so-called 'developing countries' between 1970 and 1995 (PINSTRUP-ANDERSEN et al. 2001: 15).

However, asked about how many children a woman should have nowadays, the answers of the women were directly linked to education, finances and resource degradation. All women plead for a reduced number of children, for mainly two reasons: they clearly explained the linkages between population pressure and resource degradation on the one hand and the need of good education for a better life in general on the other which is connected with high financial input: a reduced number of children simply results in a better care for each child. Farmers 3T-l and 3T-h simply referred to the general aspect of 'life being hard'. All agreed that the highest number should be four children. Six farmers regard two children as ideal (2K-l, 3K-l, 1T-h, 3T-h, 4T-m, 6T-m), five said up to three (1K-l, 2K-m, 3K-m, 1T-l, 2T-h) and seven plead for four children (1K-m, 2T-l, 3T-l, 4-6T-l, 5T-m) out of which farmer 2T-l had an interesting concept: "In the moment the families should have maybe four children, their children should have 2, and their children only one child." A friend of farmer 1K-l also gave a reason why many women still have more children: "The women like to have less children; the problem are the men. They come back home after a long time, maybe drunken and 'make children'; they are stupid; the reason behind this is to control the women."

On the other hand, women living in more traditional communities and with lower income still regarded the number of four children as ideal. This observation is congruous with the finding of the study of BONGAARTS & BRUCE (2001: 62) which says that the desired family size by women in most so-called 'developing countries' still exceeds two children, but not with the findings that in Sub-Saharan Africa the desired family size is typically more than five children.

The relation between money and education is obvious: If children went, go or will go to secondary school depends on whether the farmers can afford to pay the school fees or not[114] like is also shown by the study of BRADLEY (1991) on the KWDP project in western Kenya. Only farmer 2K-m has applied for a credit specially allocated to people for paying school fees.

A comparison of the degree of the education of the farmer's parents, the farmers and their children and a comparison on country-level (see chapter 4.2) shows that the education level increases over the generations which is according to the findings of T'HART (1992: 45). This finding supports the general growing evidence that girls' education also leads to better education of future generations (FRITSCHEL & MOHAN 2001: 218).

Asked how the level of education could be increased in general, many farmers said that men have to assist their families and have to pay the school fees. The husband

[114] The same applies to the farmers themselves as has been noted in chapter 4.2.

of farmer 4T-m highlights another crucial aspect: „Nyerere knew why he guaranteed education for free. The moment you have to pay for education, the rate of children going to school goes down. And that is the situation now in Tanzania. Unfortunately, education is becoming more expensive. This is contra productive." Also CROWLEY et al. (1996: xv) recommend to reduce (high)school fees or to come to a flexibility in payment schedules as this increases access of resource poor households to educational opportunities. Farmer 4T-l suggested that the projects have to provide videos on gender. This directly demonstrates that education in many - especially resource-poor – families is closely linked to gender as well as has been mentioned also by farmer 3T-l for herself.

Since other criteria for restricting girls from education such as lack of wage-earning opportunities, no economic gain for parents when old, security, taking care of siblings (see FRITSCHEL & MOHAN 2001: 219) have not been named, it can be summarised that education is highly governed by the availability of financial resources and gender-related restrictions.

Education not only improves the lives of the ones educated, but education makes them better caregivers for their own children as well (see FRITSCHEL & MOHAN 2001: 218; SMITH & HADDAD 2001: 23).[115] Educated parents rely less on children for income and old-age support (BONGAARTS & BRUCE 2001: 64). On the other hand, educating children means reduced cash and labour in the short run, but the chance of obtaining cash and other assistance in the form of gifts or remittances in the long run. Furthermore, educated children are less likely to be dependent upon farming for their livelihoods as they are more likely to obtain higher earning employment or tend to marry wealthier husbands (CROWLEY et al. 1996: 9, 19, 46). Many of the benefits of educating girls are the same as those of educating boys (FRITSCHEL & MOHAN 2001: 215), but girls' education even goes further: besides the effects that can be quantified, girls' education contributes to empowerment and consciousness transformation: "[…] as girls get educated they begin to see themselves as decision-makers beyond the household and as carriers and makers of knowledge. A whole new political, social, and economic narrative comes into view" (MCINTOSH, cited in FRITSCHEL & MOHAN 2001: 217-218).[116] Education of women is a powerful weapon as well because increased knowledge and skills enable women to earn higher incomes, directly enhancing household food security as well as her position in economic and social terms in general. Furthermore, education can be a crucial tool for the empowerment of women as women with education can be given leadership positions (HYUNA 1989: 23; SMITH & HADDAD 2001: 23).

[115] Accordingly, the most important reason found for the decrease of malnutrition between 1975 and '95 in 63 so-called 'developing countries' was female education (FRITSCHEL & MOHAN 2001: 218).

[116] After BAUM (1995: 40) the perception and interpretation of erosion problems is closely related to the social environment and the degree of education as well.

After BONGAARTS & BRUCE (2001: 64) higher levels of education in general are also associated with the spread of non-traditional roles and values, including gender-restricted behaviour. The linkage between the proxies for assessing empowerment and gender-differentiated impacts is obvious: a study in Bangladesh has shown that only when women borrowed money education of girls (rather than just boys) increased (SHARMA 2001: 200). To avoid generalisations from these setting, more research is needed to analyse whether there exist similar correlations in Kenya and Tanzania as well and – building on findings – to develop extension packages. But, in general, it can be said that education of girls, especially from poor families, has to be improved since this aspect has been neglected in many societies (PINSTRUP-ANDERSEN & PANDYA-LORCH 2001: 271) as well as within 'extern' projects.

Within this context the positive approaches to environmental education shall be mentioned: 'social mobilisation' on village level, a technique first used in Latin America (FRITSCHEL & MOHAN 2001: 220) can be a powerful tool for awareness-creation like is shown by activities supported respectively initiated by the HASHI-ICRAF-project in Shinyanga, Tanzania. The project relies on a community and school approach and involves drama, dance performances (live and on video), videos and cultural centres for educational purposes.[117] A good example for the success of this approach is given by the *Kenya Woodfuel Development Programme* (KWDP), later renamed in *Kenya Woodfuel and Agroforestry Programme* (KWAP), which started in 1983 and stopped some years ago (see BRADLEY 1991; BRADLEY & HUBY 1993; TENGNÄS 1994: 34). Also NSWCP has recently included awareness creation through songs, entertainment, etc. as well as poems, plays and mirror techniques on conservation aspects, at least in some areas (MOALDM 1999: 45).

Environmental education should start at primary schools and with training teachers on environmental issues (see e.g. SHAO et al. 1992: x, 94, 177-178); each school could establish a forest, etc. The authors argue that the earlier environmental education starts the higher is the chance for adoption and understanding (ibid.: 178).

Fig. 90: School children in a school in Ufala, western Tanzania, giving a performance on the value of trees

[117] These tool can be used for any kind of education, like e.g. conflict management for supporting peace processes (van BEURDEN 2000: 17).

A very promising and successful education programme, building on local tradition and culture, is handled at a school in Ufala, Kahama District, Shinyanga Region, Tanzania: The children are not only maintaining a school plot (6,5 acre) for establishing a forest through natural regeneration of trees and additionally raising and planting seedlings (from indigenous trees), but are engaged in 'environment-related performances' based on traditional songs and dances, too. These performances are of a high educational value, regarding the fact that they are directly based in the socio-cultural tradition of the people, which actually is one of the decisive factors for the success of HASHI-ICRAF (see Fig. 90).

Efforts to improve the educational situation, e.g. through reduction of school fees, flexibility in payment schedules (see also CROWLEY et al. 1996: 53) and gender-specific programmes do not only depend on governmental action. The private sector itself, such as NGOs and communities, can make fundamental changes as well. Enhancing education in general "[…] can lay the groundwork for rewards that will extend into the future for many generations" (FRITSCHEL & MOHAN 2001: 222).

6.2.2 The self-help groups

6.2.2.1 General data

> "Women groups' enterprises and mutual aid system enable women to participate and become a part of activities far beyond their own individual resources and capabilities and thereby acquire some measure of security. By forming themselves into a movement in pursuit of better shelter and in this case better living, women groups are able to express themselves more effectively and to pool their limited resources."
>
> C. KINUTHIA in her study on women's groups in Kenya (1993: 39)

As has been said in the beginning, all the women researched are engaged in solidarity networks, this is women's and mixed groups as well which empowers them to participate in and become a part of activities far beyond their own individual resources and capabilities; thereby, they acquire a certain degree of security (see e.g. WACKER 1994; KINUTHIA 1993). The groups function as forum for different interests and needs; they are correlated with a communal spirit, giving strength as to the expression of needs and increasing their position within the village which again positively effects decision-making processes. Furthermore, the groups contribute to the extension of personal knowledge for an easier management of everyday life (FORTMANN & ROCHELEAU 1984: 269; CERNEA 1991: 359, 383-384; MARTIN 1994: 3; AUGUSTAT 1994: 140, 155; BARROW 1996: 180). Self-help groups are important multiplicators, leading the way for innovations and empowerment movements. The importance of the groups concerning the above named aspects has been stressed by all women: „The group is very important, the group is the fire" (3T-h). In the following, some aspects related to these groups shall be explained.

All women are at least members of a women's group (see Tab. 35).[118] Eleven women are in a higher position: Three women hold a position as a secretary[119], nine women are chairladies out of which farmers 1T-h, 3T-h are engaged in more than two women's groups.[120] Farmer 3K-m supervises the women's groups in her district as part of her job, and farmers 1K-m and 6T-l are initiators and supervisors of women's groups in their home area (6T-l six groups, 1K-m more than 120 groups). Five women have also been initiators of the groups.

Furthermore, four Tanzanian farmers and farmer 3K-l are engaged in mixed groups out of which 2T-l and 3T-h are chairladies; 3K-l and the later husband of farmer 1T-l have been the initiators of the groups.

Additionally, thirteen farmers are engaged in a church group, five farmers (2K-l, 3K-l, 1K-m, 2K-m, 1T-h) are chairladies. 2T-l holds a position as a secretary.[121] 1K-l and 1K-m are group initiators.

Tab. 35: Positions held within groups

	Farmers																	
Position held within	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Women group[1]	3	2	4	5	2	6	1	3	3	5	2	5	1	1	5	2	1	1
Group initiator		x		x			x		x						x			
Mixed group[1]			1				1	3			1	3						
Group initiator			x				x[2]											
Church group[1]	1	3	5	3	3	1	x	2	1	3	1	1		1				1
Group initiator	x			x														

Legend:

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household; ☐ = not on resp. farm; ☐ = not in the resp. zone/country

[1] **1** = member; **2** = secretary, treasurer; **3** = chairlady; **4** = chairlady, secretary; **5** = a.o. chairlady (and other position) of more than one group; **6=** working with women's/church groups

[2] husband

Generally, the lowest number of participation in mixed and church groups as well as the lowest number of higher positions is found within HASHI/CRAF area.

[118] Farmer 1T-l is engaged in a women's group consisting of women belonging to the family only.

[119] She has been the chairlady of the women's group *Mama wa mifugo Ndatu* (*Chama cha mifugo*, Tengeru). They were 27 members, had 4 acres with fodder plants, sold beer, stopped 1989.

[120] 1K-m is chairlady of all groups in the location (240!), thus, her status/position is much higher than indicated. Furthermore, she has been one of the first initiators of the *Greenbelt Movement*: „I started my activities in the 60ies, inspired by a tale/saying in the bible: 'You have to sweat first before you can harvest'; in that times there were a lot of people and no firewood, the natural forest disappeared rapidly. The group was the best in whole Machakos District - we had more than 30.000 tree seedlings and gave them away for free."

[121] Farmer 1K-l has been a chairlady for many years but had to stop due to a serious illness; she died on 3.7.2000. Since approx. 2 years her daughter is holding the position of a chairlady.

The most frequent meetings (twice a week) are among three groups (2K-l, 3T-h, 4 T-m). However, most groups meet once in a week (1K-l, 3K-l, 2K-m, 3K-m, 2T-l, 3T-l, 1T-h, 2T-h). Group 6 T-m meets three times per month, and the groups in the LPA in HASHI-ICRAF project area as well as group 4T-m meet twice per month. Group 1K-m meets once per month only.

The oldest group is 2K-m (1978), followed by 1K-m (1981), 3K-l (1982) and 1K-l (1987). The other groups started in the 90s among which 3T-h is the most recent one (1999), followed by 5T-l and 5T-m (1998) as well as 2K-l and 2T-l (1997).

Most groups (16) have got between 5 –25 members (8- 12 and 15-25). 1K-m and 3K-m are with 68 resp. 46 members by far the biggest groups.

Five Tanzanian groups (the groups in the LPAs of SCAPA project area as well as groups 1T-h and 5T-m do not pay fees; the group members of 3K-l pay by far the highest fee, most members pay between 10 and 100 Ksh/m resp. 100-1.000 Tsh/m. As some groups do not estimate their yearly income or did not save money but have invested in tools, material, harambee, etc. data about income/money saved were not easy to assess. Eight groups – all except one in Kenya – have got bank accounts.

These as well as some (additional) data have been listed in appendix 7). Recent activities and problems will be discussed in the next chapter.

6.2.2.2 Activities of women's groups

"The group activities are for helping the poor women. More projects are needed like e.g. a mill"

Statement of farmer 3K-l

The different group activities can be seen in Tab. 36. The most common activity carried out is *harambee* (13 groups), followed by tending a tree nursery (12 groups). Ten groups are engaged in horticulture and marry-go-round activities (mainly farm activities such as cultivating, planting, weeding, etc.). Nine groups are engaged in handicraft (see also Fig. 91 below) and six groups in activities related to customs and tradition (singing, dancing). The other activities are carried out by three groups (cultivating pasture grasses/fodder plants, dairy production, doing pottery), by two groups (bee keeping, cooking, education, poultry keeping, soil conservation activities – see also Fig. 92, selling water) resp. by one group only (water tank construction, selling firewood, fish breeding, shops, construction of a social hall).[122]

Tab. 36 shows that the group 1K-m carries out eight activities, followed by group 3T-h with seven different activities and groups 3K-m and 1T-h with six activities. Three groups (2K-l, 3K-l, 2T-h) carry out five activities and three groups (1K-l, 1T-l, 2T-l) four activities. Group 2K-m is engaged in three activities, group 3T-l in two activities.

[122] Most of the women's groups keep their savings on bank accounts.

Tab. 36: Women's group activities after frequency

Women's group activities	Number in total	Farmers																	
		1K-l	2K-l	3K-l	1K-m	2K-m*	3K-m*	1T-l*	2T-l	3T-l*	1T-h	2T-h*	3T-h	4T-l*	5T-l	6T-l	4T-m	5T-m*	6T-m*
harambee	13	x	x	x	x	x	x		x	x	x	x	x	x		x			
tree nursery	12		x	x	x	x	x	x	x	x	x						x	x	x
horticulture	10		x		x	x			x		x	x	x		x		x		x
mary-go-round (mainly farm activities)	9	x	x	x	x		x	x					x	x		x			
handicraft *– see below	9		x		x	x	x					x	x	x	x	x			
tradition/culture (dancing, singing, etc.)	6				x				x				x	x	x	x			
fodder grasses/ plants	3									x		x	x						
dairy production	3													x	x	x			
doing pottery	3												x	x		x			
bee keeping	2								x		x								
cooking	2											x	x						
education (Kisuaheli, Kikamba)	2					x					x								
poultry keeping	2				x								x						
soil conservation	2	x						x											
selling water	2	x		x															
water tank construction	1							x											
selling firewood	1				x														
fish breeding	1										x								
shops	1			x															
construction of a social hall	1				x														
Number of activities in total		4	5	5	9	5	4	5	5	3	6	5	9	6	4	6	2	1	2

* making baskets/mats, sewing, embroidery/crochet

Legend:

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; ☐ = not on resp. farm; ☐ = not in the resp. zone/country; * = female-headed household

All women emphasised that the additional income raised through group activities, even if it is a small amount, is very important for the family welfare.

Activities carried out by the church groups are mainly bible studies, *harambee*, handicraft (embroidery, crochet), home economics such as cooking and baking as well as health aspects.

Five farmers are engaged in mixed groups (see Tab. 37). Except 3K-l all farmers live in the SCAPA project area out of which three farmers are engaged in so-called village soil conservation/environment committees (VSCC/VEC) which carry out activities related to soil and water conservation. Farmer 3K-l is engaged in a nursery school, 2 T-l joins a farmer's self-help group which is engaged in horticulture, bee-keeping, organic farming and raising tree seedlings.

Fig. 91: The women's group of farmer 1K-m is a.o. engaged in basket-making

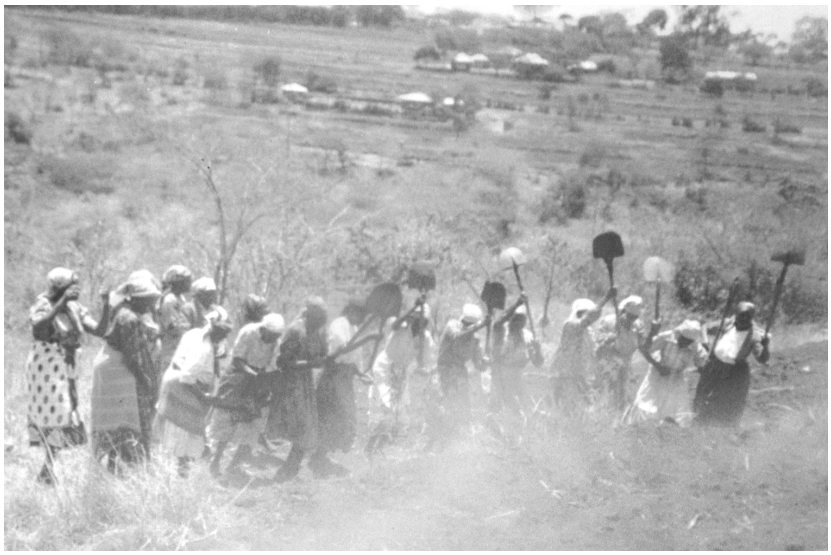


Fig. 92: Group in a low potential area in Kenya constructing a *fanya-juu* terrace

Some of the women's groups use cultural heritage like songs and dance as a tool for disseminating knowledge on environmental issues in general. The traditional dances are highly valued among the people and form an important part of the culture, especially among the Wasukuma: "[…] ngomas have educational and cultural elements. They are a means of communication given the low level of literacy in the Shinyanga region" (SHAO et al. 1992: 151; see also OTSYINA 1998: 56). The songs are full of history, messages, stories and lessons, e.g. on tribal customs (HATIBU & MTENGA 1996: 28).[123] HASHI-ICRAF e.g. integrates traditional dance groups and a local band as extension tool (see chapter 6.2.3.3). This approach has also been applied successfully by KWAP, a Kenyan project (see BRADLEY & HUBY 1993: 162-178). Also AUGUSTAT (1994: 211) recommends the use of songs composed by women's groups as instrument for awareness creation.

Tab. 37: Mixed group activities

Farmers																			
Mixed group activities	Number in total	1K-l	2K-l	3K-l	1K-m	2K-m	3K-m	1T-l	2T-l	3T-l	1T-h	2T-h	3T-h	4T-l	5T-l	6T-l	4T-m	5T-m	6T-m
tree nursery	1								x										
horticulture	1								x										
bee keeping	1								x										
soil conservation	3							x				x	x						
organic farming	1								x										
nursery school	1			x															
Number of activities in total				1				1	4			1	1						

* making baskets/mats, sewing, embroidery/crochet

Legend:

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; ☐ = not on resp. farm;
▒ = not in the resp. zone/country; * = female-headed household

[123] SHAO et al. (1992: 150) report about negative impacts of this Sukuma tradition like exposure of children, especially girls, to promiscuity, environmental degradation through building enclosures, and neglect of economic activities during a period of 4 – 6 months (June – October).

In several meetings with group members problems and constraints with regard to group activities have been discussed. The most frequently named problems were water, pests and diseases, marketing and lack of time (lack of assistance of the husbands!). The problems named are listed below:[124]

- lack of finances for membership fees
- credits & funds → lack of finances for inputs such as fertilisers, seeds, pesticides, tools, etc.
- lack of time for attending group, training, etc. → no assistance by the husbands
- lack of responsibility of some members concerning care for dairy cows (4T-l)
- competition, jealousy (4T-l), selfishness (2T-h)
- expectancy of getting 'things for free' (5T-m)
- lack of engagement ('waiting mentality' (5T-m)
- lack of tools (e.g. material for cooking stoves, polyethylene tubes for seedlings, material for sewing clothes [3K-m] + sewing machines [6T-l], embroidery, crochet, glasses [2K-m])
- marketing (of handicrafts such as baskets, farm products, [grafted] tree seedlings)
- pests and diseases (2K-l, 2K-m)
- transport → long distances, bad roads (during rainy seasons)
- water → drought and availability (long distances), bad quality (salty) → 2K-l

As the members of five groups do not have to pay membership fees and as the membership fees for five other groups are very low, financial resources do not form an obstacle for poor farmers to join these groups. The other eight groups, however, demand rather high membership fees so that poor farmers might be excluded. Generally, it can be said that at least four things are needed for a successful income-generating activity: time, knowledge, capital and marketing facilities (see also T'HART 1992: 46). Five groups (2K-m, 2T-l, 3T-l, 2T-h, 5T-m) face resp. faced problems concerning consistency and were/are jeopardised to fall apart; group 5T-m is not active in the moment because of the recent drought. Resource availability (finances, water, tools or labour force) seems to be important for the activities and consistency of groups; however, psychological aspects like solidarity and feeling close through traditions and customs are likely to be as crucial as these 'outer' factors. NYAKI (1998: 66) names as main factors lack of capital, no reliable credit facilities, lack of good leadership as well as no well-defined objectives and approaches. Furthermore, the precedents of former projects have got an influence as well and can lead to expectancies, e.g. through food-for-work as has been reported by several farmers especially in the HASHI-ICRAF project area (SHISCAP 1992: 6). A HASHI-ICRAF project report (SHISCAP 1992: 5) notes that groups which have not been created by the villagers/community themselves will fail to meet the objective for which they were created since they are not based on the felt need of the local women and since the markets for the goods have not been examined. In the case of the selected groups this reason cannot be applied as all groups have been created

[124] AUGUSTAT (1994: 143) has listed positive aspects as well as hindrances for women's group activities.

by the villagers themselves and only under assistance of the projects. More data and research is surely needed to explore these aspects.

Engagement of the farmer's children in self-help groups is generally low: farmer 6T-l said that this is due to the change of traditions. In Kenya, however, children of four farmers are engaged in groups (except 2K-m, 3K-l), in Tanzania only children of two farmers (1T-l, 1T-h) are engaged in group activities. It has to be kept in mind also that esp. in the HASHI-ICRAF project area the children are still too young; furthermore, many children moved to other places, mainly bigger cities, where the socio-economic situation is completely different.

The SHISCAP report (1992: 4/2) recommends to carefully examine whether the assistance of a women's group is the best action to be taken and continues: "Women-specific projects tend to marginalise women from the mainstream of development. They are inclined to reinforce a women's subordinate position in the village because they do not present the opportunity for women to have a say in village decisions and to participate in integrated community development." The support of women's groups has to be integrated into an integrative community development plan within the project activities which focuses on gender in a whole and not on women only; however, in certain circumstances, a focus on women is needed and appropriate. Furthermore, the groups have to find a solution regarding membership fees as high payments exclude resource poor farmers from membership and thus from one important source of empowerment.

6.2.3 Decision-making → role of customs and traditions

> "The relations of reciprocity at unit household level and outside, together with inter-household and intra-household dynamics all go a long way to influence decision making at this level."
>
> J. A. OTSYINA in her gender study on Shinyanga Region (1998: 16).

If sustainable ways for a sound management of natural resources in a given area shall be understood, revived or improved, cultural aspects like traditions, customs and religion have to be analysed and taken into account, too since they might be an important reason for development hindrances. Retrogressive culture and attitudes often manifest themselves through gender insensitivity: women often face cultural/ traditional restrictions, not only when it comes down to the marginalisation of female farmers in decision-making about conservation, management of trees, farm production and the distribution of family labour (see also WASWA et al. 2000: 184-185), but also concerning the participation in public decision-making processes. It also goes down to the economic level as both labour inputs and rewards are often allocated differently between the sexes, depending on customs (HUXLEY 1999: 26). In general,

the customary and religious laws promote the security and interests of men at the expense of women and by this contribute to the insecure life-conditions of women. Also superstition has to be considered. The SHISCAP report (1992: 6) points at the belief in witchcraft which is still strong among certain members of the *Wasukuma* society. Farmer 4T-l reported that in former times, when there were no trees, women used manure from cattle for cooking which produces a lot of smoke so that many women suffered from red eyes. Many old women have been beaten to death and cut up because people thought them to be witches (see also SHAO et al. 1992: 143). Witchcraft prevents individuals, especially women, from advancing themselves beyond the average of the society; witchcraft is said to be the reason for low quality of houses and meals in Shinyanga, Tanzania (HATIBU & MTENGA 1996: 48-49).

6.2.3.1 On-farm

> "[...] a gender perspective is unavoidable in discussions of access to and control over resources and reveals the importance of focussing on decision-making processes and systems of redistribution also within the household."
>
> T. VEDELD & K. LARSEN in their study on smallholders, gender and access to natural resources in Africa (1998: 27).

Within a household numerous decisions have to be taken, and in every decision that has to be taken, several factors play a role. If more than one person is involved in decision-making we can talk about a decision-making process as each person involved makes his/her own contribution to the process. Within the decision-making common goals of the household form the starting point, influenced by each person to reach personal goals (T'HART 1992: 13).

As the analysis of the male-headed farms regarding decision-making and distribution of financial resources has shown (see also Tab. 38) all couples share decisions and resources more or less equally on a basis of mutual support and empowerment in such a way that this has a positive impact on the whole farming-system stability. Generally, the husbands are aware of their wife's workload in the way that decisions on aspects reducing their time spend on reproductive and productive activities are given high priority. The married farmers get a lot of support from their husbands and are generally empowered to decide about all farm-related activities. Four farmers (1T-h, 3T-h, 5T-l, 4T-m) sometimes take decisions on things to be done together with their husbands like selling/buying cattle. Farmers 1K-m and 3K-l – although they do not have title deeds – as well as farmer 3K-m mainly take decisions on their own. Even farmer 2K-m said to have a lot of freedom concerning land husbandry, especially with regard to conservation measures since her husband has been deeply involved in the maintenance of the land and thus supports these activities. TIFFEN et al. (1996: 25) came to a similar finding: „On the farms, women who farmed without a

resident husband appeared able to make most decisions, although they might depend on a husband for money to pay hired labour, and had to consult him before doing any work that might impinge on farm boundaries [...]. [...] Co-operation within a family is more normal than conflict and domination [...]." Generally, decision-making power of the married women does not depend so much on aspects like age or status (which are important in the study area of T'HART - 1992: 58), but more on open-mindedness and personality of the husbands and the women farmers themselves.

Concerning differences among the female-headed farms (widow, divorcee, abandoned or single) it can be summarised that all women dispose of high decision-making power except 2K-m, 1T-l and 6T-m. The widows (3K-m, 1T-l) have kept their belongings; in the case of farmer 1T-l the cattle came under the authority of the husband's brother as to the tradition of the Masai. However, in the case of this family, the women generally have got a lot of freedom to take decisions due to high gender-awareness among the male family members. Grazing activities and aspects related to livestock like slaughtering, selling or buying is still the task of men only. As polygamy plays a role, decision-making processes are often taken by all women living on the compound (see also T'HART 1992: 58). The most unfavourable situation concerning-decision-making might be found on farm 2K-m because this farmer depends on her husband as the land does not belong to her; she had to give a piece of land and her goats to his new wife (he married a second wife and left her behind). Farmer 2T-h has got freedom of decision-making as she e.g. disposes of title deeds. The single women 3T-l and 6T-m rank at the bottom of the income list, but can take decisions completely on their own (farmer 6T-m has to consult her father when she wants to cut a tree) (see also Tab. 38).

Asked for which expenditures the money is being used, the married women said that it is spend for family purposes and thus shared. All women said that they do not face restrictions by their husbands as to how the money is to be spend. Some decide about the generated income alone, some discuss this issue with their husbands. This aspect is a clear empowerment indicator since generally decision-making processes related to expenditures – except small items for household needs – are done by men, especially when it comes to cash crop earnings and money deriving from the sale of 'big' livestock. SHISCAP (1992: 2/5) notes: "Men have access to and control large sums of cash. Women have access to and control small sums of money; either what is given to them by their husbands to cater to household needs or what they earn from petty trading" (see also T'HART 1992: 47-48; SHARMA 2001: 200). However, in this case, women can also own livestock through buying, inheritance or as bride-price (see also T'HART 1992: 49-50). A growing number of studies shows that in general, men spend a higher proportion of their incremental income on goods for their personal consumption; women are more likely to purchase goods for family needs (BROWN et al. 2001: 207).

The *de facto* presence of a husband is central to the economic conditions of the women and to labour availability/support concerning farm activities (see also chapter 6.1.3). On the other hand, the absence of a husband can result in more freedom of decisions for the women. Thus, whereas 2K-l said that the absence means more freedom of decision, 1T-h stressed the aspect of more workload. Farmers 3K-l and 1K-m see this aspect in relative terms: "The absence means more workload, but support through money and freedom of decision, too" (3K-l). Farmer 1K-l said: "I am responsible for everything, which means freedom concerning decisions, but also a lot of responsibility"

Another aspect to be analysed is related to restrictions concerning tree management: women may be restricted due to cultural beliefs and taboos from tree plantings (see TENGNÄS 1994: 145). Among the Luya, a tribe in western Kenya, taboos to preserve the male dominance are sayings like if a woman plants trees, she will become barren, her husband will die, and so on (BRADLEY 1991: 207). Out of the four farmers who mentioned to face restrictions in the field of tree management (see Tab. 38) three farmers (1K-l, 2-K-l and 1T-l) explained that they are not allowed to plant sisal or finger-euphorbia along borders without the assistance of a male relative. Out of the seven farmers who named restrictions concerning the cutting of trees, farmers 1T-h and 3T-h are only partly allowed to cut whole trees, and farmer 1T-l is not allowed to cut trees at all due to tradition. Farmer 4T-m explained that 'restriction' within her context refers to the aspect that she consults her husbands before planting and/or cutting trees. Asked whether the farmers (except 1K-l, 1T-l) ever have been refused an activity, they said no (also 2-K-l); after the farmers, consulting the husband means showing respect and taking action together since they are already in the stage of equality. They said that on the other way round, their husbands also consult them when it comes down to activities which have an impact on the family, whether they may be farm- or off-farm related.

6.2.3.2 Land tenure

> „In general, lack of control over land (or 'secure' rights) is an obstacle to its more sustainable use. The social and cultural context of the production systems used determines whether lack of control over land has a gender-specific impact."
>
> Statement of the Netherlands Development Assistance, Ministry of Foreign Affairs (1997: 22).

A crucial criterion within an empowerment analysis is land tenure. In general, land is scarce in Kenya and Tanzania, and while much of the land belongs to ministers and high public officials, many small-scale farmers do not have land tenure rights; this directly prevents them from carrying out conservation measures like planting trees (EVELEENS 2001c: 8). Women's right to land is even worse as is being described by

the statement at the beginning of this chapter: their right to land is a critical factor within the complex of the implementation of sustainable land management practices as well since insecurity of tenure reduces the likelihood that female farmers invest much time and resources in environmentally sound farming practices. Even if civil laws give women the right to inherit land, local customs or religious laws may forbid female land-ownership: in Sub-Saharan Africa, women are generally limited to user (or usufruct) land rights, and then only with the consent of the husband or male relative (BROWN et al. 2001: 206-207; see also chapter 2).[125] However, TIFFEN et al. (1996: 74) note that Kenyan husbands are obliged by custom to provide wives with land to farm (if they own farms). Furthermore, ownership of land ensures that one has got control over the products thereof. Over and above that, ownership of land gives access to credit in financial institutions because it happens to be acceptable as a collateral for loans and other forms of credits (HYUNA 1989: 27).

Tab. 38 shows that ten farm lands have been bought completely, three other farm areas have partly been bought. Three farm plots are inherited by the husbands (however, farmers 2K-m had to give some money to the husband's father); 3T-l and 6T-m inherited their land from their fathers (as they are singles a plot of land has been given to them by their fathers according to the tradition; farmer 3T-l additionally rents a piece of land). Generally, more land has been bought than inherited, although the land bought by farmers 2T-l and 2T-h belonged to their fathers. The number of land bought is higher in the project areas of NSWCP and HASHI-ICRAF; in these areas, migration seems to be play a bigger role.

Twelve farmers have got title deeds, under which all farmers in the HASHI-ICRAF project area; however, farmers 5T-l and 6T-l only have got title deeds over their own piece of land only (see Tab. 39). Title deeds are fundamental for women, especially in case of divorce/separation as has been described by farmer 2K-m. Her husband married another woman, and since that time she is facing a lot of problems, but has no choice: "I have to accept this situation, what else could I do? If I go back to my family's place, I would have nothing."

Generally, secure access to land by women farmers and their families through individual or community ownership and long-term user rights are of paramount importance for successful and sustainable land management strategies; clear property rights to other natural resources, such as water or forests, are crucial as well (PINSTRUP-ANDERSEN & PANDYA-LORCH 2001: 271).

[125] Generally, land is privately owned in the NSWCP and SCAPA project areas; in the HASHI-ICRAF project area, land is also commonly owned; in the area of farm 1T-l the grazing area is common good.

6.2.3.3 Participation in (public) decision making processes

„Women need to be actively involved to the extent possible. The Programme should ensure that women are present at all meetings and discussions; that they are given the opportunity to actively take part; and that their contributions are taken into consideration."

The *Shinyanga Soil Conservation and Afforestation Programme* in their gender/women action plan (1992: 4/2).

The literature states that women are highly disadvantaged or completely excluded from participation in decision-making processes due to traditions (see e.g. SHAO et al. 1992: 158; HATIBU & MTENGA 1996: 48; BLUME 1998: 80-82). In the following, attention will be paid to this aspect:

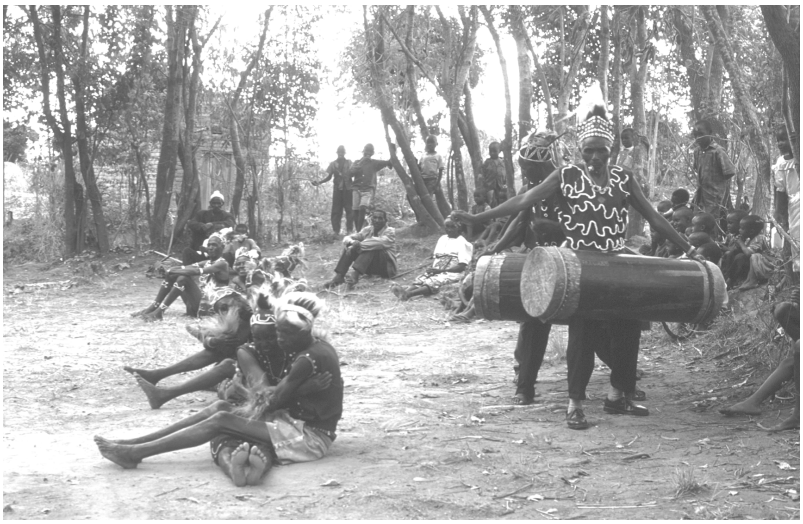


Fig. 93: Traditional dancing group of elders (*wazee*) in the home area of 1K-m

Regarding the aspect of customs and traditions, two facets of this aspect can be elucidated (see also Tab. 38): the first facet concentrates on the positive aspect of traditions, the second concentrates on restrictions related to traditions and customs. The answers concerning the first-named facet can be classified into two groups: there is the group of farmers who said that tradition and customs do not play any role in their life (2K-l, 3K-l, 2T-l, 3T-l) respectively no significant role (2K-m, 3K-m, 1T-h, 5T-m). The other ten farmers stressed the importance of culture and tradition in their personal life: "Bila utamaduni utapoteza mila" – Without culture and tradition you loose your habit - 2T-h). "Utamaduni ni asili yetu" - Tradition is our nature – 3T-h). Within this context, farmers 4T-l and 6T-m put emphasis on the aspect of dancing and singing within the women's group (see also Fig. 93) as part of preserving the traditional heritage of the Sukuma. Farmers 5T-l and 6T-l referred to the aspect of solidarity, and farmer 6T-l mentioned: „Umoja ni uguvu" – unity is strength.

All farmers said that religion is important for them, seven farmers (1K-l, 2K-l, all farmers in the HPAs in Kenya, 1T-h, 5T-l) even stressed the importance of religion in their lives, many of them saying that religion nowadays is more important than tradition (4T-l, 6T-l, 5T-m).

The other facet is related to restrictions due to cultural traditions (see also Tab. 38): regarding general restrictions for women all farmers said that women face restric-

tions due to culture and tradition, three farmers said that they are still strong (1T-l, 3T-h, 6T-l). The last statements are made by farmers within SCAPA and HASHI-ICRAF project area. Especially the farmers contacted in Shinyanga/Kahama district, Tanzania said that the tradition of the Sukuma causes a lot of problems for women (and children), e.g. regarding talking in the public, planting trees, etc. like has been explained by farmer 6T-l: „Elimu hapa ni dogo. Watoto wanalala bila nguo. Wanaume wanaoa wanawake mpaka sita. Ngoma tu. Ni utamaduni ya watu wa Sukuma" (The education level here is low. The children are sleeping without clothes. The men marry up to six women. Only traditional dancing matters. This is the culture of the Sukuma people).

Six farmers said to face little restrictions in personal life, mainly related to the habit of not eating together with male adults in general (except 3T-h) or tree management.

Pertaining restrictions related to participation of women in public decision-making processes very heterogeneous answers have been given because some farmers concentrated more on the general condition and others on the improvement. Whereas seven farmers mentioned restrictions to be low ("Women are encouraged a lot. It's not like in former times, now the women are very strong and men listen to the women" - 1K-m) four farmers referred to existing restrictions for women in their community; seven farmers said that women are confronted with partly severe restrictions. The quotation of farmer 2K-m gives some details on this aspect and on the importance of education: "Yes, women participate in the village committee, but not equally, some are not allowed to participate due to the clan they belong to, like in my husband's clan. Just few dare to speak. The women have their own groups. To make own decisions is very hard for the women here because they are illiterate, they don't have eyes to see; suppose they would have eyes to see they could see the wealth of education."

Farmer 3T-h participates in public meetings, etc., but said that she has to fight for the women's rights to participate in community decisions; many women do not dare to participate which, after her opinion, forms the main problem: She mentioned that she needs more support, especially from the project: "I have been elected into the VSCC because I dare to open my mouth. I fight for gender equality and have no fear. Participation of women in public decision is almost zero. 2-3 women more would help a lot. We need the fire and SCAPA is fire."

Farmers 6T-l, 5T-m and 6T-m said as a result of the strong traditions many women still do not dare to participate or speak openly, even if they are assisted by project activities. Farmer 4T-m: "Although women are nowadays allowed to participate, they are afraid to talk. They don't have a voice in the family" On the other hand, farmer 6T-l noted that, generally, taking part in

public decision is not a problem for women anymore; the village leader has even been a women (the chairlady of a women group). Farmer 3T-I said that the situation, although having improved through church and project activities, still is very bad.[126]

Of course, the sample size is too small to come to generalisations. However, the farmers in the Kenyan project area said that restrictions are little, also with regard to themselves.

SHAO et al. (1992: 141) mention that even the *Wasukuma* have got a history, although strongly patriarchal organised, of women leadership; and also today women can be found in high positions. For the general situation of women in Shinyanga Rural District they summarise (ibid.: 163): "Therefore, unequal division of labour between men and women, low level of education, rigid culture and traditions, and severe environmental destructions have been responsible for low level or lack of women participation in general" (see also OTSYINA 1998: vi). On the other hand, the study shows by means of the selected 18 female farmers that alleviation of these constraints directly contributes to the betterment of women's situation.

Generally, more training and awareness creation is needed through the projects. Accordingly, the SHISCAP report (1992: 4/1) recommends to empower women in the areas of knowledge and decision-making: "Once women know more about what is going on and have more of a say in the decision-making process; and once men see that women have something beneficial to contribute besides labour; then women's position in the household, community and society will improve. The sharing of decision-making by men and women will facilitate the sharing of resources." Also on the policy level measures have to be taken such as strengthening of laws to address issues on discrimination against women (OTSYINA 1998: vii).

Different authors (see e.g. SHAO et al. 1992: 177; HATIBU & MTENGA 1996: 28-29) recommend the full use of traditional dance groups for educating people, not only on environmental issues. Given the low level of education and the language barrier knowledge and information can easier be disseminated through this tool since the songs are in Kisukuma. Thus, a powerful vehicle/tool for knowledge dissemination on different issues could be the combination of modern forms like seminars with traditional forms like *ngomas* (the traditional dance groups) (see also OTSYINA 1998: 56). Keeping traditions, cultural and social values alive through songs, dances and performances is a central element within many cultures. For instance, in the Shinyanga and Kahama Districts in western Tanzania HASHI-ICRAF sponsors and uses traditional women's, mixed and youth dance groups in different villages to educate and motivate people on environment- and gender-related issues. In Lubaga village,

[126] During my stay on her farm I once observed a village meeting from the distance. The participants who had gathered under a big tree were only men. The SHISCAP report (1992: 4/2) writes as to this aspect: "Where villages fail to allow women to actively participate, the Programme should consider either suspending activities until this is rectified or dropping operations from that village altogether."

Shinyanga district, a women's group performs different songs and dances, based on traditional schemes, with environmental and development related subjects ("Songa mbele,hatuwezi kurudi nyuma"- Move forward, we cannot go backwards). Furthermore, HASHI-ICRAF supports and engages a group of musicians (financially and place for training) in Shinyanga for the same purpose.

In the research area of HATIBU & MTENGA (1996: 29), villagers asked to list the most valuable extension methods, ranked cultural songs as number one among a list of twelve. Generally, it can be stated with SIDA (2000: 26): "Women and men need to be mobilised for joint decision making at household level and in local government affairs as well as in regional committees and in parliament. Little, however, can be achieved unless men and women change their most basic attitudes and behaviours."

Tab. 38: Aspects related to cultural and traditional restrictions and land tenure

	Farmers																	
Aspects related to cultural and traditional restrictions	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Importance of culture/traditions in personal life	X			X			X				X	X	X	X	X	X		X
Inner-household/farm-related restrictions**	1	1			2		1	1		1								1
Restrictions as to participation of women in public decisions**	2	1	1	1	3	1	3	1	3	1	1	3	3	2	2	2	3	3
Restrictions as to planting trees**	1	1					1									1		
Restrictions as to cutting trees**							2			1		1		1	1	1		1
Origin of land***	3	3	3	3	1	4	1	3[1]	5	1	3[1]	4	3	4	3	3	3	2
Title deeds (female farmer)	X			X		X	[2]	X	X		X		X	X[3]	X[3]	X	X	X

Legend:

* female-headed household; **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA

** ☐ = no; ☐ = not in the resp. zone/country; **1** = little/ask husband/father; **2** = existing; **3** = high/ not allowed

*** **1** = inherited husband; **2** = inherited she; **3** = bought; **4** = inherited husband and bought; **5** = inherited she and rented

[1] land bought from her father

[2] since her husband died the title deeds belong to her husband's brothers (father died)

[3] title deeds only over own piece of land

6.2.4 Position within the community → status

The position within a community reveals power relations, acceptance and thus, the influence of a person. For instance, after SHISCAP (1992: 4) generally, divorced women are awarded a low status in the community. The higher status and respect, the more likely is the positive impact of a person on its surrounding. After HYUNA (1989: 23) "[…] status can be acquired either through marriage or education. A woman married to a better-off husband may have a higher status than one married to a poor one. Furthermore, in a polygamous situation, the first wife has more respect

and may command more resources than the junior wives. […] With education, a woman can be given a leadership position" (see also OTSYINA 1998: 48).

Concerning their position within the community all farmers except 2K-m[127] said that they are important and respected because they help to spread knowledge and function as leaders and multiplicators; 3T-h even said: "I am the fire." Farmer 5T-m described her position as follows: „Mimi ni muhimu kwa sababu napanda miti, watu wanaangalia mazingira tafauti, mimi ni mfano" (I am important because I plant trees, the people see that the environment changes, I am an example). Farmer 6T-m said: „Mimi ni muhimu sana. Naleta mawazo kwa watu" – I am very important. I bring ideas to the people).

Six Tanzanian farmers (2T-l, 1T-h, 2T-h, 3T-h, 4T-m, 5T-m) referred to the aspect of joining and copying of activities. 1T-h mentioned: "You always have some people who listen and learn, some are listening without doing.... Not many of the neighbours are joining the activities. It's human being - ni binadamu tu." And 3T-h explained as to jealousy: "I am important, although there are a lot of neighbours around who just look at my work without copying, following my example. There is jealousy, this is human being. Maybe we will increase jealousy, but it's more important to increase respect."

Farmer 4T-l said that she does not have a lower status due to her divorce in the community, but it has to be considered that she moved to this place from Kigoma only after her divorce in 1993 where she bought her own *shamba* (piece of land).

Asked about the reactions (suspicion, jealousy, support, admiration etc.) of other people as to empowerment-related activities different facets have been emphasised by the women: six farmers (1K-l, 3K-l, 3K-m, 6T-l, 4T-m, 6T-m) stressed positive experiences like support, agreement, kindness and their function as an example to the other people. Farmer 4T-m said that the people are happy with her work, and farmer 6T-m adds: „Wanafurahi tu. Wanaanza pia kuotesha miti, kupanda miti" (They are just happy. They also start raising trees, planting trees). 3K-l said that people like her work and that she is requested to write to donors. 1K-l mentioned: "One important aspect is that the people profit from my engagement, so they like my work."

Eight farmers (2K-l, 1K-m, 2K-m, 2T-h, 3T-h, 4T-l, 5T-l, 5T-m) noted, besides positive aspects, that there is jealousy – from neighbours or members of other groups who talk bad things ("Of course, 1% of 1% is of that evil kind, but that's human being" - 1K-m), but in total factors like support and encouragement are predominant. Farmer 4T-l said that jealousy stops development: "Ukiwa na wivu hakuna maendeleo" (If you feel jealous there is no development) and

[127] She mentioned: „I come from another region, meanwhile I am accepted...My position, hard to say... It's not possible to appraise your own position."

continued: „Yeye mtu anakuwa na mvivu naacha"(if that person is jealous I keep distance). Farmer 5T-m mentioned: "When I started planting seedlings on my field the people laughed about me and said, I am crazy. When they saw after a few years that I harvested fruits, timber, firewood, etc., they became jealous and tried to make me go backwards."

Within this context social networks on which essential needs like friendship and solidarity (between women) are based, are an important part of the women's lives (see Fig. 94 and 95). Farmer 4T-l said: „Unaweza kukuwa na fedha nyingi, lakini upendo - hamna, marafiki - hamna" (You can have a lot of money, but no love, no friendship). Social networks based on inter-household relations are, besides emotional support, used for pooling resources including labour, finding jobs, providing advice, information, initial capital and exchange of services. They play a particularly critical role in phases of economic weakness (e.g. unemployment), sickness and in old age (see also OTSYINA 1998: 44).

Fig. 94: Two friends

Improvements, not only of women's economic but social and legal status, has a potentially strong impact on development and empowerment processes, although its potential has not been realised. An IFPRI study showed that improvements in women's status accounted for 12 % of the total reduction in child malnutrition in the so-called 'developing countries' between 1970 and 1995 (besides the determinants education, health environment and food availability). On the other hand, a low status of women relative to men restricts women's capacity to act in their own and their children's best interests (SMITH & HADDAD 2001: 23; see also PINSTRUP-ANDERSEN & PANDYA-LORCH 2001: 271). As women's status improves and autonomy increases,

Fig. 95: Farmer 3T-l with group members. Friendship is an essential part of social life

the dominance of husbands and other male household members is reduced (BONGAARTS & BRUCE 2001: 64); this aspect also accounts for public decision-making. As the authors (ibid.: 65) summarise: "social power and economic authority for women are necessary counter-pressures to traditional imperatives to marry and have children early. Generally, […] design and implementation of policies should recognise the importance of social capital and build on it rather than trying to replace it" (PINSTRUP-ANDERSEN & PANDYA-LORCH 2001: 271). After SIDA (2000: 11) some new statuary laws have been implemented in Tanzania like the 1998 Sexual Offences Special Provision Act as well as the 1999 Land Act and the Village Land Act which protect and secure the rights of women (and children).

6.2.5 The men: problem analysis

The general phenomenon of a decline of family structures with drastic socio-economic as well as psychological consequences for the women and their children in rural Africa has been identified also for the research area. There are general complaints that men evade their responsibility for the families through absence, alcohol, excuses or even simple neglect of the family so that women have to take over the whole responsibility for maintaining the economic and social function of the family (see e.g. SHAO et al. 1992: 114; MERSMANN 1993: 105; AUGUSTAT 1994: 86-87; BLUME 1998: 79-80).

Discussions and conversations held with the farmers, their husbands, family members, friends, neighbours, members of the women's groups, project staff, etc. brought up that there is a lot of critics about the behaviour of men, reflecting a general irresponsibility. Problems stated were:

- neglect of family
  → physical absence either although still living with the family or through migration for work, taking new wife, etc.[128]
  → no financial support
  → no ideological/psychological support
- alcoholism
- violence against women and children
- spending time and money with other women
- rejection of contraceptives (condoms) → no responsibility regarding aids
- not giving decision-making power to their wives (land, finances, etc.)
- imposing high workload on wives → no physical support
- lack of trust
- restrictions due to customs and traditions → inclusive polygamy, restriction of girl's education

[128] Out of the eight farmers without husband only two are widowed, the other farmers (3T-l, 4T-l, 2K-m, 2T-h, 5T-m and 6T-m) have been left alone. Some daughters are facing the same problem (1K-l, 2K-m, 3K-m, 4T-l, 6T-l). Farmer 2T-h takes care of young women with babies who have been left behind by their husbands/friends. Two are staying at her farm.

All these factors have a negative impact not only on the family structures but on the whole farming system as e.g. alcoholism, poor cash management and investment in traditional assets, such as many wives, are often associated with downward mobility regarding socio-economic aspects (CROWLEY et al. 1996: 44).

A member of women's group 2K-m summarises the situation concerning men (see also chapter 6.3): „The men?....Ahh, really, most of them don't care about their families. They just run around on the market place the whole day and talk and drink. In the evening they come home, put their feet on the table and say: 'Bring the food' without even thinking about where it comes from."

The relation between drunkenness and poverty is obvious: according to the participants, unfortunately, there are a lot of men who spend cash income, e.g. from crop sales, on alcohol. Often, drinking becomes a daily affair, leading to violence in the family sphere, divorces and impoverishment as money to be used for the benefit of all household members vanishes in the men's pockets (see also OTSYINA 1998: 25).

Polygamy and spending time and money with other women has been named as another serious problem. It deteriorates family structures, trust and togetherness and also supports poverty.

Furthermore, on a general basis, men are still reluctant to regard women as equal partners within household and public decision-making processes. On the household and farm level, this includes not only equal sharing of responsibilities, tasks and duties or financial support, but also land rights and marketing. Regarding the public sector, men highly control the political power (see also HATIBU & MTENGA 1996: v) and often refuse women to participate in village meetings or to receive a leadership position in village councils, committees, local institutions, etc. Often, lack of decision-making power is accompanied by high workload of and responsibility for the women. These aspects are crucial when it comes to unbalanced gender-relations, low development and poverty.

The women also mentioned that men do not trust their wives. For instance, this can result in restrictions of women's mobility as a women's absence from home is interpreted as evidence of her involvement with another man; this directly limits women's involvement in development activities (see also OTSYINA 1998: 31, 50).

Still, many men do not see the meaning of giving girls the same education like boys. Women said that most of their problems will be solved if girl's education is given the same priority like boy's education.

Asked what could be done to change these attitudes the husband of farmer 1K-l suggested: „The village council could come together, and the elders could discuss this aspect; then, the village council could make a meeting to inform the men that they should assist their wives."

Many women suggested that the projects should assist with workshops and gender training, also by video and performances (farmers in Shinyanga/Kahama District, Tanzania). SCAPA has a very interesting and successful approach in this respect since the project engages farmers as gender trainers as will be described in the context of 'open-minded' men in chapter 8.2. These seminars and training should be attended by both men and women. Furthermore, women and men suggested to support small agricultural loans, credits and off-farm income activities for women.

To draw conclusions or find explanations for 'why are the men neglecting their responsibility is not easy (see also HASSAN 2000: 9).

6.2.6 Indigenous knowledge

> "With the passage of time, and through observation and trial and error, a wealth of knowledge and experience about the environment, its recources and how best to exploit them was accumulated – for example, knowledge about the uses of plants as food, medicine and as poisons. This deep-rooted indigenous knowledge is necessary for the survival and well-being of a community in its environment."
>
> MAUNDU et. al. In the context of traditional food plants in Kenya (1999: 1).

The intimate knowledge of rural people of their environment, trees and traditional ways of sustaining life with natural resources - out of which much is inherited from past generations - is referred to as indigenous, local or traditional knowledge (OTSYINA et al. 1998: 51). A strategy to improve individual and community management of natural resources begins with a basic understanding of local knowledge-, belief- and appreciation systems as their acknowledgement and incorporation is crucial to the success or failure of projects (see also BUDELMAN 1996: 10). As BARROW (1996: 234) writes, under taking the critical aspect of exotic species into account: "Knowledge of species, in particular, is the basis for improvement, for example, through natural regeneration and management; not substitution, for example, through exotic tree planting." And TOEPFER (in SNIFFEN 2001: internet) mentions: "Indigenous people not only have a right to preserve their way of life. But they also hold vital knowledge on the animals and plants with which they live. Enshrined in their cultures and customs are also secrets of how to manage habitats and the land in environmentally friendly, sustainable ways" (see also RATHGEBER 2000: 18). OTSYINA et al. (1998: 61) conclude in

Fig. 96: Farmer in western Kenya explaining traditional cropping patterns

their report on a study carried out in the HASHI-ICRAF project area that "[…] local people have a wealth of knowledge that needs to be the focal point in much of agroforestry research."

The Convention on Biological Diversity, which is administered by UNEP and which was adopted at the Rio Earth Summit of 1992, makes specific reference to the need to protect the world's indigenous cultures and traditions. Article 8 of the Convention states: "subject to its national legislation, (to) respect, preserve, and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional life styles relevant for the conservation and sustainable use of biological diversity" (SNIFFEN 2001: internet).

After SNIFFEN (ibid.) the UN Educational, Scientific and Cultural Organisation (UNESCO) which lists world cultural and heritage sites also recognises the "complex interrelationship between man and nature in the construction, formation and evolution of landscapes."

Many native people have got a vested interest in maintaining a wide variety of animals and plants in their area so they are not reliant on just one source of food (SNIFFEN 2001: internet). Referring to tree species, HUXLEY (1999: 70) mentions that there are local quality preferences which is unwise to ignore when new species are introduced. Furthermore, farmers' innovations and modifications of new technologies due to their knowledge (see also Fig. 96) can contribute tremendously to the stabilisation of problematic situations (such as food- and water shortages, etc.) and the development of sustainable, environmentally sound land-use techniques. As KAZIBWE, vice-president of Uganda, concludes (in WILSON 2001: 169): "This body of knowledge should be tapped and related to modern science. If this knowledge sustained our ancestors in the past, it cannot be totally useless today."

Tree management is closely linked to knowledge; it involves a higher level of skill than does the cropping of annual plants (HUXLEY 1999: 286). Not only the local knowledge about trees, but about herbaceous plants and grasses for multiple uses such as food, fodder, medicine, insecticides, etc. is of important for ecological, economic, political and socio-cultural sustainability in a respective area as well as in a global perspective. Still, many communities like the Wasukuma in western Tanzania, recall the importance of wild resources and their management on local level through indigenous institutions. Moreover, various traditional procedures, spiritual beliefs and values existed for the management of natural resources. Since these traditional values are nowadays undermined by values and changes coming from outside, like modern medicine or cash crops, emphasis has to be put on the strengthening and revival of local knowledge, values and institutions for securing environmental sustainability (URT 1998: 24). Within this context, gender plays a crucial role as women's knowledge about the multiple use aspects of these resources has been found to be higher compared to those of men (see e.g. OTSYINA et al. 1997b: 90).

Also the role of indigenous institutions has to be taken into consideration. URT (1998: 24) summarises: “These customary institutions, spiritual values, beliefs and the indigenous knowledge around the protection of the natural resources contributed to their sound management.”

Knowing about local wisdom also helps to identify weaknesses when it comes to refusal of specific technologies, trees, etc. For instance, there might exist socio-cultural reluctances to trees: in the HASHI-ICRAF project area *Acacia nilotica* and *Senna siamea* are believed to dry soils similar to eucalyptus (OTSYINA et al. 1998: 24).

Different aspects related to knowledge about medicine are described in chapter 6.2.6.1. Local traditional land-use systems such as raised beds, mixed cropping and crop rotation have been described in chapter 5.2.3.

Regarding the use of trees as well as tree planting patterns the study shows that some of the farmers have been confronted with the wealth of trees through parents or relatives which had a direct influence on their affinity to tree plantings (e.g. 5T-m, 6T-m, 1K-m). Accordingly, it can be stated that there is a close linkage between adoption and implementation of biological conservation strategies and experience.

When talking about food security, it has to be kept in mind that biodiversity plays a key role within this context: the greater the biodiversity - will say, the better the integration of a land-use system in a respective natural environment the more sustainable it is and the better the chance to reach the aim of food security.

Changes in land-management practices cannot be imposed, but have to be generated from within through a better understanding of local land-use systems. Consequently, appropriate research is crucial (BARROW 1997: 195). A promising approach seems to be the agro-ecological model which relies on indigenous farming knowledge and selected modern technologies. Examples from numerous experiences of sustainable agriculture implemented at the local level show that over time agro-ecological systems exhibit more stable levels of total production per unit area than high-input systems, enhance agro-biodiversity, ensure soil protection and increase livelihood conditions (see ALTIERI et al. 2001: 123-127). BUDELMAN (1996: 69) describes that in “[…] the experience of the farming system research programme in Sukumaland systematically studying farmer’s home-grown experimentation is a brand new field of attention, where information can be collected that has relevance in developing effective technology transfer strategies.” There is a strong debate going on between production-oriented agriculturalists and environmental advocates (high-input versus environmentally sustainable farming), and there are examples for resource abuse for both concepts. As PAARLBERG (2001: 132) mentions, the debate remains deadlocked until a region-specific approach is handled helping to minimise paralysing technical arguments and highlighting reform imperatives that go beyond the technical choice. Better forms of land-use will be achieved only by improving our understanding of how to use local and scientific knowledge available (HUXLEY 1999: 18).

6.2.6.1 Medicinal plants

> "Many indigenous people have intimate, local, knowledge of plants, such as herbs, trees and flowers and parts of animals, and their use as medicines which, in turn, could give clues to new drugs for the West. They also know the right part, such as the root, leaf, seed or flower, to pick and season in which to harvest these "natural medicines" so they contain the maximum amount of health-giving compounds. This knowledge is often enshrined in ritual, ceremony and magic underlining how culture, language, religion, psychology and spiritual beliefs can often not be separated from their understanding of the natural world"
>
> SNIFFEN in the context of globalisation as a threat to the world's cultural, linguistic and biological diversity (2001: internet).

Since ancient times plants have been an indispensable source of both preventive and curative medicinal preparations for human beings and livestock treatment all over the world (see also OTSYINA et al. 1998: 45) and also among many people in East-Africa (see Fig. 97): "Herbal therapy, though still an unwritten science, is well established in the cultures and traditions and has become a way of life of almost 80 per cent of the people of Africa" (BAQUAR 1995: 140).[129] Despite immense progress in modern medicine, it is estimated that more than 80 % of the rural people in Tanzania still depend on traditional healers and herbal medicine for primary health care needs (OTSYINA et al. 1998: 45-46). A survey to identify and prioritise trees used in traditional medicine in Shinyanga Region, Tanzania identified more than 300 trees for the treatment of more than 100 human diseases (TARDT 2000: 27; see also chapter 6.2.6.1) The same authors (ibid.: 9) mention that farmers keep woodlots a. o. as a continuing source for medicine.

Fig. 97: Farmer 6T-I pounding the bark of *Ficus sycomorus* to produce a decoction for the treatment of stomach problems of a sick cow

[129] Recently, a group of 160 women has organised itself to *Women Fight Against Aids in Kenya* (WOFAK) in slum areas. The object is to treat infections, which especially occur as a consequence of the weakening of the immune system after an aids-infection, with natural products since many women cannot afford expensive modern treatment (see EVELEENS 2001: 6).

The study supports the general statements in the literature as it reveals that indigenous trees and shrubs, besides local herbs, play a key role regarding medical health care: it has been shown that medicinal purposes are the most important use aspect of (indigenous) perennials besides firewood (see chapter 5.2.1.4).

Furthermore, especially the female farmers dispose of a high knowledge on natural medicine. Farmer 4T-l mentioned: „Miti ni dawa kwa watu na wanyama. Dawa ya asili ni muhimu“ (Trees are medicine for humans and animals. Natural medicine is important). Out of the 18 women farmers that have been visited all farmers have a partly far-reaching knowledge about local medicinal plants for human treatment, and 16 farmers (except 3K-m, 1T-h) dispose of a partly far-reaching knowledge for animal treatment with natural medicine (see also Fig. 97). To demonstrate the wide range of knowledge some few examples shall be mentioned: farmer 4T-l said that *Kigelia africana* helps to produce blood. Farmer 2T-h reports that „Maganda [*Rauvolfia caffra* - note by the author] is medicine for cattle. You have to boil the bark or roots." Farmer 2K-l mixes the liquid of *Aloe ssp.* with water against chicken diseases. Farmer 1T-l makes a very tasty tea through boiling the bark of *Acacia nilotica.* The tea is said to be good for cleaning the whole body, against stomach problems, malaria and it supports secretion of bile liquid. These farmers give their knowledge to people resp. treat human and animal diseases. This finding is according to the literature which states that “[…] women are generally responsible for health care in the family and are a very knowledgeable group on medicinal trees” (OTSYINA et al. 1998: 48). However, many male family members, like e.g. on farm 1T-l, 1T-h or 6T-l, have far-reaching knowledge on natural medicine as well.

Teaching of and talking about medicinal knowledge is an important aspect among the female farmers in general. All farmers knew about a person who teaches indigenous medicinal knowledge. Especially farmer 1K-m has to be named in this context who is widely known as a traditional healer: apart from the fact that she is consulted even at night by neighbours, friends, relatives and even from people living far away, she uses her car for to transport the very sick people to hospital. She said: „Yes, I am a traditional healer and a kind of midwife, too. Even late at night people come to me: "Maria, Maria, my child is sick - Laughing: „It’s already my fourth car, used up through bringing people to the hospital and so on."

Farmer 2T-l experiments with the indigenous tree *Sesbania sesban*: „The leaves of *Sesbania sesban* are good for women- milk production; I found out through self-experimentation that it is a contraceptive!"

The farmers regard knowledge about traditional medicine and pesticides as important and mentioned that people should be trained on it, e.g. through the project. Lack of time and resources were named as constraints (3K-l, 3K-m). The HASHI-ICRAF

project already works together actively with local knowledge keepers like traditional healers (TARDT 2000: 28).

Tab. 39: Knowledge/use of natural human/livestock treatment

	Farmers																	
Aspects	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Natural human treatment	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**2**
Natural animal treatment	**1**	**1**	**1**	**1**	**1**		**1**	**1**	**1**		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**

Legend:

= no knowledge/use; **1** = some knowledge/use; **2** = extensive know-ledge/use; **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household

In Shinyanga Region the most important tree for medicinal purposes with additionally being scarce in the area is *Securidaca longipedunculata* (OTSYINA et al. 1998: 51). Indigenous tree species which were most often named by the farmers as being important within traditional medicine (all project areas) include *Acacia nilotica/tortilis*, *Combretum ssp., Croton machrostachys*, *Ficus sycomorus/thoningii Kigelia africana*, *Rauvolfia caffra*, *Sesbania sesban* and *Tamarindus indica*.

Tree parts named to be used for medicinal purposes were leaves, bark, fruits, seeds, flowers, sap and roots; OTSYINA et al. (1998: 53) did not mention sap but additionally stem and wood, with roots as the most frequently used tree part. Reasons named for not planting medicinal trees were lack of skills, seeds and seedlings (ibid.: 58).

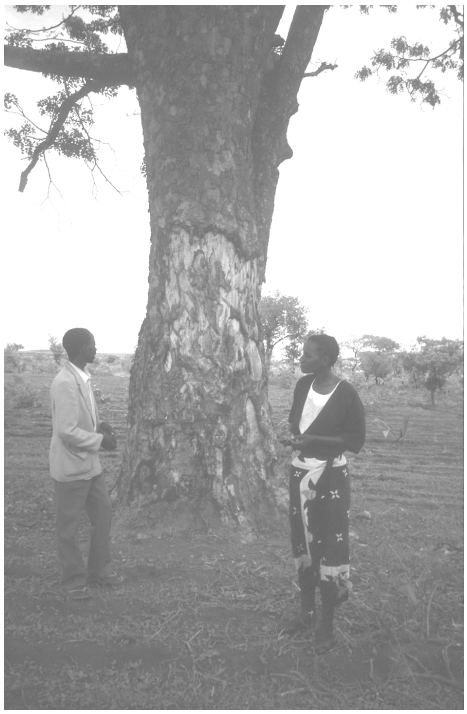


Fig. 98: Big parts of the bark of this tree (*Afzelia quanzenzis*) near Ufala, Tanzania have been removed for medicinal purposes

The widespread knowledge and use of medicinal plants serves the benefit that people do not have to rely on expensive medicine. Over and above that, medicine made from herbs and trees generally has no side-effects, and their use and propagation supports the independence of the communities with regard to health aspects. Where dispensaries and/or hospitals are out of reach for the population, traditional medicine is the only available source for achieving treatments. Moreover, many plants form an important contribution within the context of health care for livestock/veterinary treatment (KOKWARO 1993: 1-3; BAQUAR 1995: 140; MUGABE & CLARK 1998b: 18; KARMANN 1999: 91; WWF 2000b: 25-28).

Unfortunately, deforestation and booming local trade in traditional herbs are diminishing the supply in the wild; some of the priority medicinal trees are so over-harvested (see also Fig. 98) that they will become extinct unless major efforts are put in place to reverse the situation (OTSYINA et al. 1998: 46; TARDT 2000: 27; WWF 2000c: 15). In many districts of Shinyanga Region, already now most trees cannot be found anymore and are likely to have been harvested to extinction. "It is the rural people who have most to lose if this priceless indigenous intellectual heritage and some of the trees, which form its basis, disappear" (OTSYINA et al. 1998: 46). It is therefore highly recommended to support and initiate the domestication of these herbs and trees through seed production, establishment of nurseries, medicinal gardens as well as the integration of medicinal trees in farms (see also TARDT 2000: 27). Furthermore, a lot of knowledge about local health traditions is lost because they are passed to the next generation orally and are largely undocumented (OTSYINA et al. 1998: 46). The authors conclude (ibid.): "These problems of minimal documentation, diminishing supplies, unsustainable, unregulated and indiscriminate harvesting of medicinal trees actually provide numerous opportunities for the advancement of agroforestry for a better environment and rural well being in the region." Activities to be undertaken include documentation, establishment of programmes for domestication and conservation of trees as well as creating new markets for herbal medicine (ibid.).

6.2.6.2 Traditional food crops

> "Local knowledge of perennial woody species should not hide similar knowledge of grasses and other non-woody species."
>
> BARROW in the context of local participation in tree management in dryland Africa (1996: 234).

One important aspect in the context of natural resources management for ecological, economic, political and socio-cultural sustainability in a respective area as well as in a global perspective is the knowledge, conservation and resurrection not only of local trees, but, as has been stated also by the author above, also about herbaceous plants and grasses for multiple uses like food, medicine, insecticides, etc.

In this chapter attention shall be drawn to traditional food plants. In general, the most intensive use and variation of traditional food crops is found in the project areas of NSWCP and HASHI-ICRAF, the less in the LPAs of the SCAPA-project area (see Tab. 40). Among the group of leafy vegetables preferences are on amaranthine and *Commelina ssp.*; all species are indigenous (the same goes for the traditional cereals). The local plants are either cultivated (e.g. amaranthine or black nightshade) or wild growing plants like *Commelina africana/forskaolii* (all farmers except 1T-l, 1T-h, 2T-h, 3T-h), *Cucumis prophetarum/metuliferus* (1K-l, 2K-l, 4T-l, 5T-l, 6T-l, 2K-m) or *Sesamum angustifolium* (all farmers in Shinyanga/Kahama District) are collected (for

more details see chapter 6.2.6.2).[130] With regard to *Commelina africana* MAUNDU et al. (1999: 95) write: „An important vegetable just after the onset of the rainy season before cultivated vegetables are available." Especially amaranthine has been found to have some excellent properties so that an intensified cultivation of this plant is highly recommended: it grows wild, e.g. along roads, paths or on fallow, so that it can be used as wild vegetable as well. Due to its low demand in nutrients and climate it can be cultivated in arid areas, and it has a high concentration of protein, vitamin A and C (FRANKE 1997: 108-109).

Cow peas, well-suited to many agroforestry situations (HUXLEY 1999: 110) are cultivated most amongst the protein supplying crops; clusterbeans and lentils are only cropped on farms (3T-h and 4T-l). Among the group of cereals which is in total the less important group, sorghum is cropped most. Cassava and sweet potatoes can be called staple food crops, being especially important during the dry season. Although being exotic species they are meanwhile deeply rooted in the different cultures and play a crucial role for poor women (see e.g. T'HART 1992: 25; HAUG 1998: 30). An interesting option for yield improvement, tested in western Tanzania and known as the 'Mukibat system', is to graft wild cassava on ordinary cassava. When well matured, a 6 to 10-fold increase in production per plant is possible (BUDELMAN 1996: 57).

Farmers 2K-l and 1K-m are engaged in the re-introduction of traditional food plants like amaranthine, bambarra-groundnuts, pigeon peas, cow peas, finger millet, cassava (not indigenous!), etc. They said that these crops are adapted to the natural conditions as they are drought-resistant and that they provide good food (see chapter 6.2.6.2). ROCHELEAU et al. (1988: 119) describe the benefits of dryland pulses like pigeon pea (see Fig. 99) as soil-enriching and good food/fodder sources as they are rich in protein (see also OTSYINA et al. 1997b).

Fig. 99: Pigeon pea, a traditional, drought-resistant food plant

A traditional dish which is very popular among the Sukuma in Tanzania is *malimbe*, a mix made from leaves of *bamia* (okra), *mboga* (pumpkin) and/or *mlenda* (*Corchorus trilocularis*), *Commelina ssp.* and *mfuta mwitu* (*Sesamum angustifolium/calycinum*). HYUNA (1989: 37) reports of the use of the wild vegetable locally called *makonda* and a local bean variety called *miranda* in Shinyanga Region (Meatu and Maswa Districts) which is used as dry season relish while

[130] A traditional dish among the Sukuma in Western Tanzania, is *malimbe*, a mix from okras, pumpkin and/or *Corchorus* leaves and *Commelina ssp.* and *Sesamum a*.

in the rainy season fresh leaves are used. Botanical, English and Swahili names of wild growing and partly cultivated plants are given in appendix 8.

Tab. 40: Traditional food crops

	Farmers																	
traditional food crops	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m[1]**	**3K-m[1]**	**1T-l[1]**	**2T-l**	**3T-l[1]**	**1T-h**	**2T-h[1]**	**3T-h**	**4T-l[1]**	**5T-l**	**6T-l**	**4T-m**	**5T-m[1]**	**6T-m[1]**
species variety	13			15			8			10			15			13		
(leafy) vegetables																		
Amaranthine**	1	2	1	1	1	1		2	2	2	2	2	3	3	3	3	3	3
Black nightshade**			1					2	2		2	2						
Commelina ssp***	2	2	2	2	2	2		2	2				3	3	3	3	3	3
Cucumis metuliferus /prophetarum***	2	2			2								2	2	2			
Corchorus tri.*													3	3	3		3	3
Sesamum angustifolium/calycinum***													3	3	3	3	3	3
protein suppliers																		
Bambarra-groundnuts	2				2								3	3	3	3	3	3
Clusterbeans												2						
Cow pea*	1	2	2	2	2	2	2				2	2	3	3	3	3	3	3
Green gram													3		3			3
Ground nut	1			1									3	3	3	3	3	3
Lablab bean*				1		2		1			2					3		3
Lentil													3					
Pigeon pea		2	2	2							2	2		3		3	3	
Cereals																		
Bulrush/pearl millet	1			1								2						
Finger millet	2	2		2														
Sesame				3									3		3			
Sorghum	1	2		1									3	3	3	3		
Tubers																		
Cassava*	1	2	2	2	2	2		2	1	2	2	2	3	3	3	3	3	3
Coco-yam				2		2		2				2						
Sweet potato*	1	2	2	1		1		2	1	2	2	2	3	3	3	3	3	3

Legend:

[1] female-headed household * Besides the fruits leaves and young shoots are eaten as vegetable ** leaves/young shoots are eaten *** Mainly used as wild vegetable, only partly cultivated **1** = during long rains only; **2** = during long & short rains; **3 =** only one cropping season; ▢ = not in the resp. zone/country; ☐ = not on the resp. farm	**K** = Kenya **T** = Tanzania **l** = LPA **m** = MPA **h** = HPA

However, preferences on food crops are very location-specific like has been shown for the preference of maize instead of sorghum and millet in marginal areas in Zimbabwe: reasons given by the farmers were taste, market, less exposed to pests (birds), better fodder quality, less labour-intense with regard to cultivation and preparation (BAUM 1995: 44-45). There are also intriguing cases where a new crop fills a particular subsistence niche exceptionally well, as with 'sukuma wiki', the leafy Brassica species in East-Africa which spread rapidly to farms and gardens soon after its introduction in the 1960s (HUXLEY 1999: 82) and which is cropped on 13 farms. These examples make clear that risk-minimising is not always the decisive factor for farmer's preferences, but it might be aspects like production and processing.

Farmer 3K-l noted that indigenous fruit trees are dying out (no forests!) and that she tries to create awareness about this aspect. Farmer 6T-l wants to plant lemon grass (*chai chai*).

Studies show that women farmers can be experts in their own domain; thus, their integration into research and extension in the field of the enhancement of natural resources management is highly recommended. Otherwise, a vast reservoir of expert human capital remains largely untapped. Still, agricultural research and extension institutions rarely seek the expertise of local female farmers, and few women are agricultural extension agents (in Africa, only 3 % of government-employed agricultural advisers are women); the employment of female extension workers is particularly important in societies that forbid the interaction of female farmers with male agents (BROWN et al. 2001: 206-207).

6.2.6.3 Natural pesticides & insecticides

Pests, diseases and weeds form a serious threat to crops and trees. For instance, after OTSYINA et al. (1998: 44) termite attacks are one of the most important factors limiting tree survival in semi-arid areas. In general, smallholder farmers in whole Africa dispose of a wide range of knowledge on indigenous pest control practices like is shown by various studies (see e.g. MAGHEMBE 1999: 15-16). Accordingly, all farmers except 3K-m, 3T-h and 5T-m use (at least partly) natural pesticides (see Tab. 41): for instance, for the treatment of maize and cow peas farmer 2K-l uses a filtered decoction of *Lantana camara*, pepper and onions. Farmer 6T-l sprays a decoction (24 hours) of neem seeds on vegetable against insects. However, all farmers except four farmers in the Tanzanian low potential areas (among them all farmers in the LPA of HASHI-ICRAF project area) additionally apply chemical pesticides. Out of these 14 farmers ten farmers apply chemical pesticides regularly. Reasons given were no alternative if serious diseases and no time for making natural pesticides.

Tab. 41: Knowledge/use of natural pesticides/insecticides

	Farmers																	
Aspects	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Natural pesticides/insecticides[1]	**1**	**1**	**1**	**1**	**1**		**1**	**1**	**1**	**1**	**1**		**2**	**1**	**1**	**1**		**1**
Chemicals[2]	**1**	**1**	**4**	**4**	**1**	**3**		**2**	**2**	**4**	**1**	**5**				**2**	**3**	**3**

Legend:

[1] ☐ = no knowledge/use; **1** = some knowledge/use; **2** = extensive knowledge/use;

[2] ☐ = no use; ▒ = no use in resp. zone/country, **1** = only if money or if no other choice; **2** = only tomatoes; **3** = vegetables; **4** = vegetables & cash crops; **5** = vegetables, cash crops & against weeds

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household

In the research of HATIBU & MTENGA (1996: 37, 40) weeding provides the most viable opportunity for technology improvement as it has been found to be the main constraint in crop production; for instance, cereals are particularly attacked by *Striga ssp*. Generally, some weeds (like species locally known as *lugobi*, *sakule* and *lugugumila* in Shinyanga Region) can affect the yields of crops if not effectively weeded out of the fields. These weeds often have many roots which go deep into the soil or they re-grow very fast which makes weeding activities very exhausting and time-consuming (HYUNA 1989: 44).

No farmer within the research area of *this* study knew about or used (natural) treatment against weeds.[131] In the Lake area in Kenya within another project area (C-MAD) some farmers said that they practise crop rotation with *Crotalaria ochroleuca*[132] or cotton against *Striga ssp*. (see Fig. 100). Another farmer said that *Crotalaria ochroleuca* planted on a field before cultivating tomatoes combats the infestation of nematodes. These observations have also been made by farmers in Ruvuma Region, southern Tanzania; further benefits reported by them are replenishing of soil fertility, especially nitrogen, and provision of cattle feed (ROCHELEAU et al. 1988: 122). Many East-African farmers have started to plant *Desmodium ssp*., an indigenous leguminous weed, between maize against *Striga ssp*., a technique developed by a Kenyan. Some women in the research area of WILLIAMS (1996: 8) mentioned the striga weed control benefits of *Sesbania sesban*. Furthermore, planting a specific local grass ('nepergrass') helps to protect maize from stem borers (DE JAEGER 2001: 42).

Fig. 100: *Crotalaria ochroleuca* planted against *Striga ssp*. on a field in the Lake zone, Kenya

Some farmers in the C-MAD project area keep liquid manure in clay pots to decompose and mix it with water and herbs to be used as natural pesticide mainly on vegetables. Pesticides made from *Lantana camara*, *Eucalyptus ssp*., Mexican mari-

[131] The most common weeds being found were (after frequency) *Striga ssp*., *Bidens pilosa*, *Tagetes minuta*, *Solanum incanum*, *Argemone mexicana*, *Leonotis mollissima*, *Leonotis nepetifolia*, *Gutenbergia cordifolia*, *Heliocrysum ssp*., *Achyranthes aspera*, *Commelina africana/forskaolii*, *Commelina benghalensis*, *Priva curtisiae*, *Lantana camara*, *Craterostygma pumilum*, *Salva coccinea*, *Hibiscus pycnostemon.* Botanical, English and Swahili names of weeds are given in appendix 9.

[132] This plant is wrongly referred to as ‚sun hemp' (*Crotalaria **juncea***!), e.g. by ROCHELEAU et al. (1988: 122). It is used in Tanzania for green manure, as fodder, vegetable, natural herbicide (s.a.) and pesticide (seeds in stored maize against borer) and should be propagated in Kenya, too (see THOMAS 1997: 267, MAUNDU 1999: 107 and FRANKE 1997. 404).

gold, or *Tephrosia vogelii* are reported by farmers in Zimbabwe to be used against termites and other pests like psyllids or seedbed pests (NYAMANDE 1999: 15-16).

As there are high losses of stored crops/seeds, preservation measures have to be taken. Only four farmers preserve their seeds and crops before storing: farmer 2K-l uses chemicals, all farmers in the LPA of HASHI-ICRAF use natural treatments (4T-l uses neem seeds, 5T-l uses 'normal' ash, 6 T-l uses the ash of burned neem seeds). The treatment with ash has also been observed by HYUNA (1989: 45). After FRANKE (1997: 404) seeds of *Crotalaria ochroleuca* stored with maize keep away cornborers.

In general, the use natural pesticides needs to be encouraged. Studies have found that pesticides are needed in very small amounts only; research is going on for their complete replacement, e.g. through biological control (HAZELL in WILSON 2001: 106).

6.2.6.4 Primary/secondary forest resources

> "For example, forests are recognized as promoting an extremely high level of biodiversity, but even single trees can provide homes for an assemblage of plant and animal biotypes."
>
> P. HUXLEY in his book on tropical agroforestry (1999: 71).

Primary and secondary forest products form an important source for diverse materials for the livelihood of especially rural communities (see e.g. BLUME 1998). All farmers except 3K-l and 3K-m use primary/secondary forest resources; some farmers use a great variety of different resources (see Tab. 42). The husbands partly have a deep knowledge about the use of herbs and perennials, too.[133]

Tab. 42: Use of primary/secondary forest resources

	Farmers																	
Primary/secondary forest resources	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Animals	x			x	x						x	x				x		x
Firewood	x						x		x	x		x				x		x
Fruits	x			x	x				x	x						x	x	x
Honey	x							x			x							
Leafy vegetables	x			x											x			x
Medicine	x	x		x	x		x	x		x	x	x	x	x	x			
Mushrooms	x			x												x		x
Seeds				x			x	x			x					x	x	x
Fodder[1]	x	x			x		x		x	x	x		x	x	x			x

Legend:

[1] grazing and/or collected - leaves, grass, etc.; ▢ = not in the resp. zone/country; ▢ = not on the resp. farm; **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household

[133] The husband of farmer 1T-h is a traditional healer and consulted by friends, neighbours and relatives; his mother who taught him the knowledge said that he is the only one out of all her children (10) who has the same gift like she.

6.2.6.5 Traditional forest reserves, beliefs about trees

> "Local perceptions and attitudes to trees can significantly affect tree growing. Trees may have social or spiritual roles that will affect whether they are planted and protected or not irrespective of their economic value"
>
> B. TENGNÄS in a manual for agroforestry extension in Kenya (1994: 148).

Traditional beliefs about and customs related to trees and forests (medicinal aspects have been explained in chapter 6.2.6.1) have to be considered as well. For instance, in the Sukuma culture in western Tanzania various spiritual beliefs, values and procedures existed like *sacred groves* of woodland which are often associated with burial sites, ritual performances like *Kageta* for women rituals or sacred places for rainmakers. Also sacred trees existed like *mibale* (?) for rituals, *msingisa* (*Flacourtia indica*) for love medicine, *mnanga* (*Grewia similis*?) for shade and food, etc. On anyone who violated these rules local penalty (*mchenya* or *ralinda*) could be imposed (URT 1998: 24). Farmer 6T-l mentioned that old traditions are still being practiced on 'a hill in the forest'.

All farmers except 3T-l and 5T-m (not from that place) said that places/trees for practising ceremonies, dance etc. (the *Kamba* call it *ithembo*) can be found in the region: „Yes, there are places for ithembo formed by natural trees like Kiumo, Kitundu and Kithea" (3K-m).[134]

Some trees may be considered special for specific customary rituals only such as sacrifices for ancestors, religious ceremonies or funerals (BRADLEY 1991: 207). In the project areas many customs are related to tree species. Accordingly, special tree species may be considered to have a good or an evil spirit. A tree which has been named by many farmers in the project areas and around which many different stories are spinning is *Ficus thoningii.* The husband of farmer 3T-h referred to the evil spirit of this tree: "People said this tree is the house of the devil, and he comes at night to eat the fruits. If a child e.g. brought home firewood from a certain tree the mother screamed and shouted: 'Throw it out! Never cut this tree again or we all will die!'" After farmer 4T-m one is lucky if he/she can see the tree flowering, because the flowers are normally taken by the devil.

Among the *Luo*, a tribe in western Kenya (after own investigations), *Terminalia brownii* is not planted next to a house because it is believed that this might lead to the death of a family member. Other tree species said to have an evil spirit (besides *Ficus thoningii*) are *Borassus aethiopum* (5T-l), *Syzygium cuminii/jambolanum* (4T-m), *fenesi* (traditional name, not identified; people say that the one who plants this tree should not use it or he/she will die - 5T-l), *mamanwa* (traditional name, not identified; farmer 4T-m said that this tree is indigenous to the area around Kahama).

[134] Kiumo = *Ficus thonningii*, Kitundu =*Croton macrostachys*, Kithea = *Cordia sinensis*

Interestingly, a traditional belief has also been imposed on eucalyptus: After farmer 4T-l people say that the devil likes to sit on this tree because it grows so high.

On the other hand, there are trees which are said to have a good spirit. Trees named (besides *Ficus thoningii*) were *Adansonia digitata* (6T-l), *Croton macrostachys* (6T-l), *Cordia sinensis* (6T-l), *Combretum obovatum* (5T-l) and *Tamarindus indica* (5T-l).

Within a sustainable management of natural resources knowledge about traditional forest reserves (TFR) and sanctuaries forms an important aspect. GERDÉN & MTALLO (1990: 2-3, 8) explain why (see also BLUME 1998: 45-46; GRILL & MAITRE 1999: 32; WWF 2000a: 18): “Traditional beliefs contain a lot of knowledge about the environment that can be useful to the planning of development programmes. [...] In some areas the TFR stand out as ‚environmental museums‘ of vegetation that formerly covered the surrounding agricultural fields. Socially as in the case of natural springs, the TFR serve as a clear demonstration of the wise ecological beliefs and behaviour of the elders when they teach the younger generation to respect the TFR. [...] The fact that many TFR are on slopes and hills and surround natural springs is an indication of their ecological importance. They conserve water sources and protect against soil erosion. Also, they are natural, surviving habitats for animals and birds and represent a “memory” of the natural forest environment of the past.”

After a study in Shinyanga Region, most prioritised medicinal trees are found on uncultivated land; the main source of medicinal trees are now the protected forest reserves (OTSYINA et al. 1998: 56). This is also reflected by the statement of five farmers (2K-l, 2T-l, 3T-l, 1T-h, 2T-h) who said that the old practices are dying out and old wisdom disappears since almost only old people know about them; this phenomenon has been described for the knowledge about medicinal trees also, keeping in mind that this knowledge is a treasured secret of some individuals (ibid.: 48). Undermining of traditional values in recent days has – besides the fact that the trees and forests are disappearing – according to URT (1998: 24) to be related to values and changes coming from outside like modern medicine or cash crops.

6.2.7 Perception of nature

Not only in the context of the preceding chapter the perception of nature is a relevant factor; this aspect determines the way how natural resources are managed. It is supposed that the higher nature ranks and is valued as a treasure the higher the degree of sustainability regarding the use of natural resources. Of course, even people who are conscious about the value of nature cannot lay down by this knowledge while the family needs food and there are no resources left to think about this aspect. In acute emergency cases, such as hunger and poverty, this aspect becomes luxury and unimportant (BLUME 1998: 75, 78, 96). The different quotations with regard to this aspect have been listed in appendix 10.

All farmers like nature and think that nature is important - just because nature is beautiful, means life and is linked to religion, or for practical reasons like trees bring rain or shade, animals supply food or money through tourists, etc.

Asked whether they think that mankind and nature do have a chance to live in harmony, the husband of farmer 1K-l said: "If the government looks after the national parks and people do understand the necessity of nature, yes. If not, if the people don't understand, nature will go and this will be very bad. Harmony is only possible if everyone cares and takes responsibility."

Wildlife, however, has a more critical status among the farmers who are directly confronted with problems linked to wild animals like destruction of fields/crops or danger. Farmer 2K-m suffers a lot from destruction of her fields and crops through wild animals, so asked whether she likes wildlife she answered: "No. E.g. the problem with the porcupine: It completely destroyed my harvest of cassava. I want to eat and the animal too, so what is the consequence out of it?" The husband of farmer 1T-h examines the problem by means of a concrete example: "There is a problem with the natural forest up on the mountain because people get their firewood there. It's dangerous because of the wild animals, so if the women go to collect firewood they only go in groups. The forest is affected and suffers, one has to try to preserve him from extinction."

In general, after the farmers wild (dangerous) animals only have a chance if they stay in fenced areas/national parks: "Human being and wild animals together is a problem, unless you have protected and fenced areas. E.g. the buffaloes don't know borders. If they enter a field, they will be killed" (husband of 3T-h).

6.3 Project related aspects

In the following, farmer's views on and perception of different aspects related to the projects shall be outlined. The analysis of these factors has to be regarded as a feedback to the projects and their donors. Only by hearing the voice of the ones to whom the measures and innovations are dedicated, projects can improve and develop. Aspects elucidated encompass approach, extension and critics. An analysis to identify weaknesses and potentials as to projects is presented in chapter 9.3.2. Before elucidating the various issues, attention has to be drawn to the aspect of development – or – what do the people expect from the project? Generally, the people contacted in the research area perceive development, not only brought about by the project, as a process of movement towards a better way of life – better housing, enough food for the family, good education and health conditions to which

improved income, also through a healthy environment, is the key. Especially for women, this encompasses empowerment: full participation in all decision-making processes on all levels, own business/income.

A comparison of data (see Tab. 43) on the farmer's initial contacts to the projects (NSWCP started in 1974, SCAPA in 1989, HASHI-ICRAF in 1991) shows that five farmers are in contact with the project almost since the project started (3K-l, 1K-m, 3K-m, 1T-l, 2T-l) out of which the three farmers in the NSWCP project area have project experience for more than 25 years (measurement until 2000). The most recent project contact is among the farmers in HASHI-ICRAF project area. Farmers 2T-h and 5T-l had contact to other projects before; some farmers only recently moved to the place (2K-l, 5T-m).

The farmers have been contacted first on a farm-, group- or village level. Half of the farmers has been approached on a village meeting first (all farmers in the SCAPA project area – and the group members: „The project staff came to the village and talked to all the village members in a public meeting." – 3T-l). The farmers within NSWCP project area in Kenya (except 2K-l) had their first contacts through house-to-house visits (same to the Kenyan group members), thus, before the catchment approach had been introduced. While the farmers in the LPA of HASHI-ICRAF project area had been contacted via the groups (4-6T-l), the farmers in the MPA had their first contact to the project on a village meeting (the project first contacted. Farmer 2K-l mentioned that it has been the group who contacted the Ministry: „They had no transport to come."

All farmers (except 2K-l, 4T-m, 6T-m) said to have been approached by both male and female staff and/or trainers. The following project activities have been mentioned:

- Farmer field days/study tours/farmer-to-farmer extension tours (1 day)
- Demonstrations/training (1 day)
- House-to-house visits
- Seminars/training (for several days)
- Problem discussing/meetings (*barazas*)

The development of Land Management Plans for individual farms has not been named by the (Kenyan) farmers/group members (PRA method). Furthermore, meetings (*barazas*) have not been named explicitly.

A huge variety of activities have been joined by the farmers (for details see appendix 11). All farmers except three farmers (2K-m, 4T-m, 5T-m) joined farmer field days/study tours and/or demonstrations/training (1 day), and twelve farmers (except 3K-l, 1T-l[135], 3T-l, 2K-m, 3K-m, 5T-m) additionally joined at least two days seminars; nine farmers (2K-l, 3K-l, 1K-m, all farmers in the HPA in SCAPA project area and in

[135] She was sick on the day she had to join a seminar (about bee-keeping and constructing bee hives) and sent a family member instead.

the LPA of HASHI-ICRAF project area) joined training/seminars conducted by other organisations and institutions.

In general, the farmers and women's group members are satisfied with the project activities, especially the Tanzanian farmers and group members. Six Tanzanian farmers (1T-l, 2T-l, 1T-h, 2T-h, 4T-m, 6T-l) only had positive critics. Farmer 2T-h summarised: "SCAPA wameleta uwazi... SCAPA imetoa mwanga sana... SCAPA imefungua njia sana" (SCAPA brought clearness... SCAPA brought the light... SCAPA opened up the way very much). And farmer 4T-m said about HASHI-ICRAF: „HASHI brought education and knowledge. The project also helps with material like karatasi, or watering cans, brings seedlings with tractor for selling to the people …. The good thing is that they control their impact." General benefits due to project interventions named by the farmers and women's group members have been listed below:

- higher crop yields → food security and increase of income
- higher milk yields (through zero-grazing and fodder banks)
- increase of firewood availability: this aspect was one of the main benefits through the project's assistance named by all farmers. Farmer 4T-l explained: "There were no trees in the whole area before HASHI came here. HASHI helped us so much. The women used dried manure for cooking; now we can use it on our fields."
- reduced/stopped soil erosion through physical/biological conservation measures
- better soil structure and higher soil fertility
- tree products for different purposes
- improved access to water
- less use of firewood energy through firewood saving stoves (especially SCAPA)
- increase of income through creating possibilities for small scale business
- skills and knowledge through training
- contact to other people
- empowerment of women and improvement regarding gender aspects: the positive impact of the projects with regard to this aspect has been stressed by many farmers. They (4T-l, 4T-m) said that many men already have changed their behaviour: they feel more responsible for their families, help on the farms, there is more solidarity when it comes to activities related to new practices like zero-grazing (also 5T-m), they are more sensitive to decision-making aspects within the family (like on farm-management aspects or concerning title deeds) and in the public, share their income, violence against women and children is being reduced, etc.

Sanitation has not been mentioned, health-related criteria have been named by few farmers/members only.

Of course, also critic has been mentioned, especially on the extension service (see Tab. 43): eight farmers said that the contact to the extension officers needs to be closer (2K-l, 3K-l, 1K-m, 3K-m, 3T-h, 4T-l, 5T-l, 6T-m); this has been mentioned many times also during discussions with the women's group members, especially in the area of NSWCP and HASHI-ICRAF. Farmer 3K-m said: „They need more

officers to reach every farmer." Farmer 5T-l even said that there is no extension at all. Farmer 4T-l and 3T-h explain why extension is crucial: „Bila kufika kwa watu mtu hawezi kujua Mama ana matatizo gani" (Without going to the people one cannot know about the problem of the women – 4T-l). „The project is very good, but the contact has to be closer, we need more support. E.g. contours have been measured, but no one is starting to dig" (3T-h). Farmer 1K-m describes her impression of the extension as follows and also refers to the governmental approach: „The contact to the extension officers is not enough; they just come, have a look and rush back to the office. But the approach is very good, although working on grassroots level might be more effective." Some farmers also mentioned the bad timing of training.

All farmers would like the projects to assist with credits or funds; they said that lack of finances is one of their biggest problems in the context of activities related to empowerment and development. Accordingly, the MOALDM report concerning NSWCP writes (1998: 9): „Provision of credit has not been among the activities of S&WC Programme. Many farmers feel that their economic opportunities are restricted without access to credits."

2K-m said that farmer field days or training have not been conducted, and 6T-m recommends the intensification of training activities. Concerning tree management farmers 1K-m (and many Kenyan group members) and 5T-m said that more seeds/ seedlings of especially indigenous trees should be provided, and farmers 4T-m and 6T-m (as well as many group members and farmers in the MPA of HASHI-ICRAF!) complained about the distribution of eucalyptus as this tree is regarded as being destructive to crops, the soil and other trees.

Of course, this sample is too small to draw general conclusions on the project's impact, however, at least tendencies can be demonstrated.

Tab. 43: Project related aspects

	Farmers																	
Project-related aspects	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Project contact	**'90**	**'95**	**'75**	**'75**	**'97**	**'75**	**'90**	**'90**	**'95**	**'94**	**'97**	**'97**	**'97**	**'95**	**'97**	**'96**	**'98**	**'94**
Project approach*	**1**	**4**	**1**	**1**	**1**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**3**
No/not enough extension		**X**	**X**	**X**		**X**						**X**	**X**	**X**				**X**
No/not enough credits	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
No/not enough training					**X**													**X**
Not enough/bad seedlings				**X**												**X**	**X**	**X**

Legend:

*** 1** = house-to-house visits; **2** = groups; **3** = village meeting; **4** = group initiative
☐ = not on the resp. farm; ▒ = not in the resp. zone/country; **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; ***** = female-headed household

Within this context, it shall be referred to the farmer's wishes and dreams since they contain also hints for the projects. Tab. 44 below shows that the farmers have a huge variety of wishes and dreams for the future; besides general wishes like well-being or health many concrete aspects have been mentioned out of which aspects linked to water have been named most often (9 x) and reflect that for many farmers well-being is closely linked to the access of (clean) water.

Farmer 2T-h had the most wishes and set priorities (1. finishing house, 2. market, 3. electricity, 4. bio gas, 5. water tank, 6. fishpond). Farmer 1K-l additionally mentioned an interesting aspect: she wishes that all people return to the countryside and explains: "If all the young and strong people leave, only the old, weak and thus poor people remain; it's not a good living. Under this conditions there is no development possible. The strong - young - ones have to help the weak - old - ones."

Tab. 44: The farmer's dreams and wishes

	Farmers																	
dreams and wishes	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Water tank			x	x			x				x						x	x
Wellbeing family								x	x	x								
(Clean) water				x									x		x			
Biogas											x				x			
Finishing house											x			x				
Fishpond											x					x		
More money												x		x				
(More) livestock		x															x	
Electricity											x							
Enough food	x																	
Health	x																	
(Completing) social hall				x														
Wellbeing family & group									x									
Tea room		x																
Shop for firewood/charcoal						x												
Poultry keeping project		x																
Water pump													x					
Well																x		
More PSCM					x													
Mill for women							x											
Market access											x							
Sewing machine																		x

Legend:

□ = not on resp. farm; ▒ = not in the resp. zone/country
K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household

All farmers except 6T-l would like to receive more training, especially on the following subjects (farmer 4T-l did not specialise, she said any training would be good if it means improving the situation and knowledge of skills): construction of (underground) water tanks (1K-l), water management (1K-m, 6T-m), tree management (3K-

l, 1T-l, 3T-l, 3T-h, 4T-m, 5T-m), horticulture, agricultural aspects (2K-l, 2K-m, 3K-m, 3T-l, 4T-m → likes the idea that one woman can feed a whole family by tending a vegetable garden), physical soil and water conservation methods (1K-m, 2K-m), animal husbandry (cross and grade stock, zero-grazing, forage, dairy - *kooshea ng'ombe*) (1K-m, 5T-l, 6T-l), natural medicine (2K-m, 2T-l, 3T-l, 5T-l, 5T-m), poultry/livestock keeping (3K-m), improved cooking stoves („I could teach the other women, clay is here!" – 3T-h), bee-keeping (3T-h), bio gas (3T-h). These subjects have been mentioned by members of the different women's groups, too (except bio gas) with preferences for agriculture, animal husbandry, tree- and water management.

All Tanzanian farmers, but only two Kenyan farmers (1K-m, 3K-m) think that the project is known by all farmers in their area. 3K-l said: "Not at all, but few people know about the project, but the few who know about it try to educate others." Farmer 4T-m said that many people, even the school, join the project. After her opinion, this is due to the good project approach: videos and performances are liked very much by the people. However, almost all farmers added that not all people participate in the project activities. Asked why, almost all farmers within HASHI-ICRAF project area referred to the still strong traditional biases against trees like trees spoil the maize or they host birds which eat the harvest. Some farmers referred to the personalities of people like farmer 6T-l: „This depends on the person. You can find people doing nothing like playing bao (traditional game - note by the author) the whole day!" Farmer 4T-l answered: „Ni kwa sababu elimu ni kazi." (it is because learning means work). Farmer 3T-h said: "Look e.g. At the contours: The village has 12.000 inhabitants, but only 60 have started making contours. Many are too lazy, they like staying idle. See, making contours means work, so they run away. SCAPA has to control the work. Me myself I go on with enlightment."

Many farmers (3T-l, 1T-l, 3K-l, 1K-m, 3K-m, 2K-m) especially referred to gender aspects: women do not get assistance from their husbands. Farmer 3K-l said: "Men are politicians. They are sitting in the bars or outside the shops. They never like to be needed. Find women, they are very good. I am sorry to say, but African women work harder than men. I don't want to accuse them." Farmer 2K-m adds: "Men are running around doing nothing the whole day but staying idle, running on the market place from 6 till dawn. I can say this because I had a man like those other men. To gather men for information is difficult, they don't want to listen....An adult is very hard to change. Unless a man does not see the need to change... his behaviour... Aaah... there is nothing to do." Also farmer 1T-l referred to gender-related traditions (among the Maasai) and mentioned that many men still only accept the old traditions and don't want to change.

Also financial resources and natural conditions play a role like lack of water (3T-l). Farmer 2K-l said: "There is no other solution than rain. Let's pray to god that it will rain a lot so that the women can harvest a lot."

Knowledge dissemination and finding adequate channels for information are crucial for project's success although this is not a guarantee that the message will reach its target. The degree of perception depends on educational background (experience!), cultural background and the socio-cultural as well as political environment of the receiver (see also HATIBU & MTENGA 1996: 44). Furthermore, aspects like workload and location have to be considered. Identified channels and sources to be used for passing information from the side of the women as well as the projects are

- fellow farmers (neighbourhood and/or at some distance from the village)
- (women's) groups, also exchange with other groups
- public/village meetings, village leadership
- village committees (1T-l, 2T-h, 3T-h)
- traditional/local/religious institutions
- schools
- videos
- traditional songs and dances/drama
- extension staff
- study tours, field days (1T-l, 2T-l, 1K-l, 1T-h, 2T-h, 3T-h also receive study tours)
- demonstrations, and trials
- training
- manuals, posters, leaflets
- radio/TV programmes

Main sources named by farmers were fellow farmers, (women's) groups and extension. Study tours and field visits have been mentioned as another important source; these findings are congruous with the ones of BUDELMAN (1996: 65-66) in western Tanzania where by far the most important source of information mentioned were fellow farmers. Oral and visual sources are preferred according to tradition and low literacy (see also HATIBU & MTENGA 1996: 44). Critics were on lack of or low extension service, a high potential has been seen in the integration of traditional dance groups in environmental education, especially among farmers in the HASHI-ICRAF project area.

In the research area of BUDELMAN (1996: 65) female farmers apparently had a lower chance in participating in field days and study tours. This gender-related aspect forms a decisive obstacle for the empowerment of both, men and women.

Asked what could be done to enhance knowledge transfer and participation of people in project activities, farmer 2T-h suggested: „Even if they don't listen you should try and try again until they start listening." Farmer 1T-h answered: „E.g. we meet with neighbours and ask them: 'Look, why is this Mama (farmer 1T-h - note by the author) doing this

and the other one not?' Of course, many neighbours are just listening without doing anything. It's important to go on and not to stop. There are not many people around from whose farm one could say it's well managed in the sense of sustainable management like planting trees, etc." Other suggestions besides talking to the people were

- seminars, workshops (5T-l, 4T-m)
- intensification of group activities (6T-l, 4T-m)
- working with the youth ("school children could be informed, changed, but the ones who are not going to school cannot be reached" - farmer 2Km)
- using traditions as vehicle (4T-m)
- the groups/group members (two – 4T-m) should travel → learning by seeing, talking and exchanging ideas (6T-l, 4T-m, 5T-m)
- supporting VSCC
- linking up people
- talking to the men (5T-l)
- engaging village council (husband 1K-l)
- more farmer field days - exchange (visit and receive)
- radio and TV
- meeting other 'strong' women
- planting trees, being a good example (5T-m
- presence of researcher is important: „They see I had a guest from far away. They see I am doing well and will try to follow me." (5T-m); father of farmer 6T-m sad the same
- "Bring people to my place to teach them things" (6T-m).
- in each village educate one *mshauri* (Sw = advisor) concerning tree management (idea of father of farmer 6T-m)

All farmers said that the knowledge about integrated tree- and crop- management as well as physical soil conservation measures derives from the project, apart from the ancestors; farmers 1K-m, 2T-h and 3T-h additionally mentioned other institutions. Concerning animal husbandry all farmers within HASHI-ICRAF project area as well as farmers 1K-m, 2T-h and 3T-h referred to other institutions as well. All farmers in the HPA and farmer 2T-l within SCAPA project area did not refer to the ancestors.

All farmers knew about other projects and institutions (except church and hospital) working in their area.[136]

[136] 1K-l: KIOF, church - family planning & health care; 2K-l: hospital - family planning; 3K-l: GTZ; 1K-m: SIDA, project for family planning, church, dispensary - health care; 2K-m: SIDA; 3K-m: projects within the context of health care and family planning; 1T-l: Heifer; 2T-l: World Vision Tanzania, Heifer; 3T-l: Heifer, church - family planning & health care); 1T-h: SIDO, Oxfam; World Vision Tanzania; 2T-h: family planning (UMATI), Chama cha mifugo (Tengeru); 3T-h: Chama cha mifugo (Tengeru), church (family planning); 4T-l: CIDA, pride, HPI, SIDO (small-scale business like vessels, hoes, etc., loans up to 500.000 Tsh); 5T-l: HPI; 6T-l: Oxfam → wells; 4T-m: ministry, HPI; 5T-m: World Vision; 6T-m: World Vision.

The farmers were informed that the projects work together with the Ministry of Forestry in Kenya and the MoALDM, Kenya as well as the Ministry for Agriculture in Tanzania since they are visited by the extensionists, too. Furthermore, the farmers within HASHI-ICRAF project area knew that the project is in close contact to the HPI project.

6.4 Summary

Under chapter 6 various aspects linked to empowerment have been described and analysed. They have been grouped under different categories to give a systematic overview of the aspects integrated. The analysis started with economy-related facets: the different income generating activities of the farmers have been elucidated, separated in farm-related income generating through marketing of farm produce and off-farm income generating activities through job engagement. It has been revealed that the main problems concerning marketing were low prices and missing market outlets; many farmers produce the same goods and do not have a possibility to switch to other markets than local ones as an alternative because of lack of access or because there simply do not exist other markets. Off-farm income has been shown to play a crucial role as almost two third of the farmers are engaged in off-farm jobs, with high relevance and higher salaries in Kenya – also among the women - and a general low relevance for female-headed households. Poor households are least likely to be involved in off-farm activities so that access to off-farm income can somehow be associated with wealth. Generally, the income situation, also reflected in the employment of labourers and disposal of possessions, is diversified: Generally, the situation is better on the Kenyan farms if referring to country-level, and there is a lower standard on the female-headed farms if referring to marital status. All projects do not provide credits, thus, the situation as to access to loans is unfavourable. However, some farmers in the HASHI-ICRAF project area received credits from an NGO which supports dairy farming activities. Labour division was another aspect concerned: if the women are not assisted by their husbands – because he works off-farm or they do not have a spouse – labour support mainly comes from labourers or even group members, besides from the family members. Household-related activities, however, are more women-specific tasks, and female-headed farms generally face more problems concerning labour shortage.

Among the socio-cultural aspects education plays an important role for all farmers as it is regarded as key for development and especially women's empowerment. However, education shows a gender-related component as the situation for girls and women is worse than the one for boys and men, still. The general expression of a reduced number of children is directly linked to education, finances and resource degradation. The women's engagement in solidarity networks (groups) as members, treasures/secretaries or even leaders and multiple activities performed are important

aspects concerning their enhancement of resource availability and capabilities in general like positively affecting public decision-making processes. Within this whole context restrictions opposed on women due to customs and traditions are a crucial aspect to be analysed: generally, these women do not face severe restrictions – neither on-farm nor in public-related fields, but on a general level, customs and traditions still restrict women from full participation in decision-making processes. Concerning land tenure, more land has been bought than inherited, and two third of the women, among which almost all women farm managers, have got title deeds. All farmers confirmed to have a strong position within the community and that they function as important knowledge transmitters, although some are also facing jealousy. Restrictions due to customs and traditions are gender-related, thus, also problems linked to the general behaviour of men have to be analysed. Many negative aspects have been assessed, putting a heavy burden on women's (and children's!) life among which being left behind, no general support and violence might be the most severe problems women have to deal with. Within the complex of aspects related to indigenous knowledge a high sensitivity especially for indigenous (medicinal) herbs and perennials, but also for the use of traditional food crops, natural treatments against pests and forest resources has been revealed. Hereby, it has been shown that natural medicine is an important part within the family's lives and that all farmers at least dispose of knowledge about medicinal plants; many farmers even apply self-made natural medicine. Main constraints for the use and making of natural medicine were lack of time and resources. Furthermore, the fact that the farmers knew about places/trees for practising ceremonies, dance etc. shows the still high relevance of traditional forest reserves which form an important aspect within the conservation of natural resources. Among the farmers the perception of nature is very positive. Nature is regarded as wealth which has to be preserved (especially trees).

The last aspect included dealt with several project-related issues and described farmers perception of and exchange with the projects inclusive critics.

All the above mentioned criteria are important to assess to come to a true reflection of potentials and weaknesses concerning a sustainable natural resource management.

7 Effects

The analysis shows that ecological and economic conditions, such as food security, firewood- and water supply as well as gender aspects, have been stabilised and improved through different techniques. General benefits have been named by the farmers and women's group members:

- higher crop yields → food security and increase of income
- higher milk yields (through zero-grazing and fodder banks) → see above
- increase of firewood availability
- terraces and other conservation structures
- improved access to water
- firewood saving stoves (especially SCAPA)
- small scale business
- gender aspects

In the following, attention shall be paid to the different positive outcomes.

7.1 Ecological effects

7.1.1 Soil erosion phenomena

The farmers are aware of the changes in the environment in which they live and know about the origin of these changes. They have consistent and complex ideas about how their agro-ecosystem works and about links with changes in the social environment (see also BUDELMAN 1996: 61). Before describing the effects of measures on the intensity of soil erosion phenomena the status of the environment before the projects entered shall be described by the following quotations:

Husband of farmer 2T-l: "When we came here there were gullies who took away the soil, no fish pond, no trees, no goats. You need pictures to show the development, how else can one understand the difference?"

Farmer 1K-m: "Before starting with environmental protection (~ mid 60ies) there were a lot of problems in that region: Many people, no firewood; there still was some natural forest, but he disappeared quickly. Already the parents were facing problems. Now the area is green, we planted so many trees."

Husband of farmer 1T-h: "Before the project came we were suffering from severe soil erosion. There were almost no trees around, we were just planting maize and coffee, that was all!"

Farmer 2T-h: "The area was suffering from severe tree cutting; e.g. the forest surrounding the spring was almost cut, so the spring dried up. 10 years ago the VSCC started a tree planting activity: trees (a lot of natural, too) were planted with manure. Already some 2-3 years later the water was coming back slowly; nowadays the spring has sufficient freshwater."

Due to the implementation of several soil and water conservation measures partly severe soil erosion phenomena, such as deep gullies ascertained for ten farms in SCAPA and NSWCP project areas, have been solved resp. reduced to an extent of less than 5 % of the land under cultivation (see Fig. 101 and 102).

Two farms in Kenya and ten farms in Tanzania (among them all farms in the HASHI-ICRAF project area) showed no signs of soil erosion at all (1K-l, 1K-m, 2T-l, 3T-l, 1T-h, 2T-h); out of these farms eight farms (3T-l, 2T-h and all farms in the HASHI-ICRAF project area) never suffered from soil erosion (the relief of the farm land is almost flat), and four farms completely solved their soil erosion problems (out of these farms only 1T-h disposes of steep slopes exceeding 31%). Since no soil erosion has been going on the farms in the HASHI-ICRAF project area, they will not be considered in the following (also not in Fig. 102).

Fig. 101: Healing gully on a farm in a low potential area in Kenya

Healing soil erosion has been found on two Kenyan farms and one Tanzanian farm (2K-l, 1T-l and 3K-m[93]); all were suffering from gully erosion (2K-l and 3K-m with an extension less than 10 %; on farm 1T-l up to 25% of the farm land was affected), farm 3K-m was additionally suffering from rill erosion.

On-going soil erosion with an affection of less than 5 % of the farm land has been ascertained for two Kenyan farms and one Tanzanian farm characterised by different inclinations (3K-l [5-10%], 2K-m [>31%] and 3T-h [>31%]).

On the seven farms where soil erosion has (partly) been sorted out (1K-l, 2K-l, 1T-l, 2T-l, 1K-m, 2K-m, 1T-h) rill erosion was the most common phenomenon solved (six times), followed by sheet erosion (five times); gully erosion has been solved once.

There is a slight difference between the two countries with regard to the intensity of soil erosion: The farms in Tanzania are less affected by soil erosion; here, two farms are affected, and two farms never suffered from soil erosion. In Kenya soil erosion occurs on four farms; furthermore, sheet erosion is a bigger problem on the farms visited in Kenya than in Tanzania.

[93] The gullies are a direct result of the heavy rains at the beginning of 1998.

A comparison of soil erosion phenomena with data on slope gradients shows that there is somehow a linkage between these two factors: Out of the six farms who showed no signs of soil erosion four farms have a relief < 10% (2T-l, 3T-l, 1K-m, 2T-h). Out of the three farms for which on-going soil erosion processes have been stated the land of two farms is characterised by slopes with inclinations exceeding 10 % (2K-m and 3T-h).

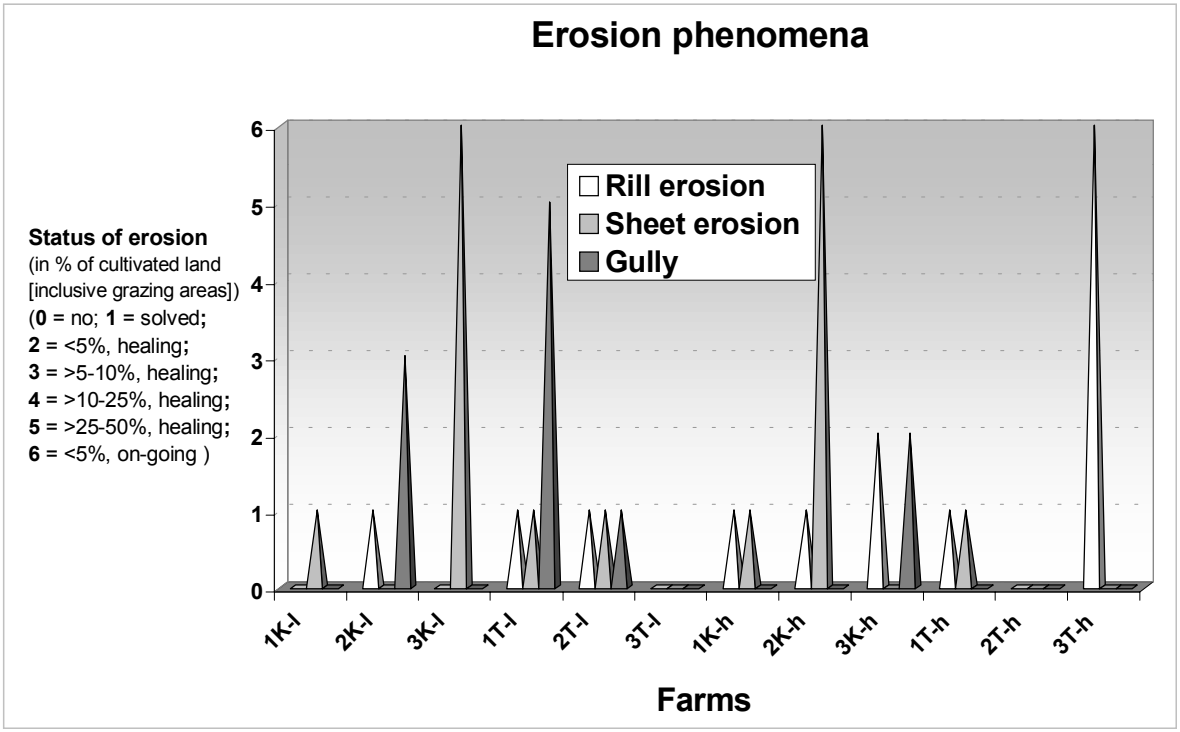


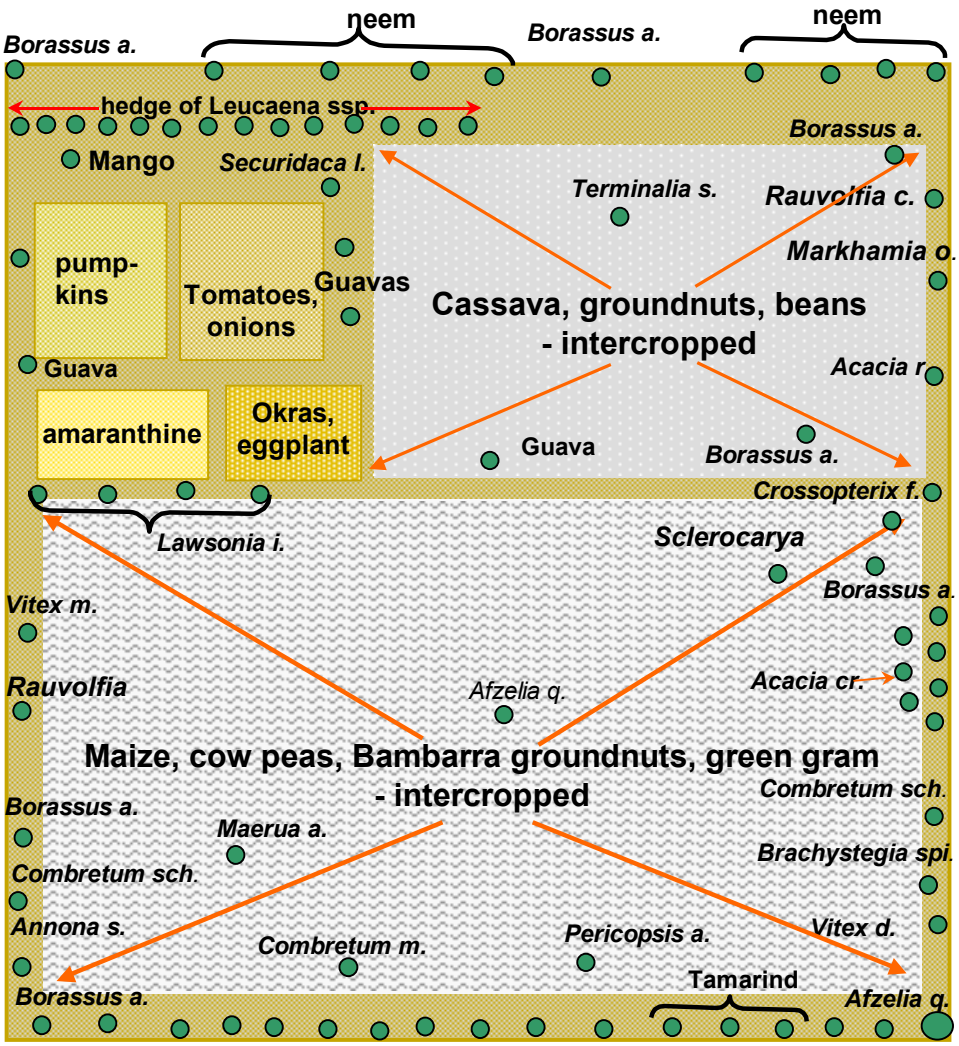
Fig. 102: On-going resp. stopped/healing soil erosion phenomena on the farms

7.1.2 Agro-biodiversity

Declining natural biodiversity and agro-biodiversity has a detrimental effect on survival strategies and on the economic function of (agro)ecosystems (see also NEDA 1997: 15). The deep engagement of the farmers in different conservation activities has led to a partly significant increase of species diversity (flora) on the farms and the environment. On the one hand, degradation processes have been reduced or stopped through measures like e.g. tree plantings, natural tree regeneration, zero-grazing (reduced tree cutting, reduced free-grazing of livestock) and live-fences. On the other hand, these activities result in a lower pressure on natural habitats and wildlife and consequently contribute to the conservation of areas (see also WITTE 1998: 75) either having a conservation status like national parks, game reserves, but also traditional forest reserves or areas without a conservation status (see chapter

2). Generally, woody vegetation creates all kinds of habitats for different kinds of wildlife, also supporting natural enemies to pests, and they play a vital role in creating and maintaining biodiversity (see also HUXLEY 1999. 247). Furthermore, the restored/increased diversity can contribute to greater food security and better risk management (see also NEDA 1997: 18).

The importance of biodiversity for the degree of success shall be elucidated by means of two farms within the project area of HASHI-ICRAF in Kahama District, Tanzania with almost opposite stages of ecological conditions as to the natural potential, leading to different natural resources management practices and resulting problems and potentials. The first farm (see Fig. 103) lies in a rural area with a high degree of natural potential. Here, the land-use systems can easily be improved by low-cost and low-labour techniques like natural tree-regrowth. The farming systems within this area reflect the natural potential as has been found through several farm visits in the area during which basic farm data, especially related to tree management have been recorded. Accordingly, a typical farmer's field in the neighbourhood of farmer 4T-m is characterised by a huge variety of trees which are either scattered randomly on the field or along boundaries. Here, also the project's influence can be seen through the integration of some exotic species (*Melia a.*, *Leucaena ssp.*, *Acacia crassicarpa, Azadiracta i.*). Most trees are planted for firewood, medicinal purposes and fruits.



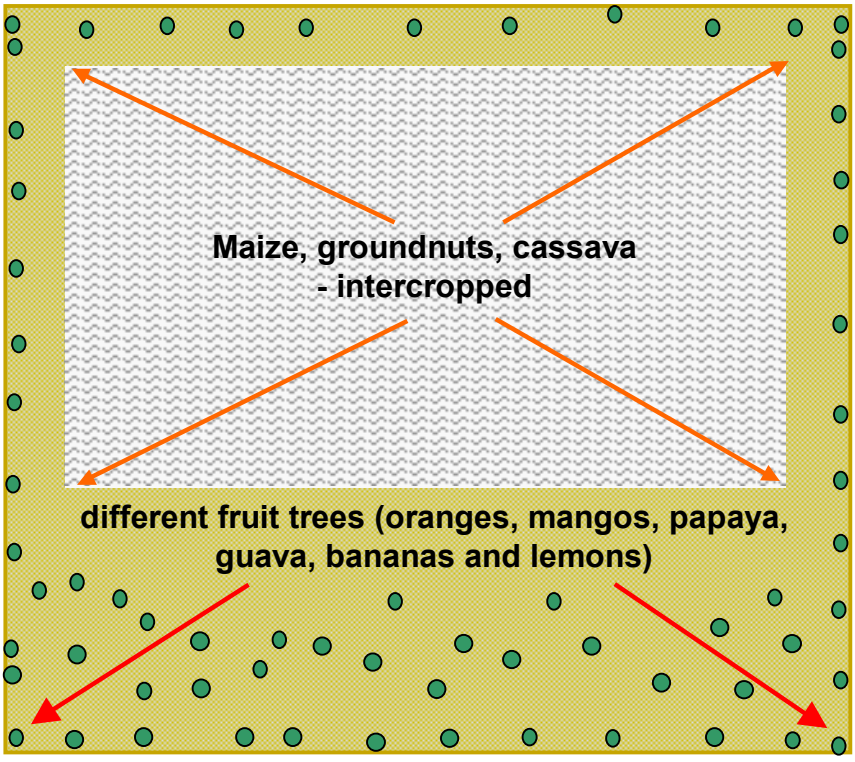
trees along this boundary are *Melia a.*, except where name has been written

Fig. 103: Typical field in an area with a *high* natural potential (1 acre)

The second farm (see Fig. 104) is an example for farms situated close to an urban centre in the neighbourhood of farmer 5T-l; here, in the 1970s, the natural forest has been cleared (ujamaa + tsetse-fly). Most of the tree species are exotic. This situation is reflected in the land-use system:

Generally, indigenous trees are preferred – if available, since the knowledge about these trees is still existent. Where they have been destroyed mostly exotic species take their place (→ projects), since knowledge and seed potential have been destroyed, too. Furthermore, the personal background is important as well, e.g. whether the parents have already planted a lot of trees (6T-l, 4T-m, 5T-m).

It can be concluded that the lower the resource potential and indigenous/local knowledge the higher the difficulty for awareness creation. It has to be kept in mind that these aspects are inter-linked: status of resource potential, local knowledge and awareness are the result of the interaction of and reciprocal effects between these factors as well as influences from outside like e.g. change of climatic conditions, project interventions (propagation of exotic species!), population pressure, logging, etc. Thus, if the ecological potential (especially local vegetation) decreases - in spatial as well as in temporal dimension - wealth and knowledge of resources get lost, hence, the local knowledge decreases, too. Furthermore, without an indigenous potential a natural regeneration is not possible anymore which makes the process of awareness creation and activities in this field much more difficult. This is not only restricted to vegetation, but goes for all natural resources. On the other hand, the degradation of local knowledge concerning a sustainable management of natural resources favours the destruction of natural resources. It is a vicious circle, resulting from/set going by self-reinforcement of these factors.



trees along the boundary are *Melia a.*, *Gmelina a.* and neem, partly mixed with coppiced *Bougainvillea g.*

Fig. 104: Typical field in an area with a *low* natural potential (1 acre)

Fig. 105 below elucidates the interrelations between the above outlined aspects by means of comparing a field of farmer 4T-m as an example for an area with a high natural potential and a field of farmer 5T-m as an example for an area with a low natural potential: It can be seen that not only the species variety is much higher on the first field, but also that no indigenous trees can be found on the second field.

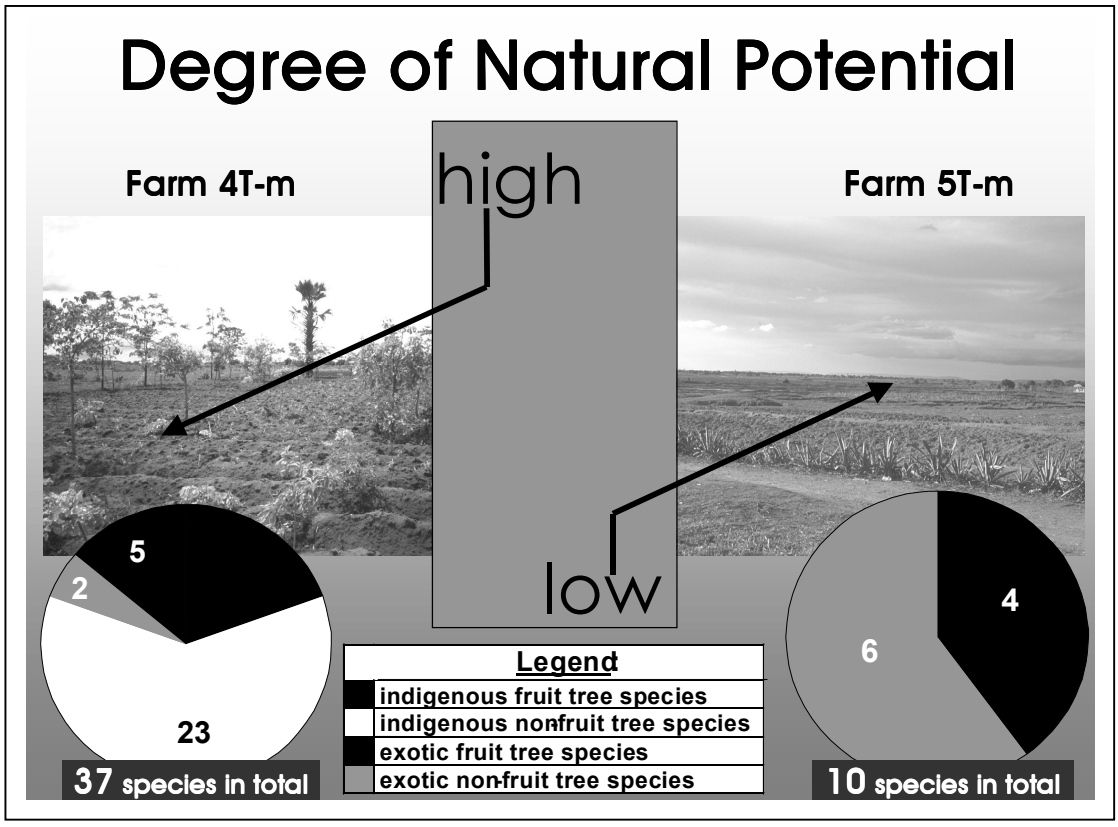


Fig. 105: Reflection of the natural potential on farm level

7.1.3 Exotic versus indigenous tree species?

The analysis revealed that except on four farms the number of exotic species exceeds the one of indigenous species, and that the exotic tree *Grevillea robusta* is the only tree found on all farms (in the SCAPA and NSWCP areas) with additionally a high number of individuals.[94] As HUXLEY (1999: 34) notes, in East-Africa there has been and still is often considerable interest in exotic species and suggests that this might be due to positive experiences in the past with introduced plantation species and fruit trees. However, the negative effect is that activities in the past as well as current one-sited propagation and distribution of exotic species through projects who (have) put the claim on exotic species and praise their advantages like fast growth has(d) the effect of thrusting indigenous species into the background; this directly cause(d)s a decrease in local biodiversity and the oblivion of local knowledge about

[94] „[*Grevillea robusta*] is the most dominant species and has established quite well in all programme areas visited“ (NYAKI 1998: 78).

tree/shrub species, further contributing to the neglect of indigenous species amongst the people. It is very common to cut down indigenous trees and replant exotic species as they are regarded as being worthless, slow-growing, etc. Old traditional forest reserves who functioned as reserves for biodiversity and which were used for ceremonies, etc. loose their meaning and by this their status of 'being untouchable'.

ROCHELEAU et al. (1988: 81) mention (see also BARROW 1996: 202, 234) that "[…] local trees may be better suited to people's needs and conditions than any of the exotic species mentioned in this manual." The statement of an old traditional healer in Shinyanga region (made in the frame of a study on medicinal trees carried out by HASHI-ICRAF) that traditional healers do not use the neem tree despite its known high value concerning medicinal aspects because it was brought to them and is not known by tradition raised a rhetorical question among the staff, exactly reflecting the recent situation: "Are development and extension agencies in the region vigorously promoting the propagation of exotic tree species at the expense of more valuable indigenous species?"

Concerning exotic species, there is a need for caution: meanwhile, it is widely accepted and there is evidence that many fast-growing, exotic tree species are likely to be short-lived in the development context (DE GROOT et. al. 1992: 81), especially with regard to negative side-effects such as high water requirement, allelopathy[95], susceptibility to pests and diseases (like cypress aphid or Leucaena psyllid), lower drought tolerance, etc. (ROCHELEAU et al. 1988: 96; TENGNÄS 1994: 70; OTSYINA et al. 1997a: 19, 1998: viii; HUXLEY 1999: 10) like known from e.g. *Eucalyptus ssp*. or *Cupressus lusitanica*: "[...] Eucalyptus and Cypress [...] are very competitive with crops and though useful for firewood, poles and timber they are not useful for conservation purposes. Eucalyptus has a high demand for water and can reduce stream flow if planted close to river banks" (THOMAS 1997: 69). Studies in East-Africa on black wattle (*Acacia mearnsii*) have shown that it is difficult to crop after this tree (HUXLEY 1999: 10).

Some exotic tree/shrub species can turn into an 'alien' invasive weed (as can some indigenous), spreading over the farmlands like *Acacia mearnsii*, *Leucaena ssp. or* the shrub *Lantana camara* (see also TENGNÄS 1994: 71; HUXLEY 1999: 163). Farmer 3K-I said: "Mukiti/Mutavisi (Lantana camara - note by the author) niko, lakini hatupendi sana kwa sababu maua inaharibu nyasi" (I have Lantana camara, but we don't like it very much because they destroy the grass).[96]

[95] WIEGARD & JUTZI [1998: 213] e.g. write with regard to allelopathy: "Durch Integration von Baum- oder Strauchkulturen in landwirtschaftliche Nutzungssysteme kann es jedoch in Abhängigkeit vom allelopathischen Potential der integrierten Baum- bzw. Strauchkultur auch zu einer Beeinträchtigung der Bodenproduktivität kommen. Vor allem die Wirkung der von den Baum- bzw. Straucharten freigesetzten Allelochemikalien auf die mikrobielle Biomasse, welche u.a. als Indikator für die Produktivität bzw. Fruchtbarkeit eines Standortes herangezogen wird, sollte im Hinblick auf eine nachhaltige Bewirtschaftungsweise besondere Beachtung finden."

[96] However, this shrub serves several medical properties (see KOKWARO 1993: 239).

These species which spread on their own can produce a significant change in plant composition or ecosystem structure and function, often leading to an impoverishment of biodiversity (BARROW 1996, WIEGARD & JUTZI 1998; HUXLEY 1999: 163).[97]

It is imperative to take aspects like water requirement, allelopathy, etc. into consideration when propagating tree/shrub species (see e.g. BARROW 1996: 202).

Fig. 106: Landscape near Nakuru, Kenya, consisting of *Cupressus lusitanica*- woodlands, maize fields and pastures (mainly for Frisians). The former indigenous potential has been destroyed and one feels more like being in e.g. the northern part of Germany than in Africa

In this context one has to consider the preservation of the *in situ* biodiversity. For instance, wide areas in Kenya have been reforested mainly with *Cupressus lusitanica* (see Fig. 106). This has not only resulted in a severe loss of biodiversity - apart from the esthetical aspect!; in the 90s a pest induced by the exotic cypress aphid destroyed wide areas of the *Cupressus lusitanica*-woodlots and left the small-scale farmers with high losses of firewood and income (see TENGNÄS 1994: 70). This pest was a. o. supported through the practice of monoculture – another example for negative land husbandry. In general, the impoverishment of species starts negative effects not only for ecosystems *per se*, but for the people living in these regions, too.

It is time to change project approaches with regard to these criteria. Of course, exotic species like *Azadiracta indica, Gliricidia sepium, Grevillea robusta*, *Leucaena ssp.* or *Senna ssp*., *Ziziphus ssp.* for firewood, timber, medicine, live-fencing, etc. – as to mention just a few species and purposes – have several positive qualities/properties (like termite- or drought resistance, growth rate, appearance; see also OTSYINA et al. 1998: 24), and it makes sense to incorporate them in tree management; however, exotic trees should not displace and substitute indigenous species, but function as a valuable additional source and supplement to the existing indigenous potential of perennials. Of course, indigenous species can have negative side-effects as well: e.g. at ICRAF's Field Station in Machakos, Kenya it has been ob-

[97] On the Kenyan farms *Eucalyptus ssp*. (mostly *E. globulus*) is still very common. The propagation of indigenous trees should be intensified as it is known that this species requires a high amount of water and has allelopathic effects. A description of the (dis)advantages of eucalyptus experienced by women in Burkina Faso is documented by BARROW (1996: 171).

served that maize sown after *Sesbania sesban* establishes poorly (HUXLEY 1999: 10). After the author (ibid.: 35) a sensitive approach is to test both indigenous and exotic species (the last named under controlled conditions!), taking farmer's preferences and knowledge into account.

7.1.4 Soil fertility

The physical resource base is another method of monitoring sustainability in farming systems.[98]

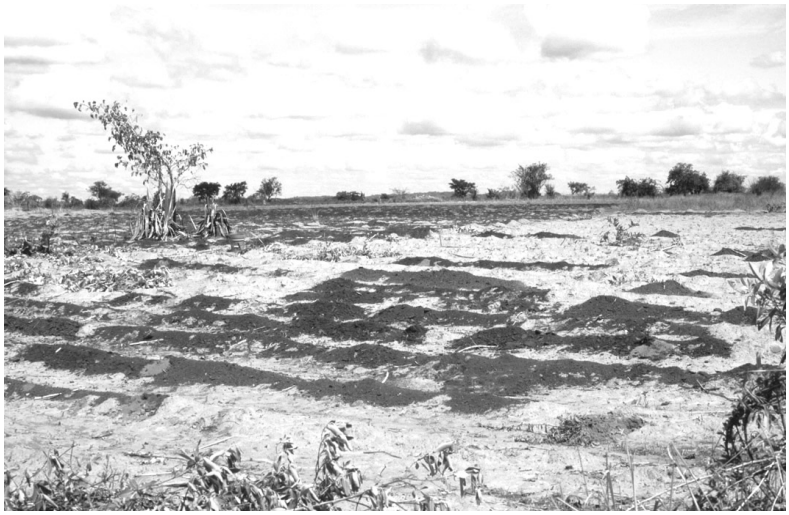


Fig. 107: Manure spread on fields in Kahama District, western Tanzania

Generally, soil fertility of the fields has been improved and stabilised through the activities described and analysed in chapter 5.2.4 which included the use of various organic materials (see also Fig. 107) as well as partly chemical fertilisers. The farmers said that before carrying out soil and water conservation activities, yields were low and declining. Nowadays, not only problems like soil erosion phenomena (see chapter above) have been reduced or even sorted out, but soil fertility has been increased through nitrogen fixation, crop residues, litter, micro-climate changes, etc. Especially in seasonally arid regions time at which mulch is applied is important in order to obtain benefits both from improved water use and nutrient supply (HUXLEY 1999: 267).

7.1.5 Micro-climate

All farmers have integrated woody perennials in their farming system. Often, these farms are striking within an often almost bare and treeless environment. Woody vegetation (assuming right management like spacing, species, etc.) has direct positive effects on the micro-climate like increasing humidity and decreasing air heat through shading (canopy, litter), changing the rainfall interception patterns and reducing wind speed (see e.g. NAIR 1993, HUXLEY 1999). HUXLEY (1999: 267) notes: "[…] the *cover* provided by mulch can drastically improve soil and water conservation, and ameliorate soil surface temperatures." Better micro-climatic conditions positively affect the crop production and by this the family's livelihood conditions.

[98] It is not possible to draw connections between soil texture and soil fertility since too many factors are involved to come to a clear statement.

7.2 Economic effects

7.2.1 Food security and family welfare

"Siku moja ni kubwa ukiwa unasikia njaa" (A day is long if you are hungry).

Farmer 1K-l

Achieving food security is one of the central aims of the projects. Kenya and Tanzania faced heavy droughts after the heavy rains in 1998. Even Kahama District faced severe food shortages in 1999 and 2000 which is not normal for this district.

The food security and welfare status of a family (provision of basic needs) can only be estimated by assessing a number of different factors (HUXLEY 1999: 287). According to Tab. 45 twelve farms – among them all farms in the HPA areas in SCAPA project area as well as in the MPAs in HASHI-ICRAF project area - do not have problems with food/fodder shortages (2K-l, 3K-l, 1K-m, 3K-m, 2T-l, 1-3T-h, 6T-l, 4-6T-m) out of which six farms (3K-l, 1K-m, 2T-l, 1-3T-h) have the most stable conditions. However, due to the recent drought somehow all farms face problems, although to a different extent, depending on resources available (land size, off-farm income, etc.). In exceptional situations only like in the years 1997/'98 with severe rains, followed by a drought two Kenyan farms face irregular shortages (1K-l, 2K-m). Four Tanzanian families (1Tl, 3Tl, 4T-l, 5T-l) suffer from regular shortages before the rains start.[99] Different reasons have been named: lack of time, land and fertilisers, climate, animals, pests & diseases. Out of the four farms who suffer from regular food/fodder shortages three farms are female headed. Farm 1T-l additionally is located in a very dry area which is since some years affected by an increase of the complete failure resp. severe delays of the short rains due to the loss of vegetation cover in a big scale.

Tab. 45: Food/fodder shortages on the farms

Farmers	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Food/fodder shortages[1]	**1**				**1**		**2**		**2**				**2**	**2**				

Legend:

[1] ☐ = not on the resp. farm; ▒ = not in the resp. zone/country; **1** = only in very dry years; **2** = yes, before the rain starts
K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household

[99] On farm 3T-l, the reason for shortages is closely linked to the small size of the plot. The farmer said: „Our problems started with Ujamaa (African socialism, here especially referred to the aspect of villagisation where the population was resettled from small settlements of 20 to 60 households into ones of 400 to sometimes 700 households- see e.g. TRÖGER 1996; BLUME 1998). For us Ujamaa was bad because the government took away almost all of our land and gave it to the settlers. All my brothers are suffering. The land is too small to feed a family." Also farmer 5T-l said that the land is too small.

This factor shows that off-farm income sources are not always a guarantor for food security, but that farm products play a decisive role for meeting the basic needs as well. However, even in rich households, food shortages can occur like has been stated by OTSYINA (1998: 38) for households in western Tanzania.

In general, the living conditions have been improved on all farms through diverse (project-related) activities: increased crop yields through soil and water conservation measures; increased milk production on the farms where zero-grazing is being practised, improvement of fodder situation, etc.[100]

All farmers store crops as indicated by Tab. 46 below. It can be seen that twelve different crops and one animal product are being stored. All farmers store maize and beans. The farmers within HASHI-ICRAF project area store the most crops, the farmers in the LPA of NSWCP project store the less. These data have to be compared with the crops cultivated (see Tab. 10). Out of the 17 farmers who crop cassava ten farmers only store this crop (all farmers in HASHI-ICRAF project area). Eight farmers only out of 16 farmers who crop sweet potatoes store this crop. Three farmers store potatoes (cropped by seven farmers). Yams and pigeon peas are stored by one farmer only.

Tab. 46: Crops/animal produce stored

	Farmers																	
Crops stored	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Bambarra ground nuts													x	x	x			x
Beans	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
cassava				x	x					x		x	x	x	x	x	x	x
cow peas				x			x	x					x	x				x
ground nuts													x	x	x	x		x
maize	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
pigeon pea														x				
rice								x								x	x	x
sorghum														x	x			
sweet potatoes				x							x	x	x	x	x		x	x
potatoes				x				x		x								
Yams								x										
Fish (baked in oil)								x										

Legend:

☐ = not on resp. farm; ☐ = not in the resp. zone/country
K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household

[100] It has been tried to make estimations/to collect data concerning the improvement of the livelihood in terms of clear facts like amount of bags of different crops before and after the implementation of the project measures, but could not get exact and reliable data. Anyhow, all farmers said that the status of the fields and thus the crop yields as well as the nutrient value in general (e.g. through provision with milk, different crops, etc.) increased significantly.

Problems named were high damage through pests which is due to poor storage technologies. The projects have to incorporate this aspect in their activities to reduce losses of crops. Furthermore, drying of sweet potatoes has been recommended by HATIBU & MTENGA (1996: viii) as a method for preservation of this crop; at the same time, marketing opportunities should be evaluated for this product (ibid.) as a means to enhance economic activities and farm income.

7.2.2 Firewood availability

Location of firewood collection and conditions like prices or access are important factors to assess the firewood situation on the farms. Generally, firewood scarcity has led to firewood commercialisation (see also OTSYINA et al. 1998: 67). This phenomenon is also reflected in the farm cases despite efforts to safe energy and produce on-farm firewood resources: Seven households can rely on firewood resources deriving from the own farmland (four Kenyan, three Tanzanian farmers), eight farmers have to collect wood additionally in the governmental forests resp. to buy it on the market (2K-l, 1K-m, 1T-h, 3T-h, 5T-l, 6T-l, 4T-m)[101], one farmer still collects all her firewood (3T-l) since her own trees are still too small for harvesting and two farmers (4T-l, 5T-m) buy their firewood because of the same reason (see Tab. 47).

Tab.: 47: Firewood availability

	Farmers																	
Aspects	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Firewood availability[1]	**1**	**3**	**2**	**2**	**4**	**3**	**2**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**1**	**3**	**3**
Resources[2]	**1**	**2**	**1**	**2**	**1**	**1**	**1**	**1**	**3**	**2**	**1**	**2**	**4**	**2**	**2**	**2**	**4**	**2**
Improved cooking stove[3]		**x**	**x**	**x**	**x**	**x**	**x**	**x**					**x**		**(x)**	**(x)**		

Legend:

[1] **1** = increase; **2** = constant; **3** = decrease; **4** = not known
[2] **1** = own (fields, forest, woodlot); **2** = partly own (governm./village forest, free/paid, market); **3** = governm./village forest, free/paid; **4** = bought
[3] **(x)** = will buy one soon
☐ = not on resp. farm; ☐ = not in the resp. zone/country; * = female-headed household
K = Kenya; **T** = Tanzania; **l** = low potential area; **h** = high/mid potential area

The degree of independence can – amongst other factors - be connected with the use of improved cooking stoves: the nine Tanzanian farmers who completely or additionally have to collect/buy firewood (3T-l, 1-3T-h, all farmers in HASHI-ICRAF project region except 4T-l) still use the traditional stove (three stones). On the other

[101] Farmer 1T-h said that many women in that area sometimes spend more than 2 hours a day fetching firewood in the nearby forests. Often they go together in groups to minimise the risk with regard to wild animals. Furthermore, they have to obtain a licence otherwise their tools (knifes, pangas, axes) can be confiscated.

hand, farmers 1K-l and 2T-h can rely on own wood resources although they do not use an improved cooking stove. The Kenyan farmers in the NSWCP project area clearly indicate a much better status quo with regard to energy management.

According to the findings in the HASHI-ICRAF report (OTSYINA et al.1998: 67), also in this research study the only farmers who have to buy firewood live close to an urban centre. Concerning the firewood availability in general, six farmers said that the supply is constant (3K-l, 1T-l, 2T-l, 1K-m, 3K-m, 1T-h), nine farmers said that the availability of wood decreases (2K-l, 3T-l, 3K-m, 1T-h, all farmers in Shinyanga Region except 4T-m), two were not sure (1K-l, 2K-m). Of course, the quotations are made before the own personal background (own resources) and thus should be handled with caution (subjectivity!) but give an overview of the general situation. Especially the data from the farms in Shinyanga Region reflect the general situation of increasing firewood scarcity in the area due to a high percentage of deforestation – except in the area of farm 4T-m where the people have gained success in increasing tree density on their farms and surrounding (by lowering the pressure on natural forest stands) through individual and community-based activities in the way that they will be able to stabilise firewood demand and availability.

The farmers generally use and appreciate wood deriving from indigenous species and have special preferences regarding exotic species as has been outlined in chapter 5.4.

SCAPA and HASHI-ICRAF have to intensify their activities with regard to improved cooking stoves.

7.2.3 Water supply

Four farmers (all farms in the HPAs in SCAPA area and 3K-m) have got stable conditions with regard to water supply. Nine farmers suffer from seasonal water shortages and some additionally from long walking distances to fetch water during dry periods (all farms in Shinyanga Region, 2T-l, 3T-l, 2K-m); here, measures like the construction of water tanks have to be implemented; additionally, this is an ecologically sound measure since e.g. an increased number of wells can lead to the lowering of the table water and to saltification problems - in particular during the dry season the farmers in the low potential area of Shinyanga Region find faults with the salty water.

Fig. 108: Farmer 6T-l fetches water from her own well to be closed with a top to keep the water clean

The other five farmers, especially the ones in the low potential areas, also have problems with water shortages during the dry season, although having implemented water harvesting measures (1T-l, all farms in the LPAs in Kenya, 1K-m; see also Fig. 108). Six farmers (1K-l, 3K-l, 4T-l, 6T-l, 4T-m, 5T-m) buy water (in the dry season).

The analysis shows that the low potential areas are the critical regions and reveals a contradiction: Although the low potential areas are the ones who are exposed to droughts, the rate of the implementation of water harvesting techniques is the lowest.

7.2.4 Income situation

The various activities and strategies of the (female) farmers contribute to the increase of farm- as well as off-farm income (however, concrete data on the estimation of the degree of economic growth have not been possible to ascertain on an equal level for all farms; only non-uniform data are available) are listed below:

- Increase of herbaceous and woody farm products like crops, fodder grasses, primary tree resources like fruits, leaves (vegetable, fodder, medicine), seeds, medicine (from other parts of the tree like bark, roots, seeds, etc.), firewood and timber, secondary tree resources like medicinal/fodder plants, seeds, mushrooms, animals, honey, materials for handicraft, etc.
- Increase of on-farm animal products (inclusive fish) (meat, milk, eggs, manure).

  → This directly contributes to the improvement of farm income with positive effects on the general economic situation of the households.
- Increase of off-farm income: through the enhanced farm situation, more time is available which can be invested in small enterprises like making and selling of energy-saving stoves, seedlings, food like traditional cakes and pastries, tending a tea room, etc.. Furthermore, there is more time for women's/mixed group activities which again directly effects the income situation in a positive way.

7.2.5 High or low-input agricultural system?

There are basic differences between land-use systems on the input level. A system can be low-input, that means depending almost entirely on the existing resource base; it is thus characterised by the intensive use of locally available renewable resources like biomass and organic fertiliser and little or no use of external inputs like artificial fertilisers and chemical pesticides. These systems are often associated with 'traditional' farming systems. High-input systems rely on additions to the resource base; they are thus characterised by the intensive and often excessive use of external inputs like artificial fertilisers, pesticides, fossil fuels and are often associated

with modern agricultural systems (NEDA 1997: 8; HUXLEY 1999: 284). Efforts to make both systems more sustainable are based on closing the natural cycles, reduction of external inputs and increase of local resources. The impact varies according to whether a system is located in a high or low potential area (NEDA 1997: 8-9).

Considering the factors labour, financial and material inputs like tools, pesticides, fertilisers, etc. as well as the different soil and water conservation measures, some farming-systems can be classified as clearly low-input systems such as all farms in the HASHI-ICRAF project area and farm 2T-l; some farming-systems are rather high-input systems like farm 1K-m and 3T-h.

After LANDECK (in WILSON 2001: 105) the ideal agriculture is that which does not incorporate any synthetic fertiliser since chemical use will not be viable in the long run (reaching yield plateaus), and organic fertiliser use could mean fewer energy inputs, making them cheaper than synthetic fertilisers.

7.3 Socio-cultural and political effects

7.3.1 General effects

Effects are not only to be registered on the ecological and economic level, but an enhanced farming system also has positive impacts on empowerment-related aspects: according to the women their activities in the field of resource management directly contribute to a better social status. This is particularly crucial concerning gender aspects like more freedom in decision-making on household- and public level which is also closely linked to the projects. The projects are engaged in activities for the enhancement of women's status through information campaigns like gender work shops, training and seminars. Furthermore, they incorporate aspects like land tenure, culture-related restrictions imposed on women and try to give them more voice through participation in public decision-making processes, e.g. as members of village committees, etc. Thus, given the moral commitment of women and their penchant for protecting the environment, the existence of a critical mass of women in the decision-making process of specific institutions at all levels would make a significant difference and a qualitative change in actions that affect the environment through the achievement of sustainable development.

What further impact does women's empowerment have on the environment? The rationale is that the promotion of gender equality and equity is likely to help reduce fertility; by this, it will have an indirect effect on critical, global and long-term environmental problems, and thus on sustainability through changing the population/ environment relation. Given that the latter is mediated by development, lower levels of population growth can interact favourably with changing patterns of production and consumption. However, the kind of development which will emerge in the coming years is the critical issue. There is a close connection between women's well-

being and women's agency in bringing about a change in the fertility pattern. Women in many third world countries have to face the lack of freedom to do other things that goes with a high frequency of births, besides medical dangers and health problems through the frequency of births like high maternal mortality. A higher degree of equality between the genders is correlated with lower fertility due to factors such as better communication among the couple, which in turn will improve effectiveness in the use of contraceptives. Generally, women's empowerment affects the manner in which families are formed. Not only reductions in birth rates are often associated with the enhancement of women's status and voice, but this is also closely related to educational expansion and political activism of women (see also MARTINE 1997: 12-14).

The enhancement of ecological conditions has a direct impact on the economic situation which again positively influences the education aspect as more money is available for sending the children to school, even further than primary school. The women identified (female) education as the motor for development as has been elucidated in chapter 6.2.1.

Another important facet to be named are trickle-down effects to be discussed in the following chapter: the women have a direct positive impact on their social environment through knowledge transfer and other activities such as providing medical treatment with natural medicine, general social consciousness and helpfulness, and are multiplicators for others through group activities, taking-over responsibilities and organisational tasks.

7.3.2 Trickle-down effects of successful female farmers and women's/ mixed groups

> *"Kuzaidia ufungua akili"* (To help creates understanding/consciousness).
>
> Farmer 2T-h

In this chapter answers shall be given to the various, often contrary statements found in the literature. One group stresses the positive influence of women's groups on the members themselves as well as on the community and society as a whole (FORTMANN & ROCHELEAU 1985, CECELSKI 1985, BRADLEY 1991, CERNEA 1991, KINUTHIA 1993, WACKER 1994, AUGUSTAT 1994, MARTIN 1994, BARROW 1996, NEDA 1997; OTSYINA 1998), and it is being stressed that strong women's organisations are needed to enhance empowerment and environment-related aspects (NEDA 1997: 21). The other group refers to critical aspects like members of women's groups tend to belong to a higher resource echelon, moral hazard problems and capture of benefits by an elite (Oomen 1992, WILLIAMS 1996, MELICEK 1998) (see chapter 1.3.2). However, OTSYINA (1998: 56) mentions these negative aspects only for groups which have been imposed from outside.

First of all, it can be stated that the groups have a direct positive impact on the members such as empowerment and economic aspects. The various activities have been listed in chapter 6.2.2.2. WILLIAMS (1996: 4) notes for her own research area in western Kenya: "Women who were members of women's groups, were generally better able to obtain money than non-members through their collective and off-farm activities […]." Another important aspect is that (women's) groups have somewhat better access to knowledge about new technologies (ibid.: 8). In ten groups no membership fees are demanded resp. the payment is very low so that this aspect does not form an obstacle to resource poor farmers to join a group. However, the fees of the other eight groups are likely to be too high for poor farmers so that they might be excluded (see also WILLIAMS 1996: 5).

The analysis shows that, in fact, successful female smallholders as members/leaders of groups as well as the groups as a whole, have got various positive trickle-down and spin-off effects as 'social networkers' on their social (and natural) environment, especially with respect to poorer households: they function as important knowledge careers and motors within the context of the sustainable management and conservation of natural resources. Through different activities in the field of sustainable husbandry they have a sustainable effect as local experts on their natural environment (reduction of resource degradation and increase of biodiversity) as well as concerning economic criteria (increase of farm-income through higher crop yields); additionally, diverse positive trickle-down effects on their social environment (group members, relatives, friends, neighbours) with special emphasis on poor people through various community-oriented activities have been ascertained; they are stimulators for innovations and emulations; the same goes for the women's/mixed groups (female solidarity networks). This also supports findings of a study carried out among farmers in Shinyanga Region on knowledge about improved cooking stoves which is spread most frequently through demonstrations followed by neighbours (OTSYINA et al. 1998: 63-64). Also the women within the research area of WILLIAMS (1996: 5) reported to learn about soil fertility management from observation of other farmer's practices. BUDELMAN (1996: 68-70) gives examples of farmer experiments. All farmers share their findings and products with interested neighbours, friends and relatives.

The women and the groups give different forms of support to their social environment. The emphasis lies on poor households as has been stressed by all participants. Gifts are a very important aspect as it is a form of direct help in emergency situations. CROWLEY et al. (1996: 24) summarise this crucial factor as follows: "Gifts tend to be irregular, but are of some importance to poorer households who rely on charity from neighbours and wealthier kins. Gifts from neighbours to poorer households take a wide variety of forms, from food, fuelwood and manure, to small amounts of cash. *Harambee* or self-help style community collections with specific objectives, such as school fee payments, are also an important source of cash to

poor and medium income households." The reliance of poor people on neighbours, relatives and friends has also been reported by AARNINK & KINGMA (1991). And OTSYINA (1998: 44) writes: "Affluent households also assist less affluent households in times of hardship – giving loans, food, helping out with labour." The following forms of support have been assessed:

- The farmers and groups provide financial support (e.g. through harambee (Ksw = self-help) activities.
- In times of hardship food/fodder is given to people in need.
- Physical help (mary-go-round as well as individual) is given to people in need.
- Also material things are provided like tools (1K-m - bought pangas [kind of machete] and plastic bags for seedlings for the whole group), seeds (one woman [2K-l] - gave seeds to the group members), seedlings & (fire)wood (allowance to collect firewood in own forest [1K-l] resp. field [6T-l] or giving away stems from *Grevillea robusta* – 2K-l).
- Facilities and transport are another form of assistance: Farmer 1K-m who is a traditional healer and midwife often takes people to hospital with her own car if the illness is too serious. She mentioned (laughing): „It's already my fourth car, used up also through bringing people to the hospital and so on."

  Some women (1K-l, 2K-l) gave parts of their land to the group for group activities. Farmer 1K-m provides a meeting place for groups, and farmer 1T-l allows resource poor farmers to graze on her land. Other farmers host people, especially poor and single women: 2T-h gives shelter to two women and their babies who don not have a place to stay as they are unmarried and do not have land (their parents are to poor to help them with land).
- The farmers are active in job creation. All farmers except 1T-h and the farmers in the LPAs in Tanzania have employed poor farmers, especially women, as unskilled permanent and casual labourers (household activities, farming activities, tending cattle, construction), and thus contribute to poverty alleviation (see also CROWLEY et al. 1996: 53; TIFFEN et al. 1996: 73).
- Medical treatment of humans and livestock (traditional medicine) is important to be named: some of the women (and their husbands, too) are known as traditional healers (see above); most of the clients are single women. There seems to be a relation between the engagement in and frankness for innovations in the field of sustainable land-use techniques and the knowledge about as well as application of natural medicine for humans and livestock. URT (1998: 24) write for Shinyanga Region: "The knowledge for example that traditional healers women, and farmers have on medicinal trees and their use in herbal formulations is indispensable."

- The women contribute to knowledge transfer through talking about different subjects related to natural resources management, income-generating, gender, etc. with friends, relatives, neighbours, group members, etc. and also teaching them different subjects like T'HART (1992: 45) reports in the frame of her study: "[…] and women teach each other the trades to earn money with, like beer-brewing and making mats/pots."

  Furthermore, some women work as trainers in the field of sustainable land husbandry and the integration of gender aspects, e.g. teaching group-members about methods for a sustainable resource management (tree plantings, terracing, livestock keeping, fodder grasses/-plants, traditional food and medicinal plants, health care, organic farming, construction of improved cooking stoves and water tanks, etc.). Some farmers receive study tours and are engaged in knowledge exchange with farmers as well as people from different organisations and institutions from other regions, countries and even from overseas: Within this context one farmer said: "We sometimes know more than the ones in the offices."

  A crucial aspect is that all women were highly supportive and cooperative when it came down to interaction with me: not only that they were extraordinary cooperative when it came down to questions I had; they themselves brought up a lot of things in our discussions and had great interest in sharing their knowledge, experience and wisdom with me.

  Four women work as teachers: adult teachers (for traditional language, Kiswahili and English, but also other subjects like home economics, handicraft, health care, etc.).

- The farmers carry out voluntary works: two women (2K-m, 1T-h) are working voluntarily as adult teachers and one (4T-m) is teaching children now and then. Farmer 3K-l, a retired teacher helps to build-up and maintain a nursery school and pre-school.

  As has been shown in chapter 6.2.1 all women regard education as being the key to empowerment. They try hard to spread this idea amongst their surrounding: "Elimu ya kutendo, elimu ya kufikiri" (Knowledge to act, knowledge to think) (3T-h). „It can safely be assumed that more women will be elected [in committees - note by the author] in backward areas through normal social developments, as women gain recognition through their education and through the organising capability they show in self-help activities" (TIFFEN et al. 1996: 73).

- Organisational, diplomatic and leadership qualities have to be mentioned as important criteria for non-material help. These qualities become clear through the women's engagement in building up women's groups (seven farmers) and taking responsibility within women's groups (eleven women are chairladies, two are treasures/secretaries), church groups (five women are chairladies) or mixed groups

(two women are chairladies). Some women are even engaged in several different groups. These groups have been found to form an important instrument for the dissemination of knowledge within the context of measures for a sustainable management of natural resources as has already been stated by AUGUSTAT (1994: 139): “Frauengruppen erweisen sich als der beste Weg, möglichst viele Frauen zu erreichen und zu beteiligen und eine wirksame Basis für die Vermittlung und Verbreitung von Beratungsinhalten und schließlich für die Umsetzung von Erosionsschutzmaßnahmen zu erhalten.” Negative aspects like taking-over the control over the group have not been mentioned or observed. But it has been found that the Kenyan women’s groups are mostly leaded by middle-aged women in partly better economic positions (OOMEN [1992: 110] revealed that the Kenyan women’s groups in her research area were dominated by rich, middle-aged women).

In general, the women dispose of a high sense of responsibility for the community: “Nikikosa tutakosa wote” (if I fail, we all fail) (3T-I).

- Furthermore, the women function as motors as to the empowerment of women and gender equality: They have an important position since they are the voices for one of the weakest groups of the society – the poor women, in public meetings, in front of institutions, authorities, etc., not only through speaking openly, but also through fund raising and other official activities. Hence, they function as mediators and can be regarded as champions concerning women’s rights.

  Through their community-oriented engagement they are of a high ideological and psychological wealth for their environment/the community as a whole with far-reaching consequences even beyond the local level.

- Through the engagement in traditional practices (dancing, singing, medicine, customs, etc.) the women contribute to the conservation of the cultural heritage of the respective ethnic group and by this contribute to the social stabilisation of (groups within) the community. Religion plays an important role within this context, too since religious activities help to stabilise social relations between family members, groups, the whole community, etc.

Due to all the above named factors successful female farmers as well as women’s/ mixed groups can be said to be key persons/organisations concerning social networking and the stabilization of social relationships. Moreover, they contribute significantly to the increase and stabilization of food and fodder in terms of quantity and quality as well as energy supply; by this, they are central within the context of the enhancement of economic conditions and thus work for poverty alleviation and a betterment of livelihood conditions.

The husbands of the group members and the successful women farmers have to be mentioned, too (see chapter 8.2). The open-minded ones (of course, they differ!) hold a central position, not only regarding sustainability within natural resource

management but also regarding empowerment, gender equality, social networking/ stabilization as well as physical help and knowledge transfer. This, actually is a new and interesting outcome of the research, apart from the already named aspects.

It can be concluded that the closer at least the whole family works together and the more open-minded each person involved is (the higher the degree in being interested towards innovation, improvement, betterment of a situation), the higher the degree of success. Of course, other factors like personal background (experience, e.g. through ancestors, financial situation, ecological conditions, etc.) have to be considered as well. It is interesting to ask whether the degree of well-being is a reason for or an outcome of success.

7.4 Summary

In the previous chapters it has been described that the different strategies, measures and activities carried out have shown various positive effects on different levels (ecological, economic, socio-cultural and political level): These can be summarised with the paramount aspects efficiency, (ratio of inputs and outputs $\rightarrow$ productivity), stability and resilience ('buffering' capacity and better protection from failure). The degree of these factors is linked to the beneficial environmental factors, multiple outputs as well as socio-cultural and political aspects.

On the ecological level it has been described that soil erosion phenomena have been reduced or even completely eliminated and that agro-biodiversity has been enhanced and stabilised through the various activities. It also has been demonstrated that the diversity of indigenous species is directly linked to the particular natural potential in that given area. It has been concluded that the lower the resource potential and indigenous/local knowledge the higher the difficulty for awareness creation in this field. Furthermore, the pros and cons of the introduction of exotic species have been outlined as well as positive impacts on soil fertility and the micro-climate. Among the economic effects it has been shown that a betterment of family welfare and food security has been achieved. Firewood availability and water supply have been enhanced as well as the income situation in general. General socio-cultural and political effects have been described: Additionally, trickle-down effects of the successful female farmers and the self-help groups have been outlined in detail.

However, the impact of changes of social benefits may be hard to evaluate in terms of sustainability: e.g., shelter and amenity aspects related to tree plantings affect the 'quality of life' and hold a level of importance far beyond their apparent worth to outsiders. In fact, they may often be a significant reason for adoption in the first place.

Whether the degree of sustainability and thus success depends on the number of different strategies involved or rather on specification (when it comes to farm-related strategies) shall be evolved in the following chapter.

8 Farm-types, profiles and portraits

Due to the approach, the target group researched is not homogeneous: all farmers are collected under the umbrella of 'being successful', but there are decisive differences among them: some are married, others manage their lives and farms without a husband, either because he died, they are divorced, abandoned or never married. What are the differences between married women and women without a husband concerning economic, farm-management and the socio-cultural situation? What role do husbands play within this context? Furthermore, women have been selected which are engaged in groups to have a look at joint activities and trickle-down effects. Some farmers are leaders of groups. Why? This is another question on which light shall be shed within this chapter.[93] All farmers live in different countries and agro-ecological zones. These aspects shall be considered while analysing the various 'sub-groups' among the sample as they are supposed to play a role within the context of a successful management of natural resources. This is also a reason why in the frame of the farming-system's analysis a classification of farm-types has been included which follows first.

8.1 Farm-types

Based on an analysis of farm-related aspects different farm-types have been identified to demonstrate differences between the farm structures on a general level. Factors considered are summarised in Tab. 48 below.[94] Generally, the farms have been differentiated according to the factors relief/inclination and AEZ. A sequence of 50 m has been chosen as even the smallest farm covers this distance. Moreover, this method has the advantage that the main cropping features can be demonstrated disregarding the farm size which varies greatly from farm to farm.

By means of this reduction process a clearer picture emerges, one that allows for easier interpretation. The illustration of generalised farm-types helps to elucidate similarities and differences: it is more easy to identify typical local practices or the adoption of project-related techniques. Thus, the illustrations form a valuable tool also for further investigations in the field of farming-system analyses.

[93] It has to be noted that the group of married women and women without husband are separated whereas the group of women leaders consists of members of both groups.

[94] A generation of farm types under consideration of all factors (economic as well as socio-cultural and political aspects) is not possible because the data are too heterogeneous.

Tab. 48: Characterisation of farm-types along ecological (farm-related) factors*

	Farm-type 1	Farm-type 2	Farm-type 3	Farm-type 4
(Number of) farms integrated	**7** (1K-m, 2K-m, 3K-m, 1T-h, 2T-h, 3T-h and 2T-l)	**4** (1K-l, 2K-l, 3K-l and 1T-l)	**3** (4T-m, 5T-m and 6T-m)	**4** (3T-l, 4T-l, 5T-l and 6T-l)
Sloping area (> 5% inclination)[1]	**X**	**X**		
Flat area (< 4% inclination)			**X**	**X**
H/MPA[2]	**X**		**X**	
LPA		**X**		**X**
Terraces	**X**	**X**		
Fodder banks (grass)	**X**	**X**		**X**
Fodder banks (trees)	**X**			**X**
Big livestock	**X**	**X**	**1**	**X**
Zero-grazing	**X**			**X**
Grazing area	**3**	**X**		
Woodlot	**3**			
Natural forest		**X**	**2**	
Special area for vegetables	**X**	**X**	**X**	**X**
High tree-crop interaction	**X**		**X**	
Water tank	**3**	**X**		
Well			**X**	**X**
River / pond / channel / spring	**X**			
Composting	**X**	**X**	**X**	
Farm yard manure & mulching	**X**	**X**	**X**	**X**
Chemical fertilisers	**X**	**X**		
Improved cooking stove	**4**			
Sufficiency of own firewood	**4**	**X**		

Legend:

* in cases where not all farms of the sample carry out the respective measure numbers are given which indicate the number of farms involved

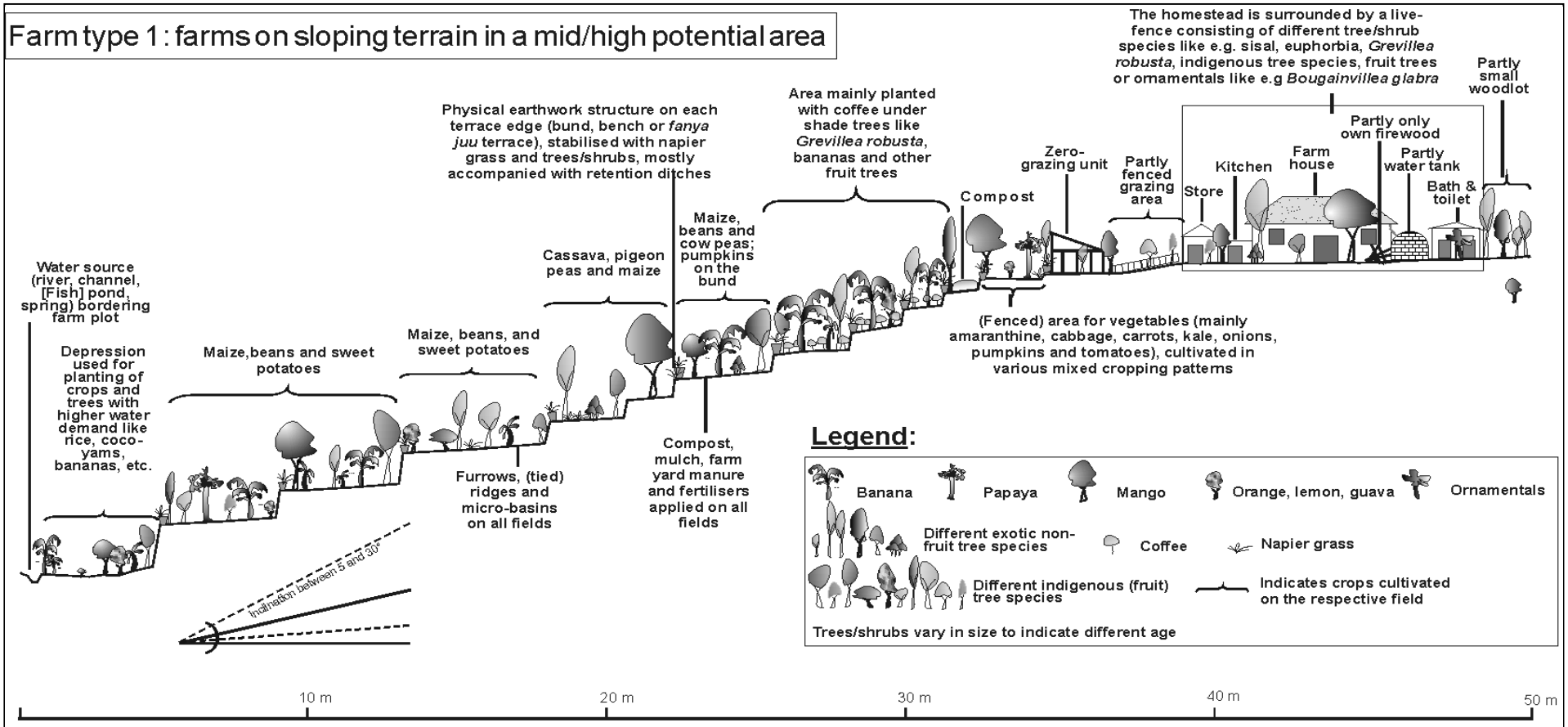
☐ = no; **K** = Kenya; **T** = Tanzania; **l, LPA** = low potential area; **h, m, H/MPA** = high/mid potential area

[1] Only exception is farm 2T-h with less than 5 % which has been included due to the implementation of big physical structures

[2] Farm 2T-l has been included due to the specific location close to rivers and springs which allow irrigation and guarantee stable water conditions, reflected also in the vegetation

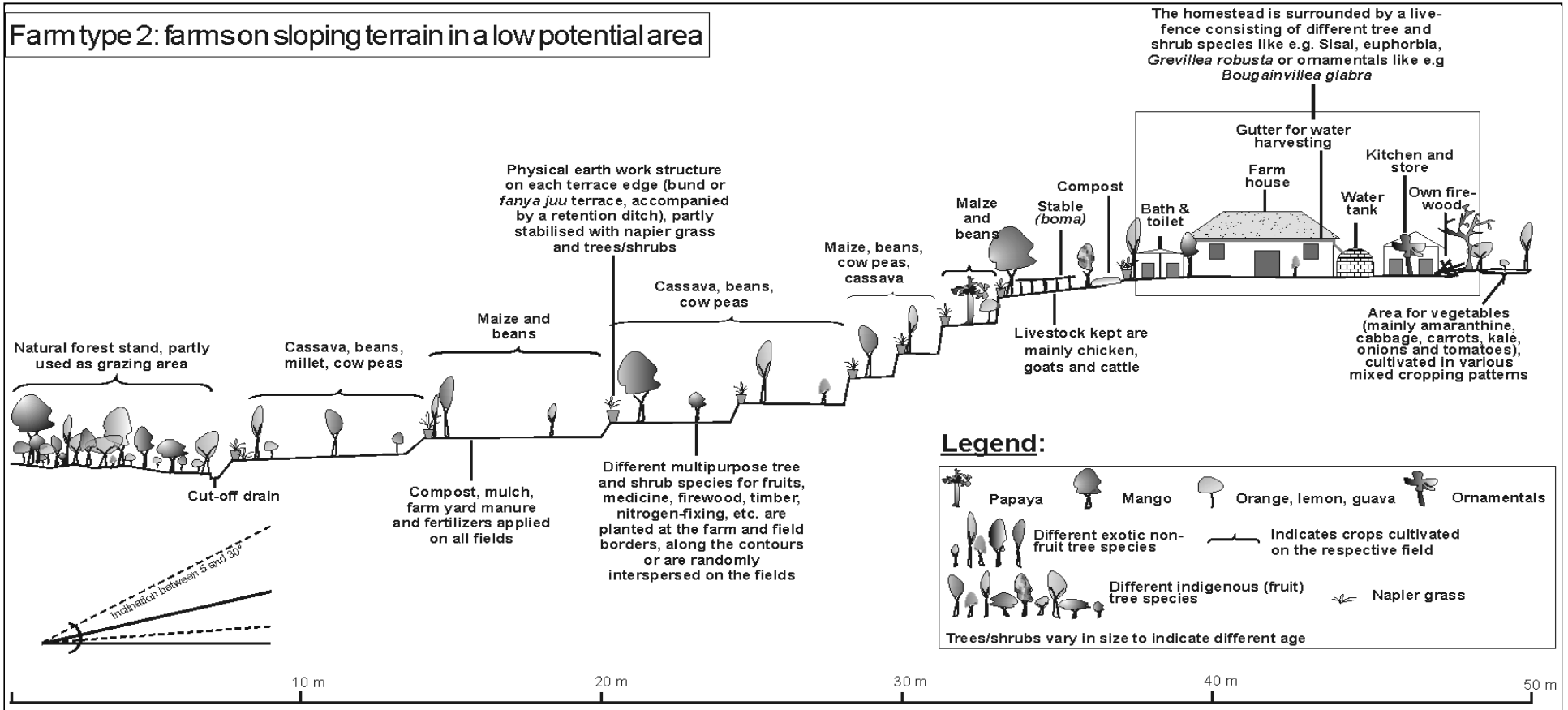
In the following, the illustration of the four farm-types is given (see Fig. 109 – 112); the text below each farm-type explains the main characteristics.

Differences between the LPAs and the H/MPAs not only reflect natural conditions but are also closely related to population density: in areas with more favourable natural conditions and in urban areas like is the case for farm types 1 and 4 the population pressure leads to small farm plots which e.g. do not allow natural forests or woodlots since the land is hardly enough for food production.



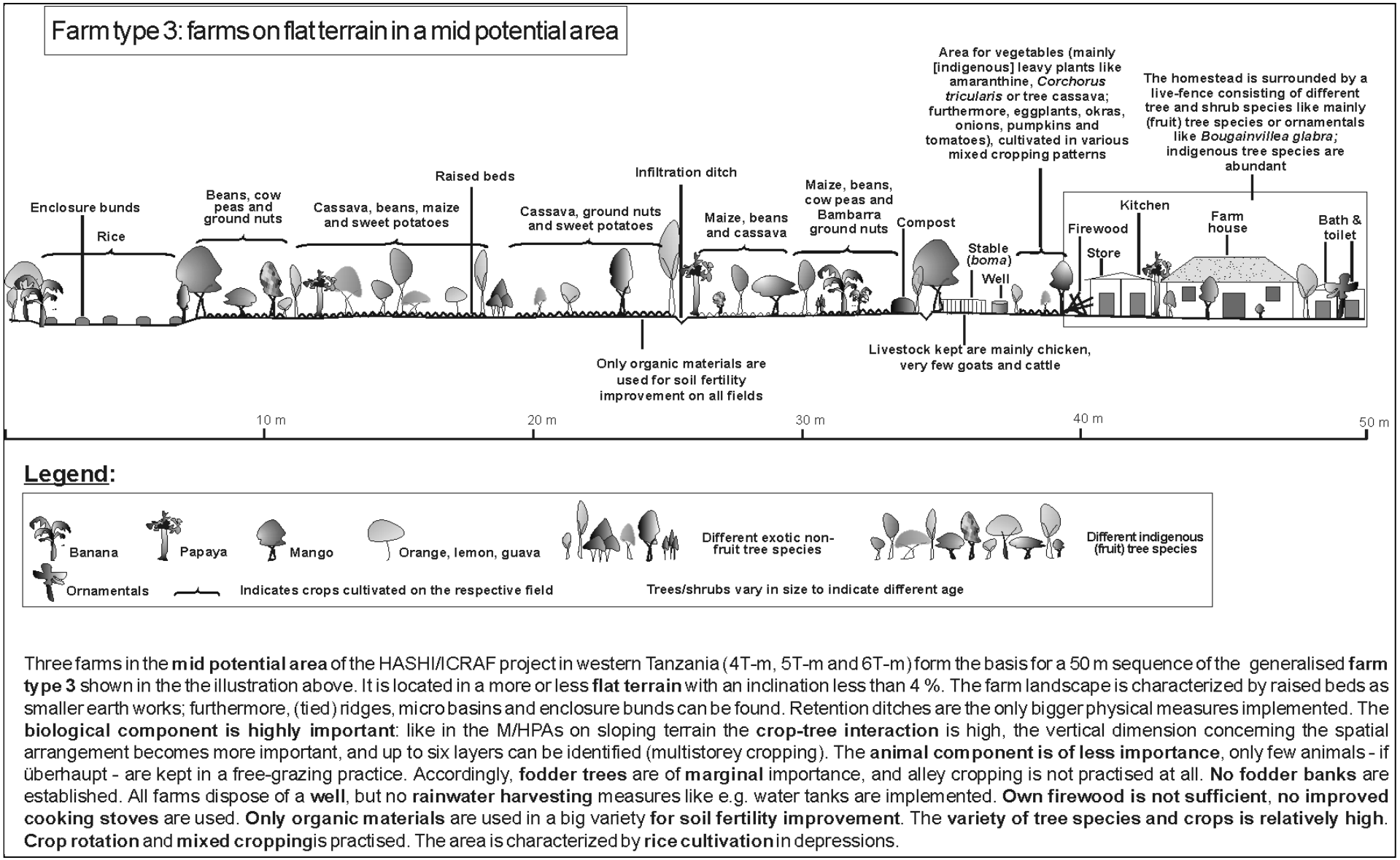
For the above given generalised **farm type 1** seven farms form the basis. The illustration shows a 50 m sequence, located on **sloping terrain** between 5 and above 30 % of inclination in a **mid/high potential area**. Partly, woodlots and (fenced) grazing areas are integrated. Furthermore, overall characteristics are implementation of **labour-intensive earthwork structures** like contour bunds, bench or *fanya-juu* terraces and retention ditches together with small soil conservation measures (furrows & ridges, micro-catchments), integration of **zero-grazing** and **fodder banks** as well as **partly water harvesting** (water tanks). **Partly, improved cooking stoves** are used, reflected in a **partly self-sufficiency in firewood**. Furthermore, an **intense crop-tree interaction** through **multi-storey cropping** up to five or even six layers can be found. The in general sufficient water supply (also through availability of different water sources) over the whole year is reflected in the occurrence of (cash) crops like especially bananas and coffee as well as in a **higher diversity of crops and trees** in general. Generally, **exotic (fruit) trees** are important. **Fodder grasses** - mainly napier grass - and **fodder-tree species** play a major role within the animal husbandry as well as for the stabilisation of physical structures. Trees and shrubs are found in different spatial arrangements, among which contour vegetation strips and alley cropping. **Soil fertility improvement** through techniques like mulching, composting and the use of organic manure and chemical fertilisers are practiced. **Crop rotation** and **mixed cropping** are further marks of this farm type.

Fig. 109: Farm type on sloping terrain in a mid/high potential area



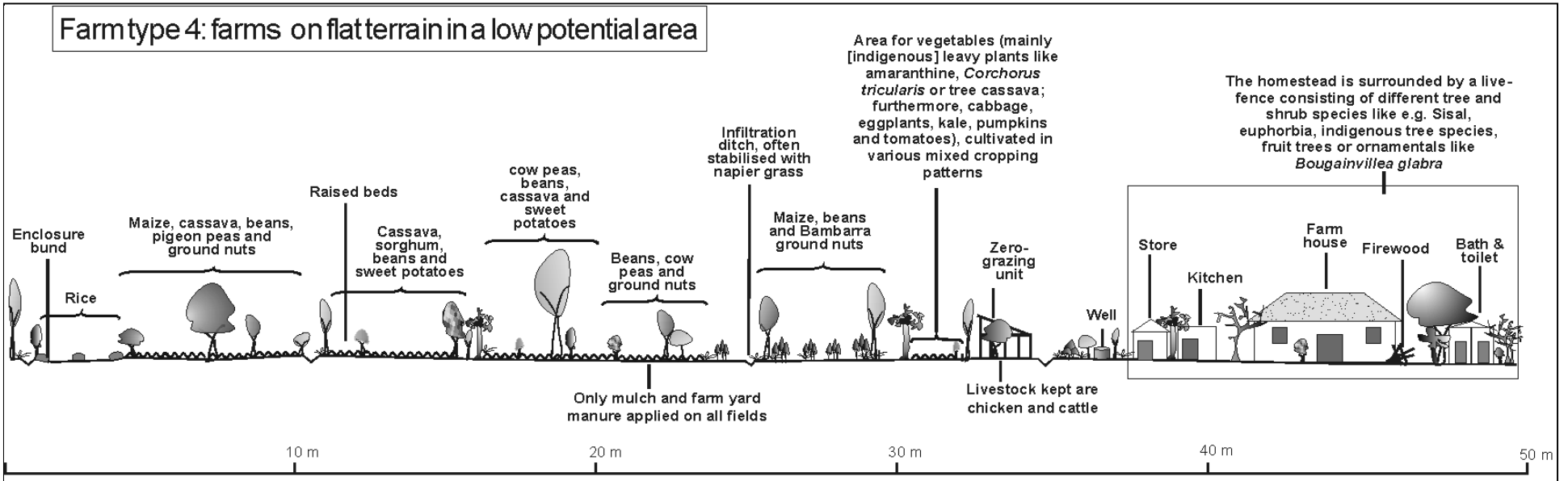
The illustration above shows a 50 m sequence of the generalised **farm type 2** generated out of data of four farms (1K-I, 2K-I, 3K-I and 1T-I). It is located on **sloping terrain** between 5 and 30 % of inclination in a **low potential area**. Characteristics are the implementation of **big physical structures** (bunds, *fanya juu* terraces, retention ditches and cut-off drains) together with small soil conservation measures like furrows & ridges or micro-catchments and more or less **free-grazing** practices. Trees and shrubs - although to a lesser extent than in the M/HPAs - are planted in different spatial arrangements, except in rows (alley cropping). **Water harvesting** is practised (water tanks), the **own firewood is sufficient** although **no improved cooking stove** is used, and diverse **soil fertility measures** are implemented. A **natural forest** is preserved at the foothill of the slope for different purposes like especially firewood, medicine and erosion prevention. Due to the agro-ecological conditions, the **crop-tree interaction is less intense**: the **vertical structure goes backwards** (mainly only two to three layers) in favour of the horizontal dimension, and the **variety of crop and tree species is less diverse**; accordingly, **drought-resistant plants** become more important in this AEZ, crops are cultivated in a **rotation** system and in **mixed cropping patterns**. Vegetables are partly irrigated. Napier grass is planted as additional fodder source and for the stabilisation of soil conservation structures. (Leguminous) **fodder trees almost do not play a role**.

Fig. 110: Farm type on sloping terrain in a low potential area



Three farms in the **mid potential area** of the HASHI/ICRAF project in western Tanzania (4T-m, 5T-m and 6T-m) form the basis for a 50 m sequence of the generalised **farm type 3** shown in the the illustration above. It is located in a more or less **flat terrain** with an inclination less than 4 %. The farm landscape is characterized by raised beds as smaller earth works; furthermore, (tied) ridges, micro basins and enclosure bunds can be found. Retention ditches are the only bigger physical measures implemented. The **biological component is highly important**: like in the M/HPAs on sloping terrain the **crop-tree interaction** is high, the vertical dimension concerning the spatial arrangement becomes more important, and up to six layers can be identified (multistorey cropping). The **animal component is of less importance**, only few animals - if überhaupt - are kept in a free-grazing practice. Accordingly, **fodder trees** are of **marginal** importance, and alley cropping is not practised at all. **No fodder banks** are established. All farms dispose of a **well**, but no **rainwater harvesting** measures like e.g. water tanks are implemented. **Own firewood is not sufficient**, **no improved cooking stoves** are used. **Only organic materials** are used in a big variety **for soil fertility improvement**. The **variety of tree species and crops is relatively high**. **Crop rotation** and **mixed cropping**is practised. The area is characterized by **rice cultivation** in depressions.

Fig. 111: Farm type on flat terrain in a mid potential area



The illustration above shows a 50 m sequence of the generalised farm type 4, generated out of data of four farms (3T-l, 4T-l, 5T-l and 6T-l). It is located in a more or less **flat terrain** with an inclination less than 4 % in a **low potential area in Tanzania**. Obvious is the **missing of bigger earthwork structures** except retention ditches and the dominance of **raised beds**; these measures together with other small physical measures like (tied) ridges, and micro basins are sufficient for soil conservation. Additionally, the **tree component is important** - although to a lesser extent than in the M/HPAs. Trees and shrubs are arranged in different spatial settings. A further characteristic of this farm type is **zero-grazing** together with **fodder banks** of grasses and shrubs/trees, mainly managed through **alley cropping**. Although suffering from long dry periods **no rainwater harvesting** measures like e.g. water tanks are implemented, although a **well** is established on the farm. **No woodlots or natural forests** exist on the farm plot, **no improved cooking stoves** are used; accordingly, **own firewood is not sufficient**. **Soil fertility measures** like mulching and the use of organic manure are conducted, compost or chemical fertilizers are not applied. Due to the agro-ecological conditions, the **crop-tree interactions are less intense**: regarding the spatial arrangement the horizontal dimension is more important than the vertical dimension (multi storey layers). Accordingly, the **variety of tree species is relatively low**. However, the one of **crop species** is relatively high, with importance of **drought-resistant plants**. Different vegetables are cultivated and are partly irrigated. **Rice cultivation** is common in depressions.

Fig. 112: Farm type on flat terrain in a low potential area

8.2 The husbands

Although the study mainly focuses on the women farmers, some crucial aspects related to the male farmers/husbands have to be taken into consideration as well. When trying to answer the question 'Why are these female farmers successful?' Factors are likely to play a role which are related to the male counterpart as has been stated in the literature (see e.g. SHISCAP 1992: 5; WILLIAMS 1996: 8; AUGUSTAT 1994: 133, 141) and is being shown in chapter 9.1.3. In this chapter, attention will be paid to the husbands of the women. All of them can be characterised as supportive, innovative and open-minded. What makes the difference between them and the others of the same sex?

In Tab. 49 below indicators have been listed which can explain or are linked to the attitudes and engagement of the farmer's husbands.[95] As education is often named as crucial factor, we will start with this aspect: interestingly, all husbands went to school, but the educational level is exceptionally high among the Kenyan farmers. In particular, five male farmers (2T-l, 3T-h, 5T-l, 6T-l, 4K-m) stressed the meaning of education in their life. For instance, farmer 5T-l would like to join secondary school when there is money and time available; the husbands of 2T-l and 6T-l use every chance for increasing their knowledge, e.g. through reading books, if available. The husband of 3T-h said that his love to books as 'knowledge keepers' were the reason why he chose his job. The educational level among the parents shows a gender difference: only four mothers went to primary school compared to six fathers out of which one even finished secondary and joined a vocational training as forester (however, he is the only one who received a vocational training).

What about further education, job engagement and social status? The table shows that six male farmers received a vocational training for a high skilled job, and all these farmers are engaged in jobs which they have been trained for. Additionally, three untrained male farmers have got/had an off-farm job. Only the husband of 1K-l does not work off-farm (retired). This is an aspect, often referred to in the literature as has been outlined in chapter 6.1.1.2. The income level is clearly higher in Kenya (here, the lowest income is double as high as the highest in Tanzania). One expression of the income situation is hired labour availability (see e.g. CROWLEY 1996). Indeed, nine out of the ten husbands engage casual and/or permanent labourers on their farms. However, off-farm income engagement of the female spouses is only of marginal importance.

Furthermore, six farmers are in a high public position out of which three Kenyans hold positions in the council or church. However, only two farmers have got/had a father or mother in an important public position.

[95] The table should be read as follows: if an indicator is referring to a ranking aspect this will be indicated in the legend; in some cases, more than one indicator can occur, indicated by a comma. The line 'ranking' gives absolute numbers.

Additionally, high relevance is found for the aspect of land tenure rights as all farmers own their land; furthermore, six farmers have full title deeds over their land.

Another relevant factor is linked to natural resources: two fathers and one mother of three husbands are closely connected through job or personal engagement in activities related to natural resources management which had/has a direct impact on the sons concerning their later engagement in and openness for this field.

Furthermore, the confrontation with and personal perception of resource degradation as came out during informal discussions with the farmers is important as well: especially five husbands (1K-l, 2K-l, 1K-m, 2T-l, 1T-h) had experienced the decrease of vegetation cover, the occurrence of severe soil erosion and the direct effect on their personal life already when they were a child or when they settled down in the area. In their view this experience made them think and aware of the fact that human-kind has to handle natural resources thoroughly and with care. Due to this experience it is no wonder that eight farmers are actively involved in knowledge transfer through working as (gender) trainers, support of (women's) groups or through other activities, and that five farmers received additional training in the field of snrm. Moreover, all farmers except one dispose of partly fundamental knowledge about natural medicine for humans and animals as well as natural pesticides as came out during many discussions. In fact, the farmers were very keen on communicating about this aspect, not only through giving examples, but also through giving me practical teaching, e.g. by studying trees and their use in a nearby forest, by cooking tea out of the bark of *Acacia nilotica*, etc. By the way, I repeatedly came across those males who had a lot of knowledge about their local flora.

The personality and engagement/position of the wives has to be taken into consideration as well as it is also directly impinging on the engagement of the male farmers and not only vice versa as it is widely stated in the literature. More and detailed studies on the impact of wives on their male partners are needed. The wife's impact is regarded as a success indicator for the male farmers as nine out of the ten wives are in high group positions. Moreover, eight wives are actively engaged in knowledge dissemination, and many women have undertaken activities already before they got married. Hence, there are many correlations, interrelations, and mutual influences which can have positive and negative influences on both partners.

Summing-up, all factors - except education of the parents which does not show a clear relation - have got an impact on the situation of these farmers, of course, in various mixtures and interrelations. However, clear indicators are education, off-farm engagement, hired labour, community position and kind of job, parent's engagement in snrm as well as aspects related to the wife. Especially for Kenya, the amount of income is likely to play a role as well as this directly helps to bring ideas on NRM into action. Furthermore, there is a clear difference between the Kenyan and the Tanzanian farmers: in Kenya, especially levels of education and income are higher.

Tab. 49: Indicators for the husbands

Aspects	Male farmers									
	1K-l	2K-l	3K-l	1K-m	2T-l	1T-h	3T-h	5T-l	6T-l	4T-m
Age	65	46	63	62	45	47	49	36	47	38
Education[1]	1	4	4	3	2	2	4	1	3	3
Training - project/ other institutions				x	X	X			X	x
Vocational training[2]		3	2	4		5	6			1
Job[3]	7	3	2	4		5	6	8	9	1
Off-farm income in Ksh[4]		180	120	180		42	60	14	30	60
Ranking income in total per capita	9	4	1	2	12	7	3	17	10	6
Public position[5]	1	7	2	2	3, 6	4,5			6	8
Active knowledge transfer on snrm	X	X		X	X	X			X	X
Active knowledge transfer on snrm - wife	X	X	X	X	X	X	X		X	
Knowledge/use of nat. medicine/pesticides	X	x	X	X	X	x	X		X	X
Wife high group position and/or initiator	X	X	X	X	X	X	X		X	X
Off-farm income engagement- wife		X	X						X	
Parent's public position[6]				1		1	2			
Engagement parents in snrm	X	X	X	X		X	X	X	X	X
Education mother[1]		2	2	2			2			
Education father[1]		2	2	2	2		4	2	2	
Land tenure rights	1	2	2	1	1	2	2	2	2	1
Hired labour	X	X	X	X		X	X	X	X	X
Experience with resource degradation	X	X		X	X	X				

Legend:

[1] **1** = primary, not finished; **2** = primary; **3** = secondary, not finished; **4** = secondary
[2] **1** = teacher; **2** = medical advisor; **3** = insurance agent; **4** = AIC immigration officer; **5** = Ward secretary; **6** = librarian
[3] **1 =** teacher; **2** = medical advisor; **3=** insurance agent; **4** = AIC immigration officer; **5** = Ward secretary; **6** = librarian; **7** = retired truck driver; **8** = fireman; **9** = labourer, livestock trainer
[4] Add three zeros! ~80 Ksh = 1 $ (January 2000)
[5] **1** = village council member; **2** = church elder; **3** chairman of VSCC; **4** = Ward secretary; **5** = traditional healer; **6** = trainer; **7** = helping group actively
[6] **1** = traditional healer (mother/father); **2** = forester (father)
[7] **1** = title deeds together with wife; **2** = full title deeds
K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; **snrm** = sustainable natural resource management; **X** = high; **x** = little/standard; ☐ = not on the resp. farm

The male farmers 2T-l and 6T-l are very open-minded and highly engaged males and shall be sketched briefly. Both are not only concerned with equality on household and farm level (activities and decision-making) but are actively engaged in knowledge transfer through training activities and guiding study tours. Both are highly interested in education and actively help other people in need:

As has been mentioned the husband of farmer 2T-l is involved in all household activities. He especially likes cooking and improved 'his' kitchen through constructing a chimney so that smoke is reduced to a minimum (see Fig. 113).

He is directly involved in the project activities as he works as gender trainer and guides study tours on his exceptionally well-managed farm. Within the context of study tours (sometimes more than one per day) farmer 2T-l and her husband teach farmers, experts, etc. about gender roles (I joined two 'sessions'), integrating me-

thods like active involvement of the participants and drama. The male farmer is crucial when it comes down to demonstrating that he, for instance, is not only helping in the kitchen but cooking meals himself (see Fig. 114). He transfers interrelated and complex aspects in a highly sensitive way to the male farmers, e.g. that a higher standard of living, the security of basic needs and the implementation of soil and water conservation measures in a sustainable way can only be achieved, if men take care for their families and assist their wives. He said that he receives a lot of feedback from female farmers who say that since that day they visited them, their husbands started to share daily household duties like helping in the kitchen, collecting firewood, fetching water, etc.

The male farmer 6T-l is very similar to the husband of farmer 2T-l concerning his attitudes, thoughts and engagement: like the later he is concerned with all household and farm activities like e.g. cooking, cleaning the dishes, washing clothes, fetching water or collecting firewood: both take over activities related to child care; the husband of farmer 6T-l e.g. also looks after the children when his wife visits relatives or has to fulfil duties, even if she is away for one week.

Every Wednesday he trains farmers on livestock-related aspects; this activity is due to his own engagement but is now supported by the project as study tours visit the farm and he and his wife explain measures related to all fields of natural resource management.

This farmer helps people in need where ever he can. For instance, he helped farmer 4T-l for two days to improve her cow-shed (see Fig. 115).

Fig. 113: Self-constructed chimney on the kitchen-roof of 2T-l

Fig. 114: Husband of farmer 2T-h in ‚his' kitchen; this farmer shares <u>all</u> activities with his wife

Despite of variations among the ten husbands all of them can be characterised by terms like openness, helpfulness, interest in education and improving own skills as well as engagement in knowledge dissemination. More detailed studies should be carried out on innovative males to increase knowledge about these men and to find ways how to bring them closer to their communities for improving knowledge on all levels of natural resource management and gender.

Fig. 115: The husband of 6T-I assists farmer 4T-I to improve her cow-shed

8.3 Women leaders

Among the 18 women 11 women are leaders of women's-, mixed- and/or church groups. Why are these women in leader positions? What are the factors behind? There is that statement that women leaders generally tend to be the better educated, those whose husbands hold prominent positions in the society and/or who are relatives of influential persons (chiefs, etc.) within the community (see e.g. SHISCAP 1992: 5; WILLIAMS 1996: 8). AUGUSTAT (1994: 133, 141) suggests that the fact that a woman is a chairlady or secretary of a women's group (or has build up a group) could be put down to a. o. corresponding experiences, support on the part of the husband, the ability to read and write as well as personal qualities.

To give answers to the above named questions and given statements in the literature in a first step the factors education/training/job skills, position of relatives/(former) husbands in the community and support of husband (also with regard to female farm managers) are to be analysed. The aspects have been listed in Tab. 50 below which is to be read like the table in chapter 8.2.

Interestingly, among the 11 women who are group leaders are all Kenyan farmers, and in HASHI-ICRAF project area only 6T-I is a group leader. Five women are even engaged in at least two groups (detailed data can be looked up in chapter 6.2.2.1). However, only three leaders are female farm managers (two are Kenyans).

Education plays a role as all women went at least to primary school (6T-I did not finish primary); only one Tanzanian (did not finish) but five Kenyan women went to secondary (one did not finish). Additionally, six group leaders have joined a vocational training - five are educated as teachers, out of which four are Kenyans.

Apparently the public position is important as well: out of the 11 group leader's husbands ten (former) husbands (six present, four former husbands) are in an important communal/job position out of which six leader's husbands and two former husbands have got an important position within the village/church. Furthermore, the table indicates that two Kenyan fathers were/are in higher public positions.

Before drawing final conclusions more indicators shall be integrated and analysed which have not been mentioned within the literature so far or in details: these are data about group initiator, active knowledge dissemination, education level/job engagement of the farmer's parents, decision-making, off-farm engagement and income patterns of the farmers as well as earlier experience with NRM and/or resource degradation.

That the aspect of taking the initiative to form a group plays a role can be seen on the fact that seven women (four Kenyans) resp. one (former) husband have been the initiators of the groups, however, only one is a female farm manager.

The educational level among the farmer's parents is good: only two farmer's parents as well as two mothers did not go to school. Furthermore, the parents of farmer 4T-m as well as the fathers of three other farmers are/have been working as teachers.

Off-farm income seems to be a relevant aspect as well since five farmers (four are Kenyans) are engaged in off-farm income activities, three are related to the training skills. Additionally, six husbands are engaged in off-farm activities, thus, in total eight families are provided with off-farm income. The ranking according to income shows that seven farmers are among the ones who rank highest regarding income per capita (four are Kenyans) which pleads for a correlation between leader position and income although four leaders belong to the low income group. In Kenya the amount of income plays a clear role to bring ideas on NRM into action.

Income is also closely linked to the factor of hired labour. As eight farmers have employed permanent and/or casual labourers this can be regarded as a sign for the access to financial resources.

Interestingly, only six out of the 11 farmers dispose of title deeds. It seems that this factor has no decisive influence on the leadership position. As this aspect is linked to decision-making, it can be asked whether the general aspect of restrictions regarding decision-making aspects is more relevant. Tab. 50 shows that only two Tanzanian farmers and one Kenyan farmer said to face few restrictions regarding decision-making aspects which somehow supports this suggestion.

All farmers are engaged in active knowledge dissemination on snrm through different activities (either in the frame of the projects or on a private basis like teaching about different subjects) which indicates the high relevance of this factor. As only five husbands are engaged in active knowledge transfer on snrm this factor seems not be too relevant for the leadership qualities of the women.

Only one woman said not to have knowledge about or to use natural medicine and/or pesticides; hence, also this factor is likely to have an influence on the family's welfare as treatments can be provided fast and without costs. Furthermore, people with knowledge about natural medicine are highly respected among their community members.

What about the aspect of natural resources management? Have these women been confronted with snrm strategies in their childhood, e.g. through the engagement of their parents? Did they experience resource degradation? Let us have a look at these two facets:

In informal discussions it came out that five farmers (2K-l, 3K-l, 2K-m, 3K-m) learned about soil conservation measures already from their fathers like making terraces or check dams. Also, many have grown up with a lot of trees on their parent's farm lands and thus learned about the wealth of trees (2K-m - especially fruit trees on terraces; 3T-l). additionally, they also learned from their parents about mixed cropping patterns (especially 3T-l, 2T-h, 3T-h). Interestingly, all farmers except two (2T-l, 1T-h) have been confronted with tree management on the one hand; on the other hand, six farmers have been confronted with their parent's problems of soil erosion and resource degradation on their own land. They directly experienced that trees are a main aspect in sustainable farming systems, but that they cannot prevent soil erosion alone on steep land (all parent's fields of the farmers mentioned had steep slopes). As has been said by the farmer's husbands already, also the female farmers mentioned that these early experiences had a decisive influence on their later view on and engagement in NRM related (group) activities.

All women reported to have been supported by the family, neighbours, friends or even the whole community to take-over the role of a leader. People recognised that their engagement is based on an community-oriented view and that they dispose of leadership qualities, shown in the fact that they are elected e.g. as group leaders.

The comparative analysis demonstrates a difference between the Kenyan and Tanzanian farmers: compared to the Tanzanian farmers the Kenyan farmers show a distinctive correlation between group leader position and the indicators education/training, initiator and husband's/parent's position in community/church as well as income level and hired labour. Obviously, these factors have an influence particularly on the personal leadership skills of the Kenyan women. Hence, regarding the Kenyan farmers the findings generally contribute to the statements mentioned at the beginning of this chapter. The aspects educational level, group initiator and parent's position in the public are no clear indicators for the Tanzanian leaders. Whereas off-farm income activities are almost of the same importance in both countries, the income level seems to be an important indicator only for the Kenyan farms. Land tenure rights are to be regarded of secondary importance. The criteria restrictions concerning decision-making, knowledge transfer and group activities in general show a clear im-

portance for empowerment and success for both groups; engagement in sustainable natural resources management and experience with resource degradation is almost as strong among the Tanzanian as among the Kenyan farmers. Furthermore, the parent's school and job engagement level is higher in Kenya.

On the other hand, the factors female farmer's off-farm engagement and parent's education/community position/job engagement are only of secondary importance concerning personal leadership skills of the Kenyan women: farmers 1K-l and 1K-m did not have a vocational training nor an off-farm job; only the father of farmer 1K-m went to school (primary), and their parents have not been in a higher public position. On the contrary, farmer 1K-m only grew up with a deaf mother. This may indicate the higher weight of own school education as well as the husband's position in village/church.

Interestingly, experience with NRM plays a general role in the farmer's lives and has a decisive influence on the farmer's engagement. However, the aspect of natural resource degradation is only of secondary importance.

A gender-related component is involved as only three women's group leaders are female farm managers (two are Kenyans), and only one leader is a group initiator.

A comparison of data related to the women's leaders with the women's group members indicates that skills are generally higher as to the leaders, keeping in mind that all members are Tanzanian so that data might be more homogenous.

To sum-up, on a general level, there is evidence that these findings contribute to the statements found in the literature: there seems to be a clear correlation between group leader position and the indicators school education, husband's/parent's position in community/job and marital status. However, these indicators (except marital status, although the female farm managers are Kenyans) are more decisive among the Kenyan farmers. Additionally, off-farm engagement in general apparently plays a role as success indicator as well.

Going back to the gender aspect of marital status: there are obviously less single/ divorced/abandoned women in a leadership position, on the other hand, it is at least three out of eleven; additionally, 2T-h (abandoned) is a treasurer of a women's group (although only fitting to few indicators). A woman within the research area of OTSYINA (1998: 29) in Western Tanzania mentioned about single educated women: "Women who are educated (at least up to secondary school) but are alone, have been quite successful in life. They are not controlled by any man, they use their income as they find necessary, and with their literacy they are able to manoeuvre and get things done as they see fit."

All factors seem to have an impact on the women's leadership qualities – of course, in various mixtures and interrelations, strongly influenced by the general openness for and interest in knowledge and widening of the own horizon on different levels.

Tab. 50: Comparison of aspects regarding position of women as leaders

	Farmers										
Aspects	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**2T-l**	**3T-l***	**1T-h**	**3T-h**	**6T-l**
Age	58	43	62	60	46	45	36	39	42	47	46
Education[1]	**4**	**4**	**4**	**2**	**4**	**3**	**2**	**2**	**2**	**2**	**1**
Vocational training[2]		**1**	**1**		**1**	**2,3**			**1**		**4**
Off-farm income activities[3]		**4**	**1,6**		**1**	**2**					**5**
Group leader[5]	**1**	**3**	**1,3**	**1,3**	**3**	**1**	**1,2**	**1**	**1,3**	**1,2**	**1**
Group initiator[5]	**3**	**1**	**1,2**	**1,3**				**1**			**1**
Active knowledge dissemination on snrm	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Importance of group activities for empowerment	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Knowledge/use of natural medicine/pesticides - ff	**X**	**x**	**X**	**X**	**X**	**x**	**X**		**X**	**X**	**X**
Public position (former) husband[6]	**1**	**11**	**2,13**	**2**	**3**	**10**	**5,8**		**6,7**	**12**	**8**
Off-farm income activities - husband		**1**	**2**	**3**					**4**	**5**	**6**
Active knowledge dissemination on snrm - husband		**X**		**X**			**X**		**X**		**X**
Education mother[1]		**2**	**2**	**2**		**2**	**2**		**2**	**2**	
Education father[1]		**2**	**2**	**2**	**4**	**2**	**2**		**2**	**2**	**2**
Public position/ job engagement parents[8]			**1,4**		**1**	**3**					**1**
Ranking income per capita	**9**	**4**	**1**	**2**	**15**	**5**	**12**	**13**	**7**	**3**	**10**
Land tenure rights[9]	**1**			**1**		**1**	**1**	**1**			**2**
Restrictions of decision-making in personal life					**X**				**X**	**X**	
Labourers (permanent and casual)	**3**	**2**	**4**	**>10**		**2**			**1**	**3**	**5**
Engagement parents in snrm	**X**	**X**	**X**	**X**	**X**	**X**		**X**		**X**	**X**
Experience with resource degradation		**X**		**X**		**X**	**X**		**X**	**X**	

Legend:

[1] **1** = primary, not finished; **2** = primary; **3** = secondary, not finished; **4** = secondary
[2] **1** = teacher ; **2** = nursery teacher; **3** = DCDA; **4** = secretary
[3] **1** = (retired) teacher, **2** = DCDA; **3** = labourer (coffee plantation); **4** = selling bought farm products; **5** = tending own tearoom; **6** = renting mill, sewing machines, kiosk, houses
[4] husband
[5] **1** =women's group; **2** = mixed group; **3** = church group
[6] **1** = village council member; **2** = church elder, A.I.C. immigration officer ; **3** = secretary of funeral association, teacher; **4** = initiator of VSCC; **5** = chairman of VSCC; **6** = Ward secretary; **7** = trad. healer; **8** = trainer; **9** = teacher; **10** = police officer; **11** = insurance agent, supports the group; **12** = librarian; **13** = initiator of group
[7] **1** = insurance agent; **2** = medical advisor; **3** = A.I.C. immigration officer; **4** = fireman; **5** = labourer; **6** = teacher
[8] **1** = teacher (father); **2** = teacher (mother); **3** = priest (father); **4** = church leader (father)
[9] **1** = full title deeds; **2** = only over own piece of land
☐ = not on resp. farm; ▒ = not in the resp. zone/country; **X** = high; **x** = little/standard; **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household; **snrm** = sustainable natural resource management; **ff** = female farmer

Concluding, it can be seen that estimations are highly depended on the level of analysis and the perspective taken; furthermore, the small sample size as well as the unequal sample sizes between Kenya and Tanzania have to be taken into account. Thus, although there is evidence for the truth of the statements in the literature, more analyses under consideration of these indicators are needed to strengthen this hypothesis, also with regard to the income level (see below). Furthermore, it would be interesting to analyse successful single male farmers as counterpart to the female-headed households.

AUGUSTAT (1994: 141) e.g. found, regarding the question of leadership qualities, that apparently age (in her case women between 30-50) and personality are more decisive than the economic situation. The findings of this study support the statement as to the age-level: the average age of a woman leader is 47,6 years; with an average age of 52,3 the Kenyan women are more than 10 years older than the Tanzanian leaders (42) (see also OOMEN (1992: 110). As to the economic aspects many women are in a more or less well-off position, thus, they do not belong to the poorest households in general which supports the finding of OOMEN (1992: 110). Within this context, I want to stress that this study has revealed that personality is a decisive factor like has been said by AUGUSTAT (141) as well: without exception, all women have got a strong personality, a strong will to change disadvantageous situations through own initiatives and to take influence on things. Many women have taken the initiative to change circumstances, whether it is farmer 1K-m who started the Greenbelt Movement in her region (an initiative by women to stop resource degradation and to re-vegetate the area), farmer 2K-l who went to the ministry to ask for help as she and her group had not been contacted, or farmer 2T-h who helps poor single women with accommodation and a job. Although all women have got a strong personality, not all are leaders. This shows that, of course, personalities vary, and that other factors play a role as well. It is the mixture of the different factors involved which determines the level of success in general and whether a woman is in a leading position or not.

8.4 Women with a husband versus women without a husband

In the following attention shall be paid to the situation of the male- and female-headed households under consideration of empowerment-related factors. Are there differences between these two groups?

One selection criterion for all farmers was at least membership of a women's and/or mixed group. According to Tab. 51 below this factor is relevant for the married women: only four out of the 13 women in higher positions are without a husband: 11 are leaders of women's-, mixed- and/or church groups among which only three female farm managers, but all Kenyan farmers; in HASHI-ICRAF project area only 6T-l is a group leader. Except 1K-l and 2K-l all married women are engaged in more than one group. Furthermore, six women have been initiators of groups among which only one female farm manager. Except 1T-l all are group leaders.

Among both groups education is positive as all women went at least to and except 6T-l finished primary school. Furthermore, five Kenyan farmers (two female farm managers) finished secondary school (except 3K-m who went up to form 2); only the Tanzanian farmer 4T-m went to secondary school but left school after form 4. Generally, also the parent's education of the married women is higher as the table below shows and is likely to have had a positive influence on the farmer's education.

The aspect of vocational training – of the farmers themselves as well as of their parents – forms a relevant aspect as this empowers people to work off-farm and to earn higher wages as would be the case in unskilled jobs. Seven farmers have joined a vocational training out of which five are married women. The fathers of five farmers (three are married women's fathers) are/have been engaged in skilled jobs (teachers, church employment); only the mother of one married farmer had an off-farm employment (retired teacher).

The position of the (former) husbands in the community/church resp. performing high skilled jobs which enjoy a good reputation in the community and/or being actively involved in different knowledge dissemination activities are extraordinary relevant with positive trickle-down effects also on the social status of the women. Nine out of ten male spouses are in relevant positions compared to four out of eight former husbands among the female farm managers. Especially the Kenyan males are in a high social status since four Kenyan male spouses are in relevant community/church positions. Additionally, five fathers (two are fathers of female farm managers) and one mother are in higher job/ community positions.

Furthermore, off-farm activities clearly reflect the differences in marital status as seven husbands are engaged in regular off-farm income activities. Six female farmers are engaged in off-farm income out of which three are married and whose husbands also work off-farm. Tab.30 in chapter 6.1.2 additionally shows that the Kenyan husbands receive a clearly higher salary than the Tanzanian husbands. It can be seen that especially the married women in Kenya are in a better financial situation.

Thirteen farmers are assisted by permanent or casual labourers out of which only four are women without a husband; additionally, they have employed only casual labourers as can be seen in Tab. 29 in chapter 6.1.2. This aspect is closely linked to financial resources: The comparison of the data with the income per capita shows that the farmers without hired labour assistance belong to the income poor - except the farmer couple 2T-l all are female-headed households.

Engagement in knowledge transfer through different activities (either in the frame of the projects or on a private basis like teaching about natural medicine, stove-making, etc.) is important for both groups. Additionally, the husband's engagement in this field (seven out of ten male spouses) is relevant for the married women as well. Generally, the factor knowledge and/or use of natural medicine has to be mentioned within this context as well. It is also interesting that 16 farmers (all female farm managers) have been confronted with sound environment technologies like tree plantings, terracing, organic farming, etc. already in their childhood. For instance, the parents of farmer 6T-l had so many trees that people around or passing by really were surprised. The parents of farmer 5T-m also had a lot of trees; when she was a child she collected seedlings in the nearby forest for planting on the fields: "Now, my parents make beds out of that trees."

The confrontation with and personal perception of resource degradation like the decrease of vegetation cover and the occurrence of severe soil erosion has been mentioned during informal discussions by five farmers (four are married). According to them, this experience made them aware of the fact that people have to handle natural resources with care.

Freedom to take part in decision-making processes has a direct impact on the farmer's activities and their empowerment. Only six Tanzanian farmers (four married women) and one Kenyan farmer said to face little inner-household- and public restrictions with respect to decision-making processes (see also chapter 6.2.3). For all farmers of both groups the group activities in general are highly important for their empowerment. Regarding land tenure it can be seen that twelve farmers dispose of title deeds. Interestingly, the situation concerning this aspect is better for the female farm managers. It might be that a functioning family system, based on equality, equity, mutual support and co-operation, is more important for the married women than title deeds.

To sum up, the analysis revealed a clear difference between the Kenyan and the Tanzanian farmers - except for active knowledge transfer and the group activities -, especially regarding level of education and vocational training, group leadership and initiator aspects, off-farm engagement, hired labour and income per capita as well as husband's position in community/church and decision-making processes: in all these aspects the Kenyan farmers show higher skills respectively better conditions. However, these factors can be clearly declared as success indicators on a general basis.

A woman within the research area of OTSYINA (1998: 29) in western Tanzania mentioned about single educated women: "Women who are educated (at least up to secondary school) but are alone, have been quite successful in life. They are not controlled by any man, they use their income as they find necessary, and with their literacy they are able to manoeuvre and get things done as they see fit." This can be supported as the eight women without a husband belong to the group of successful farmers. Only two farmers do not have land tenure rights and only two farmers said to face little restrictions in decision-making. However, compared to the married women, these women are disadvantaged regarding financial resources and thus labour input. They do not receive financial and/or physical as well as psychological support from husbands, and on the average they rank low concerning income per capita compared to the married women. Furthermore, less female farm managers are found in leadership positions. All female farm managers said that life would be much easier with a husband: He could support money and labour and they could share responsibilities. Thus, generally the female farm managers are in a weaker economic and social position although being successful managers of natural resources.

The reasons for this somehow paradox fact will be given in the course of the next chapters.[96]

Concluding, the small sample size as well as the unequal sample sizes between Kenya and Tanzania have to be taken into consideration. More analyses under consideration of these indicators are needed to strengthen the hypothesises.

Tab. 51: Aspects regarding married women and female farm managers

	married women										female farm managers							
Aspects	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2T-l**	**1T-h**	**3T-h**	**5T-l**	**6T-l**	**4T-m**	**2K-m***	**3K-m***	**1T-l***	**3T-l***	**2T-h***	**4T-l***	**5T-m***	**6T-m***
Education[1]	4	4	4	2	2	2	2	2	1	3	4	3	2	2	2	2	2	2
Vocational training[2]		1	1			1			4	1	1	2,3						
Job[3]		4	1,6						5		1	2	3					
Ranking income per capita	9	4	1	2	12	7	3	17	10	6	15	5	16	13	8	11	14	18
Labourers (permanent and casual)	X	X	X	X		x	X	x	X	x		X			x		x	x
Group leader (all)[5]	1	3	1,3	1,3	1,2	1,3	1,2		1		3	1		1				
Group initiator[5]	3	1	1,2	1,3					1				1[4]	1				
Importance of group activities for empowerment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Active knowledge dissemination on snrm – female farmer	X	X	X	X	X	X	X		X		X	X	X			X	X	X
Active knowledge dissemination on snrm - husband	X	X		X	X	X			X	X	/	/	/	/	/	/	/	/
Social status/job engagement (former) husband[6]	1	11	2,13	2	5,8	6,7	12		8	9	3	10	4		10			
Education mother[1]		2	2	2	2	2	2	1		1		2					2	2
Education father[1]		2	2	2	2	2	2	1	2	2	4	2				1	2	2
Freedom of decision-making	X	X	X	X	X	x	x	x	X	X	x	X	x	X	X	X	X	x
Land tenure rights	X			X	X			x	x	X		X		X	X	X	X	X
Social status/job engagement parents[7]			1,4						1	1,2	1	3						
Engagement parents in snrm	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X
Experience with resource degradation				X	X	X	X					X						
Knowledge/use of natural medicine/ pesticides	x	x	x	X	x			x	x	x	x		x		x	X		x

Legend:

[1] **1** = primary, not finished; **2** = primary; **3** = secondary, not finished; **4** = secondary;
[2] **1** = teacher ; **2** = nursery teacher; **3** = DCDA; **4** = secretary
[3] **1** = (retired) teacher, **2** = DCDA; **3** = labourer (coffee plantation); **4** = selling bought farm products; **5** = tending own tea room; **6** = renting mill, sewing machines, kiosk, houses
[4] husband
[5] **1** =women's group; **2** = mixed group; **3** = church group
[6] **1** = village council member; **2** = church elder; **3** = secretary of funeral association; **4** = initiator of VSCC; **5** = chairman of VSCC; **6** = Ward Secretary; **7** = trad. healer; **8** = trainer; **9** = teacher; **10** = police officer; **11** = insurance agent, supports the group; **12** = librarian; **13** = initiator of group
[7] **1** = teacher (father); **2** = teacher (mother); **3** = priest; **4** = church leader (father)
☐ = not on resp. farm; **K** = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household; **X** = high; **x** = little/standard; **snrm** = sustainable natural resource management

[96] Out of the eight female farm managers, four have been abandoned by their husbands. One can ask why someone is neglecting the mere human urge to care for the own family. If we turn around the findings of HASSAN (2000: 9-10) and ask why migrants do *not* remit, induced or tempered factors like self-interests, not willing to return and lack of altruistic feelings may play a role.

A survey to reveal the type of farmers who like to plant trees (rotational woodlots and boundary planting) in Shinyanga Region, Tanzania, showed that it were those who planted trees before, are educated (standard 1-7), rich (large sizes of land, large cattle sizes), have land user rights, are engaged in off-farm activities and are frequently visited by the extension staff (OTSYINA et al. 1997a: 45-53).[97] Transferring these indicators to the 18 case studies, generally, the following can be said concerning engagement in soil conservation activities: education and experience with tree plantings and other conservation activities seem to be crucial criteria since they fit to all farmers visited; land-use rights are more important for the female farm managers. Engagement in off-farm activities seems to be one of the key criteria influencing farmer's decisions (see also CROWLEY et al. 1996: vii). Furthermore, the degree of power to take decisions in general, which includes control of finances, land, farm products, livestock, trees, tools, etc., but also inner-household aspects, is crucial. Power of decision-making determines possibilities for personal development which directly has an influence on all household members. This aspect is crucial for both groups: for the couples it can be said that the higher the state of equity among a couple, the better they work together with positive effects also on their social environment. On the other hand, freedom to take decisions on their land and concerning public aspects determines the life situation of the female-headed farm households.

8.5 Two farmer's portraits

8.5.1 Farmer 1K-m

Farmer 1K-m is 60 years old and lives in Ivutu, a small village in Machakos District, Kenya. She is married to a (retired but still working) AIC Immigration officer who works in Nairobi and comes home at weekend. They have nine children (7 sons and 2 daughters) all of which are in partly well-paid off-farm jobs. In total, their farm land is more than 34 acre. To their homestead belong 25 acre of well-maintained undulating land with a small woodlot of mainly eucalyptus for timber and firewood, a vegetable garden and a zero-grazing unit. Near Thika and on the way to Nairobi they have another 3 plots of land, out of which two are for ranching. Here, a labourer looks after the cattle (20 zebus). On their plot near the home they keep 12 cows, out of which two are dairy cows (mixed breed), 6 goats and 2 sheep which are a. o. fed with napier grass, planted on the terrace ridges and cut with a fodder grass machine. Besides this, they keep some ducks and chicken. Main cash crops are beans, maize, potatoes, vegetable (tomatoes, onions, kale and carrots) and bananas which are sold to a middleman. A small amount of coffee is sold to the co-operative. Furthermore, she sells milk, sometimes poultry and firewood. Several permanent labourers work on the farm, and during the planting and harvesting period, she engages a lot

[97] Unfortunately, in the study no gender aspects like information on female-headed households, etc. are included.

of casual labourers, often single women, as she wants to help where she can. Besides several water tanks and a pond established on the farm land for water harvesting, a huge variety of different indigenous and exotic tree species are planted on different soil conservation measures, many out of which are for medicinal purposes.

She is a well-known traditional healer and mid-wife in the region, and even at night people come to her house. If there is no other way and she cannot help a person, she takes him or her with her own car (she has a driving licence) to hospital. Many medicinal trees and herbs she needs for treatment (also for animals) grow around her homestead, and she can tell a lot about their different uses and potentials.

Farmer 1K-m is a farmer's daughter and grew up in a small village nearby. But she had a tough childhood since her father run away and she and her sister grew up with a poor deaf mama. She went to primary school and took several courses in adult education after marriage. Already during her childhood she had great interest in and took care of the natural environment. Her active engagement started in the 60s when there were almost no trees in the area left. Indeed, she is one of the first initiators of the Greenbelt Movement. Inspired by a saying in the bible (you have to sweat first before you can harvest) she organised a women's group which started planting trees all over Machakos District. Since then, she was and is engaged in a lot of activities; for instance, between 1965 – '69 she was engaged in activities related to agriculture, marketing and terracing. She took a lot of training and has got contact even to people from overseas through her activities. Besides reforestation and small enterprises for women she supports the re-introduction of traditional food plants.

Farmer 1K-m can be called a prototype of a leader and multiplicator. She has got a strong personality and mobilises others. Her engagement became famous, so she was elected to be a leader, and her position grew. In 1993 she received a certificate for being a location leader which means that she is the chairlady of all groups in the location (240).

Her husband, working with the African Inland Church, supports her activities. He is a very open-minded man, who works hard for his family. Farmer 1K-m once told that when he came home from work on Friday evening by bike (80 km from Nairobi!) he harnessed the oxen and started ploughing the fields by the light of the moon. Almost all of their children are engaged in groups or public activities.

8.5.2 Farmer 5T-m

Farmer 5T-m is a 25 years old woman, living in a village in western Tanzania, near the tarmac main road to Burundi and 20 km from the district capital Kahama. She has a 2 years old boy child and a 4 years old daughter. She also takes care of two relative's 4 and 6 years old boys as well as two almost grown-up brothers of her husband. One is in form 4, the other is about to finish primary and wants to go to

secondary school. She herself went to primary school, but had to leave after standard 7. As she grew up with 4 brothers and 3 sisters on a farm (in Musoma near the Kenyan border) her parents did not have enough money to send her to secondary school which she would have liked very much. In Musoma she met her husband, and after their marriage in May 1998, they shifted to this place, bought a piece of land together and started building a small house which is quite well equipped. Her husband left one and a half year ago, when she was pregnant, to make business, but since then he has not send any message. His parents irregularly send some money for their sons for school-fees, clothes and food, but it is never enough. Since her husband ran away, she is managing household and farm activities all on her own, however, with a little assistance from her husband's brothers. In total, her farm land is 3 acre in a flat area: in a 5 min walking distance she has rented a rice field of 1 acre for 5.000 Tsh/year. Another 1,75 acre are located in ~ 15 min walking distance away from her home. Here, she plants different crops like maize, ground nuts, cassava, cow peas, pigeon peas, beans and Bambarra ground nuts as well as different kinds of vegetables like tomatoes, carrots, okras, kale, Chinese cabbage, eggplants, onions, pumpkins, amaranthine and cabbage. 1 acre is kept as an orchard with bananas, papayas, oranges and lemons. The field is fenced with Bougainvillea, neem trees, bead trees (*Melia azadirach*) and sisal. She has another plot of 0,25 acre ~ 8 min walking from her house, planted mainly with fruit trees. She also tends a little tree nursery where she raises tree seedlings like *Grevillea robusta*, neem, Bougainvillea, cypress, *Pithecellobium dulce*, oranges, papaya, ornamentals and *Terminalia catappa*. Indigenous tree seeds or even seedlings are hard to get. The next tree nursery is 9 km away, a school forest is only (re)growing since one year, and natural forests are far away. She uses cow manure, rice shaft and residues as fertilisers. Vegetables and sometimes fruits are sold to the middleman, tree seedlings are sold at home. She also had a little shop where she sold basic things from soap to matches and tree seedlings. But soon after people knew that she was alone, one night in October 1999 the shop was broken by thieves who took almost all her stuff. So she closed the shop. At her house she keeps four chicken and a cock. Water (from a neighbour's well) is not enough in the dry season, so she has to buy a bucket for 20 Tsh. On the big plot she has started to establish a well, but it is not finished yet.

Farmer 5T-m is a member of a women's group with five members. In the beginning they were nine women. But as this group has been set up by the project which gave seedlings, seeds and tools for free, the women thought that they will get everything for free. When they realised that this is not the case, they stopped.

She is used to visitors as the project conducts farm visits also to her farm. She even had a visit from a woman scientist from Dar-es-Salaam who is studying tree gardens.

Already her parents planted a lot of trees, and when she was a child, she took home seedlings and seeds from the nearby forest to planted on the parent's fields. For her, nature is important, and she would like to get more indigenous tree seedlings.

9 Problems & success-indicators: stock-taking, classification & ranking

> "If sustainability is to have any meaning it has to be measurable. To be able to do this some criteria have to be used. […] A qualitative indicator might be an attempt to ascertain how a farmer and his/her family perceive changes in their quality of life over time, using field interviews."
>
> P. HUXLEY in his book on tropical agroforestry (1999: 286).

The total environment in which the rural household is operating can be divided into a technical and a human element. The technical element reflects how physical and biological conditions can be manipulated (fertilisers, irrigation, breeding varieties, etc.) to reach the potential system. However, whether improvements can be followed up by small-scale farmers mainly depends on the human element in the total environment. The human element is divided into an exogenous and an endogenous component. The exogenous component which includes the social, economic and political environment and which is largely out of control of the individual household, determines the ability to act. This component can be divided into a) community structures, norms and beliefs (e.g. socio-cultural background, preferred food crop, gender issues), b) external institutions or support systems (e.g. extension, co-operatives, credit, input supply, produce marketing, transport) and c) other influences (distance to potential markets, population density) (ENSERINK & KAITABA 1996: 3).

The endogenous component is more under control of the individual farmer: the inputs like land, labour, capital and management can be used to develop a system within the boundaries laid down by the technical and the exogenous component. Availability of and access to these inputs varies among areas and households, influencing a farming system's performance and potential. However, the farmer's aims and motivations give the system its dynamic dimension. The endogenous component is more under control of the individual farmer: inputs like land, labour, capital and management can be used to develop a system within the boundaries laid down by the technical and the exogenous component. Availability of and access to these inputs varies among areas and households, influencing a farming system's performance and potential. The farmer's aims and motivations, however, give the system its dynamic dimension (ENSERINK & KAITABA 1996: 3).

The human element has often been neglected in traditional agricultural research approaches. However, development is determined by the interaction and availability of natural *and* human resources (ENSERINK & KAITABA 1996: 3). In the following chapters problems and success indicators are analysed under consideration of expert's views as is shown by Fig. 116 below:

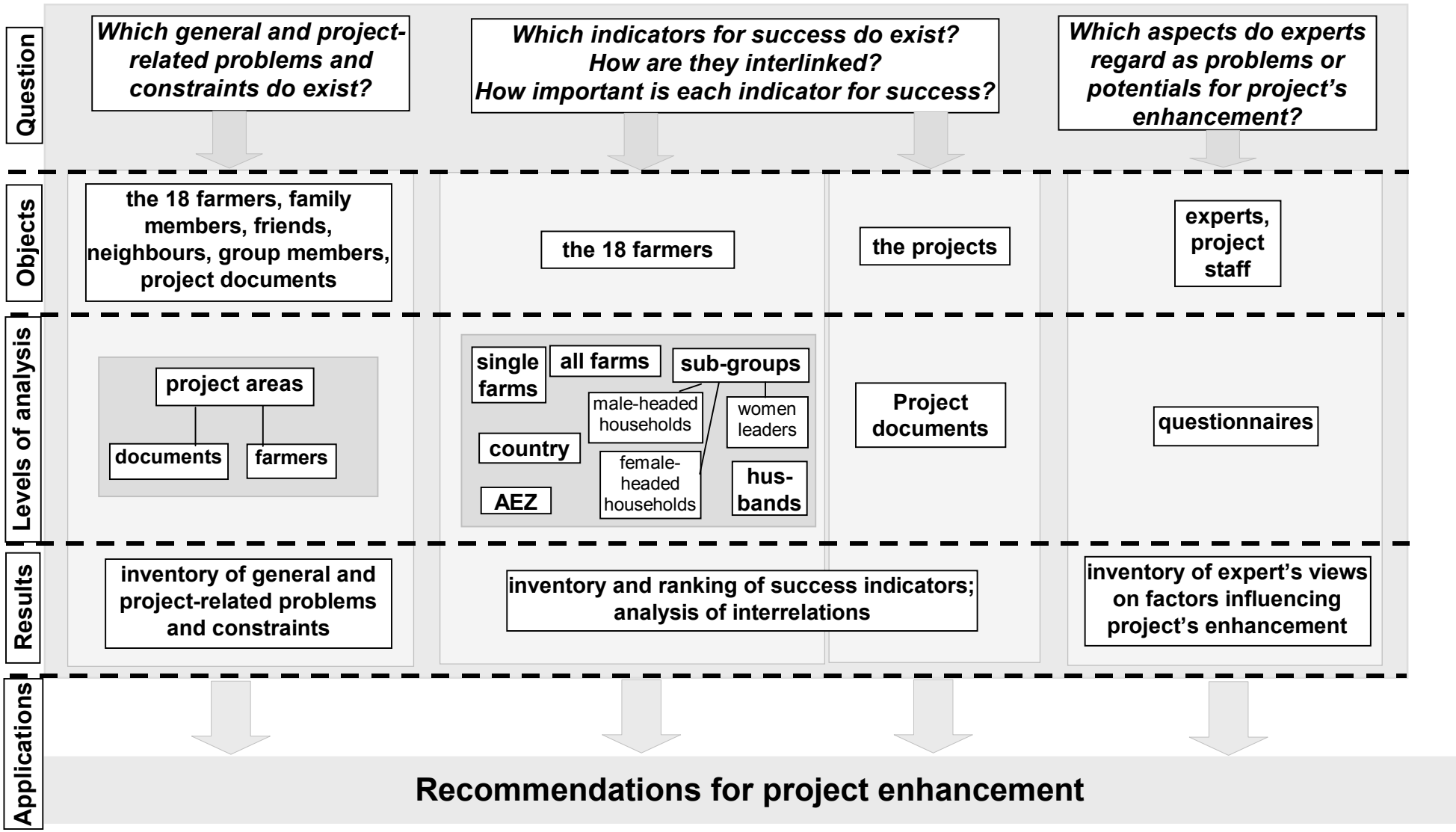


Fig. 115: ***Problems*** **and** ***success indicators*** **applied as recommendations for project-enhancement; the arrows indicate the direction of the process of analysis**

9.1 Success-indicators

Measurements of success or sustainability can usually only be made if a way is found to keep track of some factors that have been identified as crucial to the success of the system. Measures of and indicators for efficiency can be many things like labour, capital or socio-cultural & political aspects (see also HUXLEY 1999: 145). But still, there are difficulties for monitoring sustainability like what is a significant departure in a set of circumstances, and after how many years (of recording) is it confirmed? (HUXLEY 1999: 286). Success has different shades. Success is defined with regard to the respective (socio-economic, cultural and ecological) environment within a given area and functions as criterion for sustainability.

In the following chapters, attention is paid first to the classification of each farm along indicators for potentials (success) and weaknesses. Subsequently, these indicators are investigated on different levels (AEZ, country, project) as well as for specific farmer groups (the farmers in total, female and male spouses, women leaders and female-headed households).

9.1.1 The individual farms/female farmers

> "In looking at farms as integrated units, it is possible to arrange them in some sort of classification […]" (BRADLEY 1991: 241).
>
> P. N. BRADLEY in the context of an analysis on a woodfuel development strategy for East Africa (1991: 241).

Different indicators regarded as playing a (key)role within the context of success and sustainability have been identified and a matrix has been developed to which the farms have been assigned (see Tab. 55; see also BRADLEY 1991: 238-239). A grading from none/not to very good/high makes it possible to rate the farms and identify weaknesses and potentials and by this key indicators for success. Some of the indicators like community position cannot be quantified easily (see also WITTE 1998: 77). Although critics are found in the literature as to the ranking methods like distortion through strong affective elements and selective perception (like participant observation) (see FRIEDRICHS & LÜDTKE 1973: 93) this method seems to be practicable to elucidate differences and similarities between the farms and to give a broad characterisation of the farming systems (see also BRADLEY 1991: 238-253).

Furthermore, the matrix allows assessment of the status of the families (wealth classification) through not only assessing aspects related to land, livestock, agricultural equipment[151] and income, but assets like household- and family size, education, la-

[151] These criteria are, however, still the most common and important measures of wealth ranking since wealth is largely determined by assets owned by a family in the rural areas. A study carried out by HATIBU & MTENGA (1996: vi, 50) listed ownership of cattle (number), labour, engineering

bour, socio-cultural influence, etc. as well (see also T'HART 1992: 14-15; CROWLEY et al. 1996: 13; MADULU 1998: 19, 40; OTSYINA 1998: 33). Each of these different indicators plays a role within the context of success and sustainability; however, a comparative analysis of the different factors integrated in the matrix not only provides a (simplified) description of the pattern of indicator relationships, but some indicators can be identified playing a key role within this context. For instance, the degree of the stabilisation of ecological conditions and economic factors is correlated to the interaction of different factors like e.g. inclination or financial and labour resources; the last named factors are in turn related to marital status, etc. Or the fact that a field is far away has to be correlated to factors like transport situation, employment of labourers, etc.

Multiple correlations have been found which reaffirms the supposition in the beginning of this study (chapter 1.3.2) that a farm must be considered as a whole – a farming system; items of particular interest such as agroforestry or energy aspects cannot be properly examined in any other context than as part of the totality of the farm operation (BRADLEY 1991: 247). Clusters have been built by grouping the indicators under different categories (economic, socio-cultural and political as well as ecological - see Tab. 55). This eases the step to identify *farm types* (ibid.). Accordingly, the analysis will be conducted for each category first to come to general conclusions in the end. Tab. 52 below is used as basis for ranking. This table indicates with a number for each farm how often a particular estimation (from **--** to **++**) for all indicators within a specific category has been chosen in total: for instance, farm 1K-m scored 14 times the highest estimation (**++**) within the category of socio-cultural and political indicators, 1 time **+**, 4 times **+-** etc. It also indicates how high a specific estimation scored among the farms in total. The best farmers will be handled first down to the lowest scoring farmers.

Starting with the economic indicators the male-headed farms 3K-l, 1K-m and 3T-h which are top three regarding income per capita in total score best compared to the other farms. Zero scoring criteria are found one time only per farm. Farm assets and all income-related- indicators (inclusive credit) score high among all these farms. The houses are well built and well-equipped. Water supply is good – all farms dispose of a water tank. All husbands provide off-farm income, and consequently, labourer employment is high. Not surprisingly, the only cars found within the whole sample belong to these farms. However, only for 3K-l and 1K-m the market situation is favourable. For 1K-m and 3T-h road conditions have been found to be bad during the rains, but as their access to the main road is (very) good, this aspect does not have a decisive negative influence. Although 3K-l and 1K-m use an improved cooking stove, only 3K-l is self-sufficient regarding firewood. This is a critical factor since it shows that more has to be done to enhance the tree component on the farms. The

technologies, food supply, land and water as main important wealth determining indicators (see also CROWLEY et al. 1996: 10).

size of land for cultivation commensurates with the household sizes, and all farms dispose of grazing/forest areas. All farmers have got fields which are farther away than 10 km (3K-l and 1K-m even have got plots as far as up to 100 km) which they have either rented to someone or which are taken care of by a hired labourer. At first sight distance is regarded as a negative aspect if not considering other criteria like transport, infrastructure and administration of the land. It can be summarised that the farmer's well-being is reflected almost on all indicators.

Tab. 52: Scoring* of a particular estimation (from -- to ++) for all indicators within a specific category in total, listed per farm

Farmers	Economic category					Socio-cultural & political category - ff					Socio-cultural & political category - hb					Ecological category				
Scoring	**--**	**-**	**+-**	**+**	**++**	**--**	**-**	**+-**	**+**	**++**	**--**	**-**	**+-**	**+**	**++**	**--**	**-**	**+-**	**+**	**++**
1K-l	4	1	3	7	8	6	0	4	1	11	6	0	0	0	4	2	0	4	5	0
2K-l	2	2	5	6	8	3	0	6	2	11	2	0	2	0	6	1	0	3	6	1
3K-l	1	0	1	3	18	4	0	5	1	12	3	0	2	0	5	1	0	4	4	2
1K-m	1	1	1	3	17	3	0	4	1	14	0	0	4	0	6	0	0	1	2	8
2K-m*	8	2	8	1	4	5	0	5	3	9						2	0	3	2	4
3K-m*	7	1	5	3	7	5	0	5	2	10						0	1	1	5	4
1T-l*	8	6	1	2	6	7	0	8	0	7						1	2	6	2	0
2T-l	7	2	3	4	7	4	0	5	2	11	4	0	2	0	4	0	0	0	4	7
3T-l*	12	6	2	3	0	11	0	3	1	7						1	2	5	3	0
1T-h	7	5	2	3	6	7	0	4	1	10	2	0	1	0	7	0	0	3	3	5
2T-h*	9	4	4	1	5	7	1	6	1	6						1	1	1	5	3
3T-h	1	2	4	3	13	6	0	7	2	7	2	0	1	0	7	1	1	2	3	4
4T-l*	9	5	5	2	2	9	1	3	2	7						0	2	3	5	1
5T-l	5	6	6	1	3	7	4	4	5	2	6	1	2	0	1	1	2	3	4	1
6T-l	4	2	7	3	7	4	0	4	4	10	4	0	1	1	4	1	0	5	3	2
4T-m	8	3	6	3	3	4	1	3	5	9	4	0	1	2	3	1	1	2	3	4
5T-m*	9	3	5	3	3	8	2	5	1	5						2	1	3	3	2
6T-m*	9	1	2	4	3	7	1	6	2	6						1	0	4	6	0

Legend:

--	not/none	**-**	bad/low/few	**+-**	sufficient/standard/partly	**+**	good	**++**	very good/high

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household;
ff = female farmer; **hb** = husband

* each number indicates for each farm how often a particular estimation (from **--** to **++**) for all indicators within a specific category has been chosen in total

Five similar scoring farms (1K-l, 2K-l, 3K-m – the only female-headed farm –, 2T-l, 6T-l) shall be discussed next; variations among the indicators are more diversified (see Tab. 52). All farm houses are in a good state, but the size of land for cultivation is only favourable on farms 1K-l and 2T-l, and only 1K-l has got sufficient land for grazing and woodland. Three farms (1K-l, 3K-m, 2T-l) can rely exclusively on their own firewood, and three farms (2K-l, 3K-m, 2T-l) use an effective energy-saving

stove. Except for 3K-m the road conditions during rain are bad, but access to the main road is (very) good; the same goes for food/fodder/water supply and the market situation. Hired labour is available on all farms except 2T-l; three farms each dispose of an ox-cart, a water tank and a plough. Furthermore, for three farms access to credit is very important. Off-farm income is standard or even good, although only on farms 2K-l and 6T-l both partners carry out off-farm income-generating activities.

Out of the farms 2K-m, 1T-l, 1T-h and 2T-h the first two named farms already belong to the resource poor according to income per capita; moreover, three farms are female-headed. Within these samples many indicators score low or even not at all. The houses are only standard resp. the house of 1T-l is even below standard. However, generally, the supply with firewood is favourable on three farms, and farms 2K-m and 1T-l dispose of an improved cooking stove. Whereas the female farm managers do not work off-farm, on farm 1T-h both farmers are engaged in off-farm income generating activities. Supply with food/fodder is only very good on farms 1T-h and 2T-h with a higher income level; they are also the only farms which casually engage labourers. However, only 1T-l has got a water tank. As only 2K-m sometimes faces water shortages only this farmer should be supported with a water harvesting system. Three farms have applied for/received a loan. On farms 1T-h and 2T-h the size of land for cultivation is a limiting factor. Fields are close to all four farms. 1T-h and 2T-h did not set aside land for forest/grazing. Other indicators score rather low.

Farms 3T-l, 4T-l, 5T-l and all farms in the mid potential area of HASHI-ICRAF belong to the poorest households and show a similar distribution of the single estimation codes. Four farms are female-headed. The biggest difference in the whole sample between the estimation of off-farm income per capita and the economic situation in total is found on farm 4T-m. Out of these farms only one disposes of an improved cooking stove, no farm has got sufficient firewood. The food/fodder situation is bad for the three farms in the LPAs, the houses of 3T-l, 5T-l and 6T-m are in a bad state and poorly equipped as well. However, the market situation is good, although road conditions during the rains are unsatisfactory for all farms in the LPAs as well as for 4T-m. These farmers only occasionally employ labourers, 3T-l does not fall back on hired labour at all. The farms neither dispose of an ox-cart nor of a plough or water tank. The water supply is only standard for all farms, thus, shortages occur, especially during the dry period. Interestingly, all farmers have got a bicycle. The size of land for cultivation is not enough on farms 3T-l and 4T-l, and no farmer set aside land for forest or grazing. Only 4T-l and 5T-l applied for resp. received a credit; only the husbands of 4T-m and 5T-l work off-farm.

Farmers 2K-l, 3K-l, 1K-m and 2T-l, out of which 3K-l and 1K-m lie first in the category of economic indicators, rank highest in the socio-cultural & political category.[152] All farmers score high as to nine indicators (view on importance of group engage-

[152] The husband-related criteria have been integrated in chapter 8.2.

ment for empowerment, active knowledge dissemination on snrm, parent's engagement in snrm, training, freedom of decision-making, women's and church group position, group initiator and public position of husband). Only mixed group position does not score. Land tenure rights do not score among two women. Only 1K-m has got fundamental knowledge about natural treatments for humans and about pesticides. Furthermore, only the parents of farmer 3K-l had a good social status. 2K-l and 1K-m were confronted with resource degradation. Only 2K-l has project contact for less than 10 years.

Seven farmers (1K-l, 2K-m, 3K-m, 1T-h, 3T-h, 6T-l, 4T-m), out of which two are female-headed, can be analysed as one group. The first six indicators listed in Tab. 55 score high (view on importance of group engagement for empowerment, active knowledge dissemination on snrm, engagement parents in snrm, training, freedom of decision-making [2K-m, 1T-h and 4T-m score lower] and women's group position). Additionally, the social status of the (former) husband and his knowledge on natural medicine scores high among all women. Active knowledge dissemination of the (former) husband plays a major role except for 3K-m and 3T-h. Only 1K-l and 3T-h did not join a vocational training. School education is of high importance for farmers 1K-l and 2K-m as well as church group position which ranks also high for farmer 1T-h. Only 3K-m and 4T-m have got full title deeds, and only farmers 3K-m, 1T-h and 3T-h have got experience with resource degradation. Farmers 1K-l, 2K-m and 6T-l reflect a better status within this category than with respect to economic indicators. Data on project contact are heterogeneous: three farmers are in contact with the project less than 5 years.

The remaining seven farmers (1T-l, 3T-l, 2T-h, 4T-l, 5T-l, 5T-m, 6T-m), out of which six are without a husband, shall be discussed as one group. The same indicators as for the two groups considered before score high. Furthermore, all farmers except 1T-l have got full title deeds, farmer 5T-l has got partly title deeds. Only 1T-l and 3T-l are group initiators. The parent's engagement in snrm is of special relevance to farmer 6T-m only. Only farmer 1T-l is in contact with the project for more than 10 years. Except knowledge on natural medicine in general no indicator is highly important. Farmer 6T-m ranks higher in the socio-cultural & political category, 5T-m and 5T-l which rank the lowest are the youngest in the sample.

How are findings of the analysis of the socio-cultural- and economy-related indicators reflected on the farmland-related indicators? Within this category farmer 1K-m scores by far the best as can be seen in the table. As a next group the similar scoring married farmers 2T-l and 1T-h as well as the widowed farmer 3K-m shall be analysed. Seven indicators (state of land, tree species diversity in total, exotic tree species diversity, diversity of biological and soil fertility measures, tree nursery and zero-grazing) score high, followed by use of organic fertilisers.

Tree species diversity in total and diversity of biological measures are the only indicators which score high among the female farm managers 2K-m and 2T-h as well as the married farmers 3T-h and 4T-m. Tree nursery scores lowest; state of land, diversity of soil fertility measures, exotic tree species and use of organic fertilisers are important among three farmers each. The other indicators are of high importance for at least two farmers. 3T-h scores low as to use of organic fertilisers.

Among the married farmers 2K-l, 3K-l, 6T-l and 5T-m no indicator scores high. State of land, diversity of tree species in total, physical and soil fertility measures are important for three farmers each. Also among these farmers tree nursery is the lowest scoring indicator. The next group consists of farmers 4T-l and 5T-l: zero-grazing ranks very high, followed by state of land, crop diversity, diversity of soil fertility measures and use of organic fertilisers.

The last group to be analysed consists of farmers 1K-l, 1T-l, 3T-l and 6T-m. here, the lowest scoring indicator is tree nursery, followed by zero-grazing. State of land, diversity of tree species in total and of biological measures score good among three farmers each.

1K-m scores high and farmer 5T-l low as to all three categories. The three Kenyan farmers in the LPAs which scored high as to the other two categories score remarkably low in this category. Farmer 2T-l scores high compared to the economic indicators. Farmer 3T-l scores low concerning the economic and ecological category but high with regard to socio-cultural & political indicators. Generally, many farmers score higher regarding the socio-cultural & political category as to the economic and/or ecological category.

The aim of this analysis is to estimate why some farmers are more successful in total than others: different interrelations between the indicators according to the specific farm-situation play a role, and not just one single indicator. Only a thorough investigation of all indicators and their interrelations with each other gives a true reflection of the situation on each particular farm. This shall be demonstrated by an example: farm size alone is a very poor indicator as this aspect has to be seen in relation to specific agro-ecological and socio-economic circumstances. The data on size of available land in total per capita (see Tab. 53) indicate that 1T-l has got the best conditions, followed by 1K-l, 3K-l, 1K-m and 4T-m. However, natural conditions have to be considered as well: whereas farms 1T-l and 1K-m dispose of more or less fertile soils (see chapter 4.1), on the average, the soils on farms 1K-l, 3K-l and 4T-m are less fertile. Furthermore, farm 1T-l is located in an area highly prone to droughts so that the agricultural conditions are very unstable. Also farms 1K-l and 3K-l are affected by droughts. On the contrary, farms 1K-m and 4T-m are located in areas with more or less stable climatic conditions. Additionally, on the average, slopes are steeper on the farmland of 1T-l and 1K-l compared to 3K-l and 1K-m; the farmland of 4T-m is more or less flat (see chapter 4.1).

If only the farm area under cultivation per capita is taken into consideration, the most favourable conditions are found on farms 3K-l and 1K-m, followed by 4T-m. However, as 3 K-l is located in a LPA, in total farm 1K-m scores best. Furthermore, there is a significant difference between household and family members on six farms (1K-l, 3K-l, 1K-m, 1T-l, 2T-h, 6T-l) (see chapter 4.1). Depending on the particular socio-economic situation of the family members this can mean better conditions for the respective farm (labour, finances, tools, etc.) or additional burdens such as responsibility for the support of family members (school/university fees for children, maintenance of parents). A comparison of household-related data from Tab. 6 in chapter 4.2 shows that seven Tanzanian families (1T-l, 2T-l, 3T-l, 1T-h, 6T-l, 5T-m, 6T-m) and family 1K-l face the most unfavourable conditions concerning relation adults – children below the age of 14 as this means less labour support on the one and more responsibility and higher workload on the other hand.

Tab. 53: Size of land in total per capita and size of land for cultivation per capita

	Farmers																	
Aspects (in absolute numbers)	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Size of land in total per capita/acre	**7,1**	**0,3**	**6,5**	**6,8**	**1,1**	**0,5**	**25**	**1,7**	**0,5**	**0,2**	**0,4**	**1,4**	**0,3**	**0,7**	**0,6**	**4**	**0,5**	**1,9**
Size of land for cultivation per capita/acre	**2,1**	**0,7**	**6**	**5,3**	**0,9**	**1.3**	**2,7**	**1.6**	**0,5**	**0,1**	**0,3**	**0,9**	**0,3**	**0,7**	**0,5**	**4**	**0,4**	**1,3**

Legend:

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; * = female-headed household

Furthermore, this study reveals a close inter-relation between economic- and socio-cultural & political indicators since the most successful farmers (all three categories together) are the ones in a good financial position with a high social status.

The importance of country and marital status for successful farming strategies is evident: a clear difference can be stated between Kenyan and Tanzanian farmer families: generally, the Kenyan group shows higher skills: the farmers are better educated, have employed more labourers and are engaged in (well paid) off-farm activities. It is striking that five out of the six poorest (only income level) households are situated in Tanzania. Furthermore, married farmers are in a better situation than farmers without a husband. Accordingly, married farmers in Kenya generally score better than Tanzanian female farmers, keeping in mind the unequal sample size as well as differences between the female farm managers since there are various correlations between marital status, off-farm income and social status like demonstrated above. The women without a husband are successful farm managers as well, but the fact of being alone often forms an obstacle for the implementation of new and the maintenance of existing soil and water conservation measures as has been outlined by farmer 2K-m: "For me I can say through my experience a woman

should be supported concerning the fieldwork, especially by the husband. I don't get support and I can say it is very hard. Before he married this other woman he was very committed with the shamba [field - note by the author]. But now I am struggling alone, and I find it is difficult to work on my shamba alone."[153]

According to Tab. 5 in chapter 4.2 no direct linkages can be seen between the female farm managers with respect to the aspect whether they have been abandoned/they are separated, divorced, widowed or never married as well as to the time period of being alone. The only obvious thing is that the single farmers 3T-l and 6T-m score lowest among the women farm managers. But whether this might be due to the fact of being a single woman is hard to say.

The analysis indicates that the implementation of soil conservation measures and related techniques does not depend so much on financial resources as it has been shown that even resource poor female farm managers can be highly engaged and successful in the context of soil conservation activities, but more on criteria like personal background (environmental education through family, etc.) or project interventions. Indeed, the last-named aspect might be crucial within this context as a successful farm management is also strongly correlated to kind, duration and intensity of project contact. Size of the land and natural conditions are crucial as well: the smaller the area of land available and the lower the agro-ecological potential, the lower the chance and simply the possibility of the farmer to operate at risk – like planting a huge variety of trees – and the higher the need to protect family's subsistence needs first – thus, planting food and other preferred crops. This has been shown by the example of farmer 3T-l. It is obvious that farms score lower in the category of ecological indicators which are located in the LPAs although they scored high with respect to economic and/or socio-cultural & political indicators such as all farms in the Kenyan LPAs. On the other hand, the Tanzanian farms 3T-l, 4T-l and 5T-l which already scored low with respect to the economic and/or socio-cultural & political category also score low regarding the farm-management-related aspects. All these farms suffer from unstable climatic conditions, being one cause for regular food/fodder shortages before the rains start on all farms and water shortages especially on farms 4T-l and 5T-l. Also, it might be of crucial impact if the land is inherited or bought, thus whether the farmers are used to the environment or whether they have shifted to an area where the ecological conditions differ decisively from the home place so that new land use techniques have to be applied. This also includes aspects like the indigenous vegetation potential and degradation status of the area in which the farm is located (see also chapter 7.1.2).

[153] This example also elucidates negative side-effects of polygamous marriages for the women.

According to the analysis paramount aspects have been listed in Tab. 54 below to elucidate the above mentioned interrelations: among all three categories it is evident that the Kenyan farmers and married farmers score higher than Tanzanian farmers and farmers without a husband. Furthermore, it seems that the H/MPAs score especially high in the group following the top group.

Tab. 54: Farmer groups and paramount aspects after analysis on farm-level

Farmer groups (ranking from high to low)	Number of farmers	Relation K - T	Relation LPA – H/MPA	Relation MHH - FHH	Problems/low scoring aspects in numbers
Economic aspects					
Group 1	**3** (3K-l, 1K-m, 3T-h)	**3:0**	**2:1**	**3:0**	Firewood; distance to fields; 2 x road condition
Group 2	**5** (1K-l, 2K-l, 3K-m, 2T-l, 6T-l)	**3:2**	**1:4**	**4:1**	2 x firewood; 2x stove; 4 x bad roads; 2 x credit; 2 x ox-cart; 2 x plough; 3 x size of land (culti-vation); 4 x land (forest/grazing)
Group 3	**4** (2K-m, 1T-l, 1T-h, 2T-h)	**1:3**	**3:1**	**1:3**	No off-farm FHH; 2 x food/fodder; houses; labourers; 2 x size of land (cultivation)
Group 4	**6** (3T-l, 4T-l, 5T-l, 4-6T-m)	**0:6**	**3:3**	**2:4**	Firewood; stove; water; 3 x food /fodder – LPAs; 3 x houses; 4 x road; 2 x labourers; water tank; plough; ox-cart; 4 x credit; 4 x off-farm; 2 x size of land (cultivation); 6 x land (forest/grazing)
Socio-cultural & political aspects					
Group 1	**4** (2K-l, 3K-l, 1K-m, 2T-l)	**3:1**	**3:1**	**4:0**	4x mixed group position, 3x parent's social status, 2x land tenure rights
Group 2	**7** (1K-l, 2K-m, 3K-m, 1T-h, 3T-h, 6T-l, 4T-m)	**3:4**	**2:5**	**5:2**	5x title deeds, 4x experience with resource degradation, 5x school education, 4x church group position, 3 X freedom of decision-making
Group 3	**7** (1T-l, 3T-l, 2T-h, 4T-l, 5T-l, 5T-m and 6T-m)	**0:7**	**4:3**	**1:6**	Except seven aspects (view on the importance of group engagement for empowerment, active knowledge dissemination on snrm, their parent's engagement in snrm, training, freedom of decision-making, women's group position, title deeds) all aspects score more or less low
Ecological aspects					
Group 1	1K-m	**1:0**	**1:0**	**1:0**	-
Group 2	**3** (2T-l, 1T-h, 3K-m)	**1:2**	**1:2**	**2:1**	1 x indigenous tree species, 1x crop diversity, 1x diversity of physical measures, 1x use of organic fertilisers
Group 3	**4** (2K-m, 2T-h, 3T-h, 4T-m)	**1:3**	**0:4**	**2:2**	More or less all aspects except tree species diversity in total and diversity of biological measures
Group 4	**4** (2K-l, 3K-l, 6T-l, 5T-m)	**2:2**	**3:1**	**0:4**	More or less all aspects except state of land, diversity of tree species in total, physical and soil fertility measures
Group 5	**2** (4T-l, 5T-l)	**0:2**	**2:0**	**1:1**	More or less all aspects except zero-grazing, state of land, crop & soil fertility measure's diversity, use of organic fertilisers
Group 6	**4** (1K-l, 1T-l, 3T-l, 6T-m)	**1:3**	**3:1**	**1:3**	More or less all aspects except state of land, diversity of tree species in total, biological measures

Male farmers have been shown to be key persons with regard to sustainable resource management and food security as well as empowerment processes of female farmers and rural women in general. All ten women who are married get psychological as well as financial and/or physical support from their husbands (a detailed analysis of husband-related aspects has been carried-out in chapter 8.2. However,

there are differences: the farms scoring lowest among the group of married farmers also receive less support from the husbands. Those women holding a high social position and who are successful with regard to soil and water conservation as well as economic stability and food security are the ones who receive a lot of support from their husbands. This support is related to psychological aspects[154] as well as to financial and/or physical support. However, natural conditions are important, too: Female farmers can be successful without a husband, if they have good conditions with regard to AEZ; on the other hand, unfavourable conditions are one of the main reasons for poor economic conditions of female-headed households. Nevertheless, it can be seen that women farmers can be successful despite unfavourable conditions, if they are supported by their husbands.

Besides the female farmer's active knowledge dissemination on sustainable natural resource management and the importance of group engagement parent's engagement in sustainable natural resource management has been shown to be a crucial aspect among the socio-cultural & political aspects. In chapter 6.2.7 we have seen that all farmers perceive nature in a very positive way. This is likely to be directly related to their parent's perception and handling of natural resources. On the other hand, the aspect of how farmers perceive nature can have a decisive influence on the approach to conservation activities, especially when it comes to tree-related aspects. Indigenous knowledge, especially about natural medicine has to be mentioned in this context as well as it is closely linked to the personal background of the farmers: often, the parents, relatives or neighbours have taught the farmers on natural medicine when they were still a child.

What about linkages between living standard/financial potential and successful farm management? Does success in handling natural resources lead to a high living standard/high financial potential or is a high financial potential the precondition for success in natural resources management? The analysis shows that no clear relations to economic indicators can be made – or – to say it with other words: high economic standard is not a guarantee or precondition for successful land husbandry. However, farmers with financial resources are more likely to implement ecologically sound techniques like e.g. a terrace, a water tank or a cooking stove. Farmer 1K-m is an example for this case. On the other hand, sustainable land tenure is a precondition for a good livelihood. The couple on farm 2T-l which has got no off-farm income and which does not belong to the highest scoring farms among the economic category, are a good example for this aspect: when they bought their land, it was completely degraded by soil erosion. They rehabilitated the land by thoroughly implementing a combination of physical and biological measures. Meanwhile, the land provides them with enough food, money for education, etc.

[154] Within the context of her investigations AUGUSTAT (1994: 137-138) found out that it meant gain in prestige to the men if their wives were a member of a women's group.

Concerning relations between ethnicity and the degree of success no statements can be given as the sample sizes are too small to come to general conclusions. Of course, within some cultural traditions restrictions for women are stronger than in others, and this is a factor impinging on women's empowerment and natural resources management strategies. However, it has not been possible to correlate these factors to ethnicity as the group chosen is too heterogeneous with respect to marital status, AEZ and country; all these indicators have got an influence on the respective setting and have to be considered when comparing farming-systems.

The degree of success is correlated to the interaction of all indicators involved. It can be seen that farmer's success varies according to categories, showing that generalisations do not make sense. Each category is crucial within the farming-system. A site- and category-specific approach is needed if weaknesses and strong aspects are to be identified. From here, generalisations can take place for the development of 'solution packages'. In the following chapters it shall be tried to generalise these findings to come to a clearer picture.

Tab. 55: Ranking of farms with regard to different criteria showing weaknesses and potentials

	Farmers																	
Aspects	**1K-l**	**2K-l**	**3K-l**	**1K-m**	**2K-m***	**3K-m***	**1T-l***	**2T-l**	**3T-l***	**1T-h**	**2T-h***	**3T-h**	**4T-l***	**5T-l**	**6T-l**	**4T-m**	**5T-m***	**6T-m***
Age in absolute numbers - ff	58	43	62	60	46	45	38	36	39	42	54	47	45	24	46	33	25	29
Age in absolute numbers – hb	65	46	63	62	--	--	--	45	--	47	--	49	--	36	47	38	--	--
Number of household members in total	5	5	2	5	9	6	6	6	4	8	4	7	5	5	6	5	7	8
Children in household in total	3	1	--	--	4	2	4	3	2	4	2	3	2	1	3	2	4	6
Number of family members in total	24	9	19	38	12	9	22	8	4	9	19	8	5	5	17	7	9	14
Economic factors																		
Ranking income per capita in total (best = 1)	9	4	1	2	15	5	16	12	13	7	8	3	11	17	10	6	14	18
Income/year in Ksh/y[1]	+-	+	++	++	+-	+	-	+-	-	+	+-	++	+-	-	+-	+-	+-	-
Accessibility of main road	++	+-	++	++	+-	++	+	+	-	-	+	+	+-	+-	+-	-	++	++
Kind of house, valuables (furniture, etc.)	+	+	++	++	+-	+	-	+	-	+-	+-	++	+-	-	+-	+	+	-
Food/fodder supply (shortages)	+-	+	++	++	+-	+	-	++	-	++	++	++	-	-	+	+	+	+
Water supply	+	+	+	+	+-	++	+	+-	+-	++	++	++	+-	+-	+-	+-	+-	+-
Market situation (outlet, transport)	+	+-	++	++	+-	++	-	+-	+	--	-	-	+	+	++	+-	++	+
Livestock	+	+-	+	++	-	+-	+-	+	+	+	+-	++	+-	+-	+	--	-	+
Supply with own firewood	++	+-	++	+-	++	++	++	++	--	+-	++	+-	--	+-	+-	+-	--	+-
Distance to (farthest) field[2]	+	++	--	--	++	+-	++	++	+-	++	++	--	-	+	+	+-	+-	-
Applied/received credit (incl. group)	++	++	++	++	++	--	--	--	--	++	++	++	++	++	++	--	--	--
Improved cooking stove	+-	++	++	++	++	++	++	++	--	--	+-	+-	++	+-	+-	--	+-	--
Water tank	++	++	++	++	--	++	++	--	--	--	--	++	--	--	--	--	--	--
Off-farm income both (Ksh/y)[3]	--	++	++	++	+-	+-	-	--	--	-	--	+-	--	-	-	+-	--	--
Labourers	+	+	++	++	--	+-	--	--	--	-	-	+	-	-	++	-	-	-
Bicycle	+	+	+	+	--	--	--	+	+	+	--	+	+	+	++	+	+	+
Off-farm income activities - ff	--	++	++	++	--	--	--	--	--	++	--	++	--	++	++	++	--	--
Size of land (for cultivation) in acre[13]	++	+-	++	++	+	+-	++	++	-	-	-	+	-	+-	+-	++	+-	++
Off-farm income activities - hb	--	++	++	++	--	--	--	--	--	++	--	++	--	++	++	++	--	--
Road condition up to main road during rains	-	-	++	-	-	++	-	-	-	-	-	-	-	-	-	-	++	++
Size of land (forest/woodlot, pasture)[13] in acre	++	-	+-	+	+-	-	++	-	--	--	--	+-	--	--	--	--	-	-
Plough	++	++	++	++	--	--	--	++	--	--	--	++	--	--	--	--	--	--
Ox-cart	++	--	++	++	--	--	--	++	--	--	--	++	--	--	++	--	--	--
Car	--	--	++	++	--	--	--	--	--	--	--	++	--	--	--	--	--	--
Socio-cultural & political factors																		
Importance of group engagement	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
Active knowledge dissemination on snrm - ff	++	++	++	++	++	++	++	++	++	++	++	++	++	--	++	++	++	++
Engagement parents in snrm - ff	++	++	++	++	++	++	++	--	++	--	++	++	++	++	++	++	++	++
Project contact[16]	+	+-	++	++	-	++	+	+	+-	+-	-	-	-	+-	-	+-	-	+-
Training (project and other institutions) - ff	++	++	++	++	+-	++	+-	++	+	++	++	++	++	+	++	+-	+-	++
Freedom of decision-making	++	++	++	++	+-	++	+-	++	++	+	++	+	++	+-	++	+	++	+-
Women's group –position[4]	++	+	++	++	+	++	+-	++	++	++	+	++	+-	+-	++	+	+-	+-
Knowl./use of nat. medicine (humans) - ff	+-	+-	+-	++	+-	+-	+-	++	+-	+-	+-	+-	+	+	+	++	+	+
School education – ff[5]	++	++	++	+-	++	+	+-	+-	+-	+-	+-	+-	+-	-	+-	+	+-	-
Public position (former) husband	++	+	++	++	+	+	++	++	--	++	+	+	--	-	++	+	-	--
Church group – position – ff[4]	++	++	++	++	++	+-	--	+	+-	++	+-	+-	--	+-	--	--	--	+-
Knowl./use of nat. medicine (animals) - ff	+-	+-	+-	+-	+-	--	+-	+-	--	--	+-	+-	+	+	+	++	+	+
Knowl./use of nat. medicine/pesticides (former) hb	+	+-	+	+	++	+-	++	+	--	++	-	+-	+-	+	++	+	-	--
Land tenure rights – ff[6]	+-	--	--	++	--	++	--	++	++	--	++	--	++	+-	+-	++	++	++
Vocational training - ff	--	++	++	--	++	++	--	--	--	++	--	--	--	--	+	++	--	--
Active knowledge dissemination on snrm – (former) hb	++	++	--	++	++	--	++	++	--	++	--	--	--	--	++	++	--	--
Knowl/use of nat. pesticides/insecticides - ff	+-	+-	+-	++	+-	--	+-	+-	--	--	+-	--	++	+-	+-	+-	--	+-
Community/job position her parents	--	--	++	--	+	++	--	--	--	--	--	--	--	--	+	++	--	++
Education her father[5]	--	+-	+-	+-	++	+-	--	+-	--	+-	--	+-	-	-	+-	+-	+-	+-
Education her mother[5]	--	+-	+-	+-	--	+-	--	+-	--	+-	--	+-	--	-	--	-	+-	+-
Experience with resource degradation - ff	--	++	--	++	--	++	--	++	--	++	--	++	--	--	--	--	--	--
Group initiator (women's/church/mixed) -ff	++	++	++	++	--	--	++	--	++	--	--	--	--	--	++	--	--	--
Mixed group – position[4]	--	--	--	--	--	--	+-	++	--	--	+-	++	--	--	--	--	--	--

Aspects	1K-l	2K-l	3K-l	1K-m	2K-m*	3K-m*	1T-l*	2T-l	3T-l*	1T-h	2T-h*	3T-h	4T-l*	5T-l	6T-l	4T-m	5T-m*	6T-m*
Age in absolute numbers - hb	65	46	63	62	--	--	--	45	--	47	--	49	--	36	47	38	--	--
Socio-cultural & political factors - husband																		
Training (project/ other institutions)	--	--	--	+-	--	--	--	++	--	++	--	--	--	--	++	+-	--	--
Land tenure rights	++	++	++	++	--	--	--	++	--	++	--	++	--	+-	++	++	--	--
Vocational training husband	--	++	++	++	--	--	--	--	--	++	--	++	--	--	--	++	--	--
Community/job position his parents	--	--	--	++	--	--	--	--	--	++	--	++	--	--	--	--	--	--
Education his father[5]	--	+-	+-	+-	--	--	--	+-	--	--	--	++	--	+-	+-	--	--	--
Education his mother[5]	--	+-	+-	+-	--	--	--	--	--	--	--	+-	--	--	--	--	--	--
Engagement parents in snrm - hb	++	++	++	++	--	--	--	--	--	++	--	++	--	++	++	++	--	--
Experience with resource degradation - hb	++	++	--	++	--	--	--	++	--	++	--	--	--	--	--	--	--	--
Woman leader/treasurer/initiator	++	++	++	++	--	--	--	++	--	++	--	++	--	--	++	+	--	--
Education husband[5]	-	++	++	+	--	--	--	+-	--	+-	--	++	--	-	+	+	--	--
Ecological/farm-related factors																		
State of land (soil erosion)	+	+	+-	++	+-	+	+-	++	+	++	++	+	+	+	+	++	++	+
Tree species diversity in total[7]	+	+	++	++	++	+	+	++	+-	++	+	++	+-	+-	+	++	-	+
Tree species diversity – indigenous[8]	+-	+	+	+	++	-	+-	+	-	+-	-	+-	-	+-	+-	++	--	+-
Tree species diversity – exotic[8]	+-	+-	+	++	+	++	+-	++	+-	++	+	++	+-	-	+-	-	+-	+-
Crop diversity[9]	+	+-	+-	++	+-	+	-	+	+-	+-	+-	++	+	+	++	+	+	+
Diversity of physical measures[10]	+-	+	+	++	++	+	+-	+	+-	+-	+	+	-	-	+-	+-	+	+-
Diversity of biological measures[11]	+	++	++	++	++	++	+	+	-	+	+	++	+-	+-	+-	+	+-	+
Diversity of soil fertility measures[12]	+	+	+	++	+	+	+-	++	+	+	++	+	+	+	+	+-	+-	+-
Tree nursery (on-farm)[14]	--	+	--	++	--	++	--	++	--	++	--	--	+	--	--	+	++	+
Zero-grazing[15]	--	--	+-	+-	--	++	+-	++	+-	++	++	+-	++	++	+-	--	--	--
Use of organic fertilisers	+-	+-	+-	+	+-	+-	-	++	+	+	+	-	+	+	++	++	+	+

Legend:

--	not/none
-	bad/low/few
+-	sufficient/standard/partly
+	good
++	very good/high

K = Kenya; **T =** Tanzania; **l =** low potential area; **m =** mid potential area; **h =** high potential area; * = female-headed household; **X** = yes; **ff** = female farmer; **hb** = husband

[1] ++ = 400.000 - 250.000; + = >250.000 - 100.000; +- = > 100.000 - 40.000; - = >40.000

[2] -- = >10 km; - = >5 <10 km; +- = >2-5 km; + = 1-2 km; ++ = near house

[3] ++ = 200.000 – 150.000; + = <150.000 – 100.000; +- = <100.000 – 50.000; - = <50.000; -- = none

[4] -- = no; +- = member; + = secretary, treasurer; ++ = chairlady

[5] -- = none; - = primary partly; +- = primary; + = secondary partly; ++ = secondary

[6] ++ = full title deeds; +- = only over own piece of land

[7] -- = 0; - = 1-10; +- = 11-20; + = 21-30; ++ = ≥31

[8] -- = 0; - = 1-5; +- = 6-15; + = 16-20; ++ = ≥ 21

[9] -- = 0; - = 1-10; +- = 11-15; + = 16-20; ++ = ≥21

[10] -- = 0; - = 1-2; +- = 3-5; + = 6-8; ++ = ≥9

[11] -- = 0; - = 1-3; +- = 4-7; + = 8-10; ++ = ≥11

[12] -- = 0; - = 1; +- = 2; + = 3-4; ++ = ≥5

[13] -- = 0; - = ≤ 2; +- = ≤ 5; + = > 5 ≤ 10; ++ = ≥ 10

[14] farmers 1K-l, 3K-l and 1T-l had a tree nursery and will establish one soon again

[15] farmers 2K-m, 4T-m and 5T-m do not keep livestock (except chicken)

[16] -- = > 1 > 5 years; +- = >5 < 10; + = >10 < 20; ++ = >20

9.1.2 The farms/farmers in total

For the following indicator analysis given in this and the following chapter the criteria listed in Tab. 55 of the previous chapter have been grouped according to the levels country, AEZ and project. Then, indicators have been considered also under the aspect of differences in social status among the farmers to be able to integrate aspects like marital status or leadership. The question behind is 'how is a certain indicator reflected on a certain sub-group respectively among all farmers in total?' Hence, each indicator shows the relevance for the respective level as well as for the whole sample according to the particular sub-group. However, the level of projects cannot be applied to the sub-groups as the sample sizes are too small or even missing completely. Thus, the project-related indicator analysis only takes place for all farms as a group, except for Kenya where AEZ also indicates the project level. Additionally, out of indicators related to groups and natural medicine, components have been built for a better overview. Tab. 55 in chapter 9.1 functions as basis for the following classification: fictitious numbers have been applied for each symbol (**--** = 0; **-** = 1; **+-** = 2; **+** = 3; **++** = 4). These numbers have been added up, and each resulting number has been assigned to one out of the three classes like shown in Fig. 117 below:

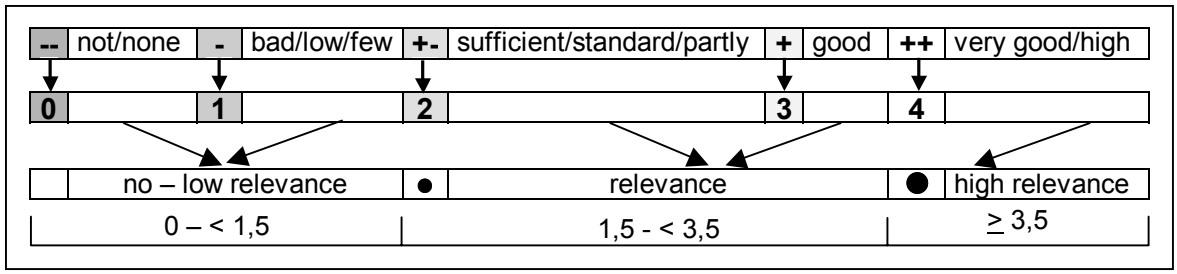


Fig. 117: Classification of criteria

For the analysis it makes sense to let flow together the first two symbols since a differentiation between no (= **--**) or low relevance (= **-**) makes no difference to the fact that both score low. Furthermore, it is meaningful to let flow together the next two aspects (**+-** and **+**) as within this spectrum relevance occurs. Additionally, the handling of three criteria eases the aspect of comprehensibility.

The trial to quantify data which derive from a qualitative method has been made as this is the only practical way to draw conclusions out of the overview of the data analysed and to make estimations comprehensible and transparent on different levels. If the projects are to be given recommendations to evolve strategies the basis out which these recommendations derive has to be comprehensible and clear. It has to be stressed that the generalisations made are based on *small* sample sizes, and that it is not the intention to put into the receptor's mind that these abstractions derive from a huge sample of quantitative data!

First, indicators will be analysed for all farms together. Subsequently, indicators will be considered for the different sub-groups (married women, female-headed households, women leaders and husbands).

Tab. 56 does not only demonstrate the importance of indicators as to success but also gives hints about the deplorable state of affairs of certain aspects which is of extraordinary importance for the enhancement of strategies and concepts in the frame of projects and policy.

Within the socio-cultural & political category five indicators score very high among all sub-groups (female farmer's active knowledge dissemination on snrm, female farmer's view on the importance of group engagement for empowerment, engagement parents in snrm, training and public position of [former] husband). The first two listed indicators score high on all levels and among all sub-groups, the third indicator ranks lower in the SCAPA area. Group-related indicators rank very high among the Kenyan farms; here, church group position plays an important role. In the H/MPAs in general as well as in the HASHI-ICRAF project area land tenure rights are very important. Knowledge about natural medicine (female and male farmers) shows relevance for all categories, except in the HPA of SCAPA. The husband's active knowledge dissemination on snrm is not important in the HPA of SCAPA and in the whole project area of HASHI-ICRAF. Duration of project contact scores low in the Tanzanian project areas.

Apparently, the first twelve listed indicators in the economic category score at least relevant concerning all levels and zones in total. Among these twelve indicators differences can be seen according to country, project and zone-level: Four indicators (supply with own firewood, improved cooking stove, water supply and livestock) score low in the HASHI-ICRAF project area, and five indicators (labourers, supply with own firewood, improved cooking stove, applied/received credit, accessibility of main road) score high in Kenya only. The indicator bicycle scores highest. Out of the other twelve economic factors, many score in Kenya only as well; here, in total, only two indicators are marginal (car and road conditions during rains – except one time, they do not score on all levels). In Tanzania, four asset-related indicators (water tank, plough, ox-cart and car) as well as female farmer's off-farm activities and road conditions do not score at all.

Between LPAs and H/MPAs variations are not so big. Concerning the Tanzanian AEZs the H/MPA ranks slightly higher (especially food/fodder supply), in Kenya higher indicator levels are found for the LPA with the biggest difference between the indicator plough. A comparison on project level shows that the Kenyan farms score by far the highest indicator level. However, the food/fodder situation ranks the highest in the Tanzanian SCAPA project. Whereas the size of land for cultivation is not enough in the HPAs of SCAPA, but interestingly not reflected in food/fodder shortages, this is the case in the LPAs of HASHI-ICRAF.

The farms in the Kenyan project clearly show the importance of indicators like especially high income and access to credits which directly determines availability of labourers. Water tanks play a key role for a sustainable farming system as can be seen by this example. Furthermore, accessibility of the main road has a direct impact on e.g. marketing activities. The sound management of farm-owned wood resources is reflected by the complete independence from off-farm wood resources and is also closely linked to the use of energy-saving stoves. In general, the Kenyan farms are a prototype of good farm management.

The low scoring indicators show that especially the Tanzanian projects need to increase efforts to enhance, for instance, the situation of marketing-related aspects like infrastructure or off-farm opportunities (high-level, not only petty trading!).

Among the ecological indicators only very few factors do not score at all or score high which shows that they are balanced. Again the Kenyan project scores the highest rank, especially concerning biological measures and tree species variety. Physical measures score high only among the Kenyan farms located in the MPA. This might be due to the fact that these farms are located on steep slopes and that the Kenyan project has put high emphasis on these measures. Generally, the H/MPAs rank higher, reflecting the more favourable ecological conditions. The partly excellent state of the land regarding soil erosion phenomena is a sign for the thorough implementation and maintenance of soil conservation technologies. Exotic tree species play a key role among the farming systems in the MPA resp. HPA of NSWCP and SCAPA. Interestingly, only in the H/MPAs in total the indicator of crop diversity scores very high which might be due to the more favourable natural conditions in these zones. It is obvious that generally in the Tanzanian projects indigenous tree species diversity, the size of land for wood production and/or fodder-related activities (economic category) as well as tree nurseries in the LPAs have to be taken into consideration by the projects. Farm land is often too small for wood production; thus, alternatives have to be found. Furthermore, local trees need to be supported for the various reasons given already in previous chapters (see a. o. 7.1.3). Factors which hinder tree nursery establishment are to be identified, and solution strategies are to be evolved.

Some household-related data have been listed at the beginning of the table. Interestingly, the Kenyan farmers - assessed to be the most successful ones - are of the highest age and have got the biggest family-size as well. These factors might be critical as support from outside (labour, finances) might be more sustainable - the farmers simply might have had enough time to progress. Also the general fact that Kenya differs from some neighbouring East-African countries in that the status of women has risen considerably over the last few decades might be reflected in this sample (TIFFEN et al. 1996: 73). However, more data and bigger sample sizes are needed to verify these hypothesises.

Summing-up, the analysis shows that not only economic and ecological indicators (hard facts) play a role within the context of success, but socio-cultural & political indicators inclusive political indicators as well. Among this category the female farmer's active knowledge dissemination on snrm, their view on the importance of group engagement for empowerment and their parent's engagement in snrm show the highest scoring. Compared to the economic as well as the socio-cultural & political category, the ecological category shows by far the lowest number of non-relevant indicators. Various criteria have to be taken into consideration to come to a true reflection of aspects leading to success or failure.

9.1.3 Male- and female-headed households, women leaders and husbands

First, the three sub-groups male- and female-headed households as well as women leaders will be analysed. A comparison of these sub-groups shows that the female-headed households score low with regard to economic, socio-cultural & political indicators, and that the married farmers score highest with respect to all three categories. The ecological category scores similar among all sub-groups.

According to Tab. 57 three indicators within the socio-cultural & political category (her active knowledge dissemination on snrm, her view on the importance of group engagement for empowerment, engagement of the female farmer's parents in snrm) show a high importance for all sub-groups. The indicators training, women's group positions and freedom of decision-making are highly relevant among the married women and the women leaders. Within these two sub-groups the church group position is very important for the Kenyan farmers. Interestingly, husband's position in the public plays a key role for the married women. Furthermore, for the Kenyan farmers other group-related aspects rank high. It seems that their empowerment is strongly related to these aspects. For the Kenyan female-headed households the community/ job position of the parents as well as the farmer's vocational training are likely to be important for their success. The same goes for education which ranks high among the Kenyan farmers of all sub-groups. Land tenure rights are highly important for the female farm managers in Tanzania as well in the LPAs. The experience of resource degradation scores high among the married women and the women leaders in the H/MPs. Knowledge about natural medicine does not score among the Kenyan female-headed households as well as among the women leaders in Tanzania and the H/MPAs. Duration of project contact is the only indicator that scores relevant among all sub-groups. The Tanzanian farmers show the lowest number of high ranking indicators compared to the Kenyan farmers in all categories and among all sub-groups. This might correlate with the fact that they are the youngest farmers.

Within the economic category different indicators play a key role among the sub-groups: among the married women credit and off-farm activities of the husband score high, showing the importance of these indicators for this group. No indicator ranks high among the other two sub-groups but many score 'relevant' or – like especially among the group of female-headed households – low resp. not at all. Availability of a car plays a role among the married women and the women leaders in the HPAs. Whereas road condition is marginal for the group of married women and women leaders, this aspect has a relevance for the female-headed households. Interestingly, off-farm income activities of the female farmers is highly important for the Kenyan female-headed households. Apparently, there is a link to the off-farm income activities of the male spouses as this aspect is very important for the group of married women. Furthermore, there seems to be a correlation between low ranking income per capita and low importance of the indicator labourers among the female-headed households. For the sub-group of Kenyan farmers a relation is likely between complete self-sufficiency regarding firewood and the high importance of improved cooking stoves. Also, it is interesting that only among this sub-group female off-farm activities score high. Off-farm income of both partners shows that the male's income is relevant for the group of married women in Kenya, and that off-farm income is important for the Kenyan female farmers only. Interestingly, this aspect does not score on country level for the women leaders.

Only the indicator tree species diversity in total scores high among the group of married women among the ecological category. Other indicators are of regional importance only: among the Kenyan female-headed households four indicators are highly relevant, among which physical measures (same reason as given for the group of female farmers in the previous chapter). Zero-grazing scores high for the Tanzanian married women and the female-headed households in the HPAs. The diversity of biological measures is highly important for the Kenyan farmers in all three sub-groups and among the women leaders in the H/MPAs. It is obvious that the number of non-relevant indicators is very low among this category compared to the others.

Like for the Kenyan farmers age is likely to play a key role for all farmers – not only regarding experience and that activities have been carried out over a longer period of time. Moreover, age is closely linked to the number of children in a household and the family size; the fact that the average number of children living in the household is the lowest among this group and that the number of family members for the married women and the women leaders is higher is likely to be reflected in a better resource situation (availability of labour, finances, tools, etc.) and less expenditures.

It has been shown that the relevance of indicators varies according to marital status or social status. Female-headed households are the most disadvantaged and married women are in the best situation. The female farm managers show weaknesses especially within the economic and socio-cultural & political category. Among the group of the married women off-farm activities and active knowledge dissemination

of the husbands score very high which indicates that their success and the better farming-system situation is also directly linked to the support of the male spouses. Over and above that, this aspect reflects an intact household system and is likely to be crucial within the whole complex of a sustainable management of natural resources as well as for the empowerment of women.

The fact that also female-headed households in a less favourable economic, socio-cultural and political situation carry out snrm strategies with success on the first sight is paradox and leads to the suggestion that economic or socio-cultural & political aspects might be negligible within the context of a successful farm management. This is not the case. At this point the project's influence has to be considered: the situation reflects that the projects have succeeded in supporting and stabilising factors especially related to farm management. Their impact especially on socio-cultural & political aspects cannot be seen so easily and is more diverse as to each factor; furthermore, some aspects are related to the parents and thus reflect influences which cannot be changed anymore (education, position, etc.). If influences on these aspects are to be studied the farmers and their children must be the focus as they need a long-term observation. Also, success in farm management is not necessarily to be reflected directly in a higher wealth status but first in the stabilisation of basic needs like food, water, firewood, to name just a few. For to come to a true reflection of the improvement of the economic situation the status of the farmers before the project intervened has to be assessed which is, of course, extraordinary difficult due to many aspects which shall not be discussed here. It has to be noted that all farmers stressed the positive influence of the projects on all levels. As to name an example, gender-related aspects like women's position concerning public and inner-household decision-making processes have been said to have tremendously improved through project activities.

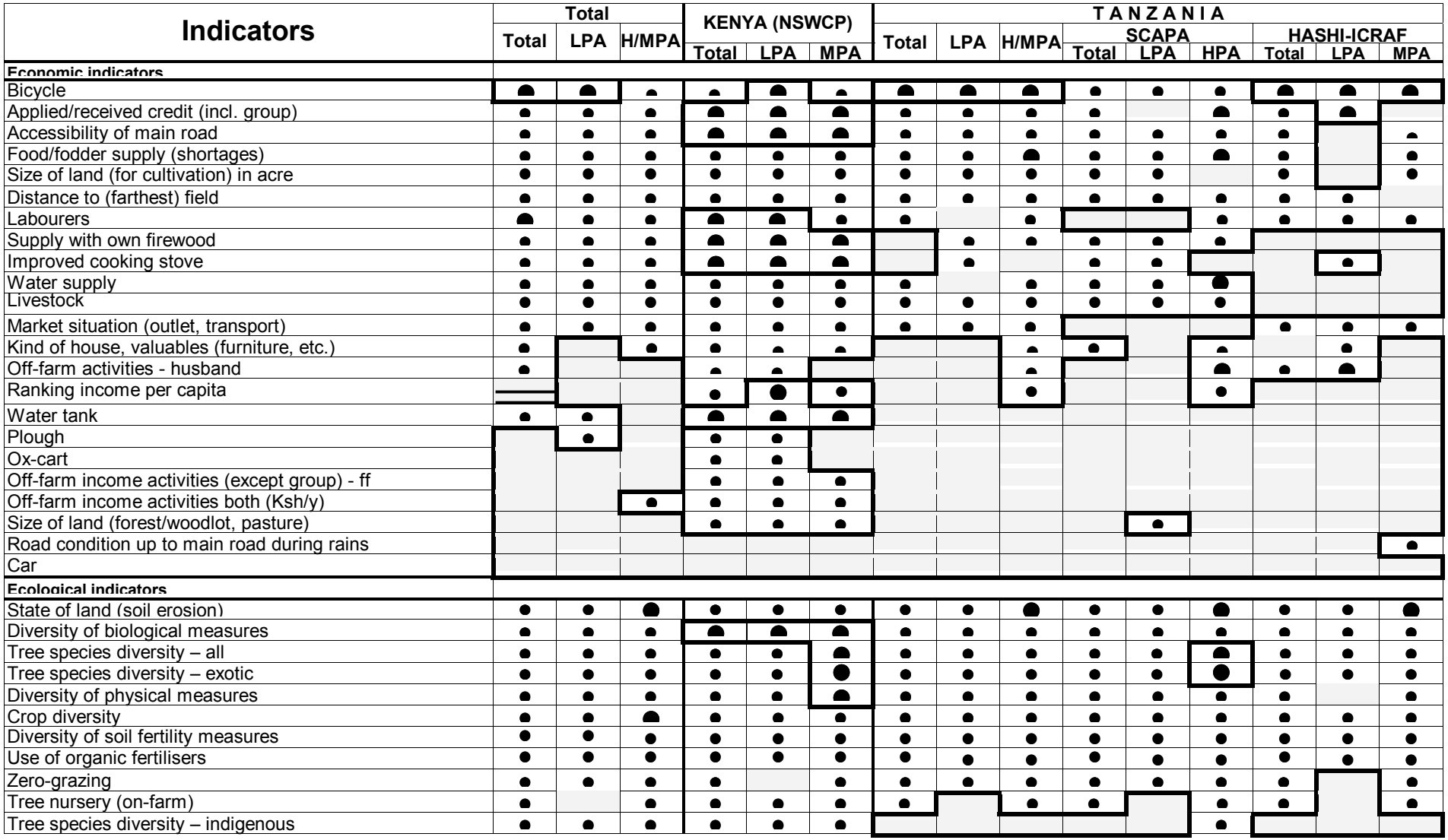
However, a farming system is embedded in a network of natural conditions *as well as* socio-cultural, political and economic aspects. If a system is being sustainable, all factors will need to be stabilised, otherwise, it might collapse in case of a negative influence from outside like e.g. natural hazards. If, to take the example of a female-headed household, socio-cultural and political as well as economic aspects show already weaknesses, and this unstable situation is additionally influenced by one factor such as a drought, this might lead to a strong disruption of the whole system with as a consequence bad farm management → upcoming soil erosion → decrease of economic power → increasing impoverishment. The more stable a system the less it becomes susceptible to negative influences from outside. A system has to be based on a broad variety of stable aspects so that it has the ability to buffer and counterbalance disturbances.

The analysis of the indicators has shown that a detailed consideration of the indicators on the various levels is necessary as variations occur.

Tab. 56: Ranking of success indicators – female farmers

The question behind this table is 'how is a certain indicator reflected for the female farmers as a group on country, project and AEZ level?' The table shows (marked with bold boxes) that indicators rank high especially in Kenya and that two indicators are relevant for almost all categories. Furthermore, it can be seen that some indicators do not score at all which indicates weak aspects to be taken into consideration by the projects to enhance the general farming-system and livelihood situation of the farmers. Clusters of same ranking may indicate correlations among indicators or sub-groups or levels (country, AEZ).

Indicators	Female farmers														
	Total			KENYA NSWCP			TANZANIA								
										SCAPA			HASHI-ICRAF		
	Total	LPA	H/MPA	Total	LPA	MPA	Total	LPA	H/MPA	Total	LPA	HPA	Total	LPA	MPA
Number farmers	18	9	9	6	3	3	12	6	6	6	3	3	6	3	3
Number farmers without husband	8	3	5	2	0	2	6	3	3	3	2	1	3	1	2
Average age	43	43,4	42,3	52,3	54,3	50,3	38,2	38	38,3	42,7	37,7	47,7	33,7	38,3	29
Average household size	5,7	4,9	6,6	6,2	4	6,7	6,6	5,3	6,5	5,8	5,3	6,3	6	5,3	6,7
Average number of children in household	2,6	2,1	3	1,7	1,3	2	3	2,5	3,5	3	3	3	2	4	3
Average family size	12,7	12,6	12,8	18,5	17,3	19,7	10,6	10,3	11	13,8	11,3	12	11,2	9	10
socio-cultural & political indicators															
Active knowledge dissemination on snrm - ff															
Group engagement for empowerment - ff															
Engagement of her parents in snrm															
Training (project and other institutions)															
Freedom of decision-making															
Women's group –position															
Position in groups inclusive initiative aspect															
Church group – position															
Public position (former) husband															
Education															
Land tenure rights - ff															
Knowledge/use of nat. medicine/pesticides (former) - hb															
Knowledge/use of nat. medicine & pesticides - ff															
Active knowledge dissemination on snrm - hb															
Duration of project contact															
Education father															
Education mother															
Community/job position parents															
Vocational training															
Group initiator (women's/church/mixed)															
Treasurer, secretary of group															
Mixed group – position															
Experience with resource degradation															



Legend:

K = Kenya; **T** = Tanzania; **l** = low potential area; **H/MPA** = high/mid potential area; **ff** = female farmer; **hb** = husband; **snrm** = sustainable natural resource management; **==** = not in this category

The first column derives from **Fig. 117**; for each category numbers are added up and divided by the number of respective farmers. The deriving number is applied according to the classification scheme given in the second column.

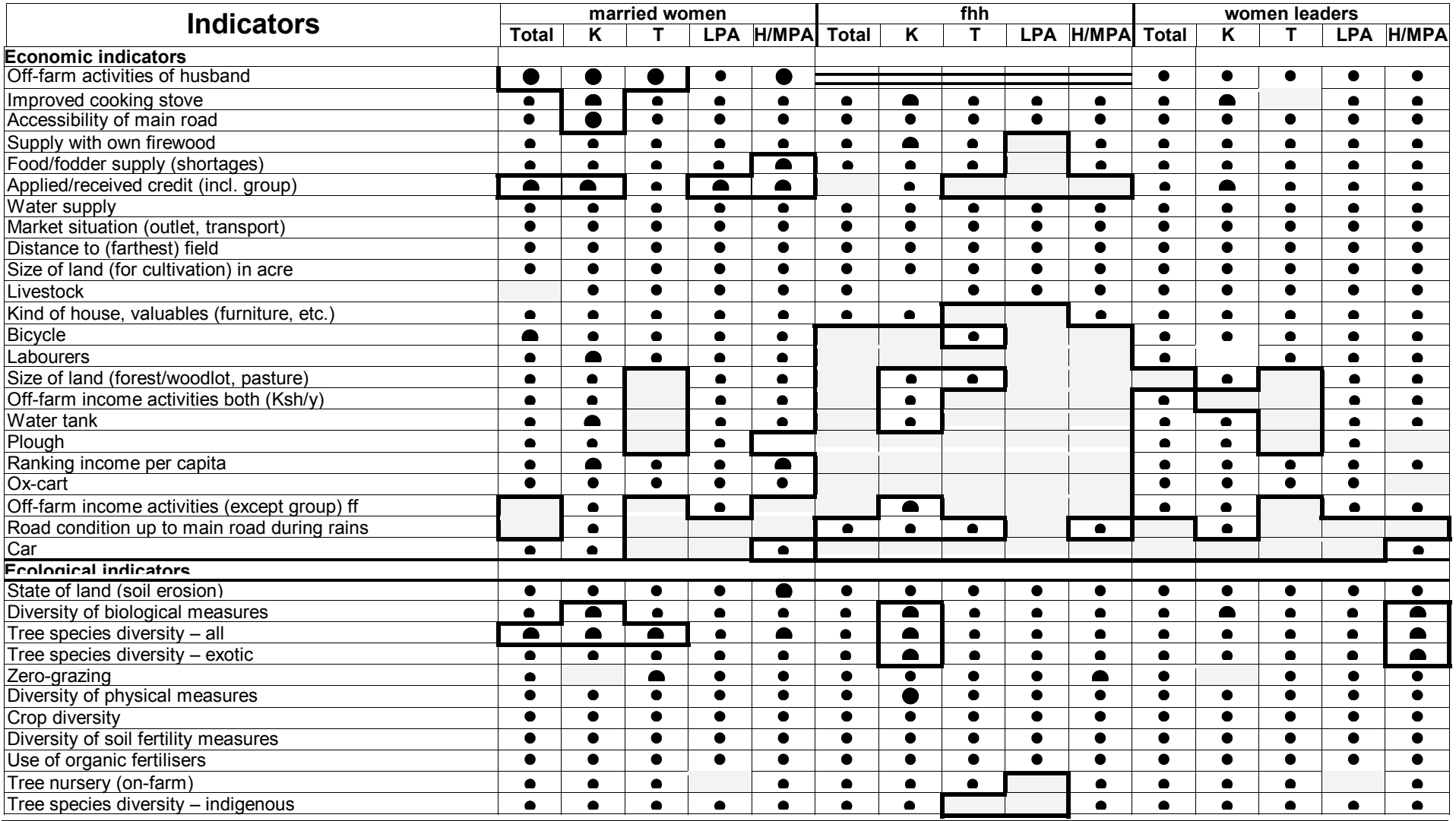
--	0	not/none	-	1	bad/low/few	+-	2	sufficient/standard/partly	+	3	good	++	4	very good/high

	no – low relevance		relevance		high relevance
	< 1.5		1.5 - < 3.5		> 3.5

Tab. 57: Ranking of success indicators for married women, female-headed households and women leaders

The question behind this table is 'how is a certain indicator reflected for the farmer groups married women, female-headed households and women leaders on country and AEZ level?' The table shows (marked with bold boxes) that indicators rank high especially among the married women and the women leaders as well as generally in Kenya and that two indicators are highly relevant for almost all categories. Furthermore, it can be seen that some indicators do not score at all which indicates weak aspects to be taken into consideration by the projects to enhance the general farming-system and livelihood situation of the farmers. Clusters of same ranking may indicate correlations among indicators or sub-groups or levels (country, AEZ).

Indicators	married women					female-headed households					women leaders				
	Total	K	T	LPA	H/MPA	Total	K	T	LPA	H/MPA	Total	K	T	LPA	H/MPA
Number farmers	10	4	6	6	4	8	2	6	3	5	11	6	5	6	5
Number farmers without husband						8	2	6	3	5	3	2	1	1	2
Average age	45,1	55,8	38	44,8	48	40,1	45,5	38,3	40,7	39,8	46,5	52,3	42	47,3	48
Average household size	5,1	4,3	6,2	4,8	6,6	8,2	7,5	5,7	5	6,8	5,7	5,3	6,2	4,7	7
Average number of children in household	2	1	2,7	1,8	2,6	3,6	3	3,3	2,7	3,6	2,3	1,7	3	2	2,6
Average family size	14,4	22,5	9	1,4	15,5	15,7	10,5	12,2	10,3	12,6	14,3	18,5	9,2	13,5	15,2
socio-cultural & political indicators															
Group engagement -ff	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Active knowledge dissemination on snrm -ff	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Engagement parents in snrm - ff	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Women's group –position	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Training (project and other institutions)	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Freedom of decision-making	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Public position (former) husband	●	●	●	●	●		●		●	●	●	●	●	●	●
Education	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Land tenure rights - ff	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Duration of project contact	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Knowledge/use of nat. medicine & pesticides - ff	●	●	●	●	●	●		●	●	●	●	●		●	
Position in groups inclusive initiative aspect	●	●	●	●	●						●	●	●	●	●
Church group – position	●	●	●	●	●		●		●	●	●	●	●	●	●
Active knowledge dissemination on snrm -hb	●	●	●	●	●						●	●	●	●	●
Knowl./use of nat. medicine/pesticides (former) - hb	●	●	●	●	●						●	●	●	●	●
Education father	●	●	●	●	●		●			●	●	●	●	●	●
Education mother		●			●						●				●
Community/job position parents							●			●		●			
Vocational training	●	●	●	●	●		●				●	●		●	●
Group initiator (women's/church/mixed)	●	●									●	●		●	
Treasurer, secretary of group	●	●		●							●	●		●	
Mixed group – position											●	●			
Experience with resource degradation - ff	●	●	●		●						●	●	●		●



Legend:

K = Kenya; **T** = Tanzania; **l** = low potential area; **H/MPA** = high/mid potential area; **fhh** = female-headed household; **ff** = female farmer; **hb** = husband; **snrm** = sustainable natural resource management; **=** = not in this category

The first column derives from **Fig. 117**; for each category numbers are added up and divided by the number of respective farmers. The deriving number is applied according to the classification scheme given in the second column.

--	0	not/none	-	1	bad/low/few	+-	2	sufficient/standard/partly	+	3	good	++	4	very good/high

	no – low relevance	•	relevance	●	high relevance
	< 1.5		1.5 - < 3.5		> 3.5

Concerning the analysis of differences between male and female spouses regarding indicators only the socio-cultural & political category will be considered as the other two categories are identical. Ten husband-related indicators have been integrated (engagement of parents in snrm, land tenure rights, freedom of decision-making, vocational training, farmer's and parent's education, experience with resource degradation, training and parents public position).

Tab. 58 shows that active knowledge dissemination on snrm, engagement of parents in snrm, her group position and view on the importance of group engagement for empowerment as well as his position in the community are high ranking indicators for the male and female spouses. Whereas vocational training is very important for the female spouses, this indicator only ranks high for the males in Kenya and the H/MPAs. But it can be seen that among the group of husbands land tenure rights are crucial. All farmers own the land they farm which is a prerequisite for the implementation of measures like e.g. tree plantings. Freedom of decision-making is a gender-related factor and has been integrated for the males as well: since they do not face curtails due to customs or traditions this is a supportive aspect for their empowerment. Interestingly, the educational level of the parents is the same for both spouses. Experience with resource degradation varies: whereas this indicator is highly relevant for the married women in the H/MPAs but of no/low relevance for the male spouses, it is relevant for the females and even highly relevant for the males in Kenya. In Tanzania this indicator is important for the married women, but not relevant for the husbands; in the LPAs it is the other way round. Whereas training is crucial for the married women on all levels, it is only relevant for the husbands in total and marginal for Tanzania and the H/MPAs. Among female and male spouses their parent's position in the community is not important, except for the husbands in the H/MPAs. Also in this sub-group the Kenyan farmers are the most successful ones which might, like for the Kenyan women, also be related to the age.

To sum-up, some slight differences have been identified among which land tenure rights and freedom of decision-making are the most obvious ones.

Tab. 58: Ranking of husband-related success indicators

The question behind this table is 'how is a certain indicator reflected for the farmer group husbands on country and AEZ level?' Indicators that rank extraordinary high as well as the ones ranking not respectively low have been marked with bold boxes. The indicators which do not score at all indicate weak aspects to be taken into consideration by the projects to enhance the general farming-system and livelihood situation of the farmers. Clusters of same ranking may indicate correlations among indicators or sub-groups or levels (country, AEZ).

Indicators	Husband				
	Total	K	T	LPA	H/MPA
Number farmers	10	4	6	6	4
Average age	49,8	56,5	43,7	50,3	49
Socio-cultural & political indicators					
Active knowledge dissemination on snrm -ff	●	●	●	●	●
Engagement parents in snrm	●	●	●	●	●
Position in groups inclusive initiative - ff	●	●	●	●	●
Group engagement - ff	●	●	●	●	●
Freedom of decision-making - hb	●	●	●	●	●
Land tenure rights - hb	●	●	●	●	●
Public position	●	●	●	●	●
Active knowledge dissemination on snrm -hb	●	●	●	●	●
Vocational training	●	●	●		●
Knowledge/use of nat. medicine/pesticides	●	●	●	●	●
Education	●	●	●	●	●
Education father	●	●	●	●	●
Experience with resource degradation – hb	●	●		●	
Training (project and other institutions)	●		●		●
Community/job position parents					●
Education mother		●			

Legend:

K = Kenya; **T** = Tanzania; **l** = low potential area; **H/MPA** = high/mid potential area; **ff** = female farmer; **hb** = husband; **snrm** = sustainable natural resource management

The first column derives from **Fig. 117**; for each category numbers are added up and divided by the number of respective farmers. The deriving number is applied according to the classification scheme given in the second column.

--	0	not/none	-	1	bad/low/few	+-	2	sufficient/standard/partly	+	3	good	++	4	very good/high

	no – low relevance	●	relevance	●	high relevance
	< 1.5		1.5 - < 3.5		> 3.5

9.1.4 Summary

This chapter is meant to bring the results of the previous two chapters together. The most important indicators in total shall be identified for all groups of farmers as well as concerning AEZ and country. For this, the indicators for the farmers in total, for the different sub-groups as well as for the country- and AEZ-level have been listed in Tab. 59. On country and AEZ-level, only the indicators concerning the female farmers are listed.

The final analysis for the farmer groups, country and AEZ in total shows the following for the socio-cultural & political category: the female farmer's active knowledge dissemination on snrm, their view on the importance of group engagement for empowerment and the engagement of parents in snrm ranks high among all (sub-

)groups and levels, followed by training and the public position of the (former) husband. Freedom in decision-making is highly relevant among the groups of married farmers, women leaders and the husbands as well as generally in Kenya and in the LPAs. Women's group position scores high among the married women, the women leaders and again in Kenya. Furthermore, it can be seen that the eight indicators following next at least score relevant among all (sub-)groups and levels (only two exceptions) and that many of the last following eight indicators score low, especially among the sub-group of female farmers and in Tanzania.

Within the group of economic indicators two main characteristics can be identified: the first twelve indicators score at least relevant (only five times non-relevant), if they score high, it is mainly in Kenya; bicycle and credit show the highest importance in general. The other eleven indicators are characterised by non-scoring especially in Tanzania, both AEZs, among the female-headed households and the group of farmers in total.

Within the ecological category it is obvious that only two times indicators do not score at all; no indicator is of high importance throughout all groups and levels. Tree species diversity in total scores high among the female and male spouses, and the diversity of biological measures is high in Kenya. State of land and crop diversity are highly important in the H/MPAs.

Fig. 118: A farmer team. Working together and sharing all aspects on an equal basis is the prerequisite for a successful farming-system and the stability of livelihood conditions

The listing and ranking of success indicators in form of a graphic representation has been done to give an idea of the manifold interrelations and correlations of factors relevant within a farming system. It also clearly demonstrates strong and weak aspects to be considered by the projects. For instance, it can be seen that the emphasis of the Kenyan project on water saving techniques like water tanks has been very successful, that the diversity of tree species and biological measures is closely linked to natural conditions, etc. Of special interest is the aspect of reciprocity: it has been shown that often indicators like e.g. knowledge dissemination or public position are important for the female as well as for the male farmers (see also Fig. 118). Among the socio-cultural & political category differences are most obvious: female-headed farmers score the lowest among the sub-groups, and Tanzania scores lower as to the country-level.

Tab. 59: Ranking of success indicators

The question behind this table is 'how do the indicators score in total for the different groups as well as on country and AEZ level?' Indicators that rank extraordinary high and the ones ranking not respectively low have been marked with bold boxes. The indicators which do not score at all indicate weak aspects to be taken into consideration by the projects to enhance the general farming-system and livelihood situation of the farmers. Clusters of same ranking may indicate correlations among indicators or sub-groups or levels (country, AEZ).

Indicators in total	Farmers in total	Sub-groups				Country		AEZ	
		MHH	FHH	WL	HB	K	T	LPA	H/MPA
Socio-cultural & political indicators									
Active knowledge dissemination on snrm – ff									
Group engagement – ff									
Engagement of parents in snrm									
Training (project and other institutions)									
Public position (former) husband									
Freedom of decision-making									
Women's group –position									
Land tenure rights									
Education									
Church group – position									
Position in groups (ff) inclusive initiative aspect									
Duration of project contact									
Active knowledge dissemination on snrm – hb									
Knowledge/use of nat. medicine & pesticides – ff									
Knowl./use of nat. medicine/pesticides (former) – hb									
Education father									
Vocational training									
Experience with resource degradation									
Group initiator (women's/church/mixed)									
Treasurer, secretary of group									
Education mother									
Mixed group – position									
Community/job position parents									
Economic indicators									
Bicycle									
Applied/received credit (incl. group)									
Accessibility of main road									
Labourers									
Improved cooking stove									
Supply with own firewood									
Food/fodder supply (shortages)									
Water supply									
Market situation (outlet, transport)									
Livestock									
Size of land (for cultivation) in acre									
Distance to (farthest) field									
Kind of house, valuables (furniture, etc.)									
Off-farm activities of husband									
Water tank									
Plough									
Ranking income per capita									
Ox-cart									
Off-farm income activities both (Ksh/y)									
Size of land (forest/woodlot, pasture)									
Off-farm income activities (except group) ff									
Road condition up to main road during rains									
Car									

Indicators in total	Farmers in total	Sub-groups				Country		AEZ	
		MHH	FHH	WL	HB	K	T	LPA	H/MPA
Ecological indicators									
Tree species diversity – all	●	⬤	●	●	⬤	●	●	●	●
Diversity of biological measures	●	●	●	●	●	⬤	●	●	●
State of land (soil erosion)	●	●	●	●	●	●	●	●	⬤
Crop diversity	●	●	●	●	●	●	●	●	⬤
Tree species diversity – exotic	●	●	●	●	●	●	●	●	●
Diversity of physical measures	●	●	●	●	●	●	●	●	●
Diversity of soil fertility measures	●	●	●	●	●	●	●	●	●
Use of organic fertilisers	●	●	●	●	●	●	●	●	●
Zero-grazing	●	●	●	●	●	●	●	●	●
Tree nursery (on-farm)	●	●	●	●	●	●	●		●
Tree species diversity – indigenous	●	●	●	●	●	●		●	●

Legend:

K = Kenya; **T** = Tanzania; **l** = low potential area; **H/MPA** = high/mid potential area; **MHH** = male-headed household; **FHH** = female-headed household; **WL** = women leader; **HB, hb** = husband; **ff** = female farmer; **snrm** = sustainable natural resource management; **==** = not in this category

The first column derives from **Fig. 117**; for each category numbers are added up and divided by the number of respective farmers. The deriving number is applied according to the classification scheme given in the second column.

--	0 not/none	-	1 bad/low/few	+-	2 sufficient/standard/partly	+	3 good	++	4 very good/high

	no – low relevance	●	relevance	⬤	high relevance
	< 1.5		1.5 - < 3.5		> 3.5

9.2 Success-indicators for the projects

The projects - all are governmental - show similarities and differences concerning approach, extension and training. Whereas the Kenyan project NSWCP works with a catchment approach, the Tanzanian projects SCAPA and HASHI-ICRAF apply a village approach (see Tab. 60).

All projects practise networking through collaborating with (inter)national) (non-) governmental organisations, research institutions like universities, ministries and policy-makers which enhances knowledge exchange and helps to prevent doubling of efforts. Generally, the organisational set up of the three projects in relation to the regional, district, and village government promotes full participation of respective stakeholders in the programme's areas. The intention is to actively involve all stakeholders at all stages of planning and implementation of the programmes, particularly at the grassroots level. This aspect makes the projects relatively efficient in raising awareness among the farming communities on the importance of environmental issues and in the dissemination of sound land use measures and related technologies. Close interaction and exchange between the projects and the target groups – small-scale farmers has a considerable influence on people's attitudes and their life styles, not only with regard to gender aspects. Hence, agricultural productivity (crop yields, milk production) has been increased, with the effect of a decisive improvement of incomes and standard of living of the families in most programme areas.

According to the documents the programmes have succeeded in considerably improving the relationship between men and women with effects like greater harmony in the household, decreased women's workload through increased sharing of responsibilities and decision-making aspects; within this context farmer exchange has contributed decisively to this situation.

The general approach and monitory system of the projects is similar and can summarised as follows, divided into different steps (after SHISCAP 1992: 4/4):

1 To **establish community needs** and **prioritising process by community** is being undertaken in the villages/catchment areas through surveys and discussions (problem identification and solution suggestions by participants); capabilities and constraints of beneficiaries need to be identified since project foresees on how to overcome community problems and what the community actually wants/expects may be two different things.

2 Project, local government and beneficiaries **identify project entry point** and **select activities**. An activity should be selected which meet expectations of beneficiaries and which fall into the programme's mandate; it should be designed that it is acceptable, meets local conditions, is appropriate, can be expanded if needed, and be sustained and possibly replicated by the beneficiaries.

3 Joint discussion between project and beneficiaries to **approve activity** (select appropriate activity). Project states problem that can be addressed by it; presents list of activities that can reach this aim. To the beneficiaries it has to be made clear what is the activity, what the beneficiaries will have to do, what benefits will accrue, disadvantages, time, required timing (e.g. wet season).

4 **Activity analysis from gender perspective** to find out whether it is accepted, needs modification or is to be rejected. Rejection means either going back to step 3 or selecting a new group.

5 **Practical analysis of project/activity** to determine whether project is realistic in terms of what has to be done, is expected and required to achieve objective.

6 **Development of implementation programme**: modified activity from exercise in step 5 brought back to beneficiaries for discussion; step 3 exercise repeated, esp. to ensure that all beneficiaries understood changes of activity initially approved. Outlining of and agreement on timing of activity and obligations of project and beneficiaries.

7 **Implementation**

8 **Monitoring and evaluation**: taking agreed upon activity from 7 back to beneficiaries. Analysis of how project has changed, direction of change, validity of objectives, evaluation of project by beneficiaries, who benefits. Analysis and eventually redesign.

The aspects which characterise the projects and are responsible for their success can be summarised as follows:

- The projects work with a 'site specific' approach, this means consideration of socio-cultural, ecological, economic and political aspects.
- A 'cross-level sight' is applied, thus, consideration of aspects on all levels (micro, meso, macro).
- Gender-awareness/sensitivity, not only regarding farmers, but also training of extensionists, project staff and policy makers on gender aspects.
- Consideration of local knowledge & institutions. Whether it concerns land-use practices or wisdom on medicinal plants, etc., it is tried to incorporate this knowledge in project concepts and activities; the same goes for local institutions. Concerning this aspect, especially HASHI-ICRAF has to be named as a pioneer concerning programmes for environmental education which build on local customs and traditions like integration of dance groups or drama.
- Networking/collaboration with the target group, other projects, research institutions & policy-makers. This increases outcomes through exchange of ideas, concepts and results and reduces doubling of efforts.
- Interdisciplinarity is crucial for the achievement of well-founded results and solution strategies. Hence, it is tried to work with interdisciplinary teams – in the field as well as concerning research and institutionally-based exchange.
- Participation, this simply means that solely interests, needs & problems expressed by the participants form the basis for all measures and activities implemented!
- Thorough monitoring: regular & close contact to the participants is tried to keep, besides the carrying-out of impact and follow-up studies.

The table below shows that quite a few aspects, mainly related to knowledge dissemination and collaboration, are only carried out by HASHI-ICRAF. Generally, it is advised that the projects try to copy successful strategies and apply them to their specific conditions to enhance project's success.

Despite the promising activities of the projects, weak aspects have been identified and shall be discussed in the following chapter.

Tab. 60: Key data on project approaches, extension and measures

Approach, extension, strategies, facilities	NSWCP	SCAPA	HASHI-ICRAF
Since when	**1974**	**1989**	**1986/87 HASHI since 1991 ICRAF**
Area covered	whole of Kenya	Arusha Region (training), Arumeru/ Arusha Districts (field)	Shinyanga and Tabora Region
Donors	**SIDA**	**SIDA**	**NORAD** (since 1991)
APPROACH, EXTENSION, FACILITIES			
Governmental	**X**	**X**	**X**
In the beginning top-down concept	**X**		**X**
Multi-disciplinary team	**X**	**X**	**X**
Participatory Catchment Approach	**X** since mid '80s		
Integrated Village Approach		**X**	**X**
Gender responsive/awareness	**X**	**X**	**X**
T&V	**X** since '87/'88		
RRA	**X** since '89	**X**	**X**
Using general agricultural extension service	**X**	**X**	**X**
Formation of catchment committees	**X**		
Formation of village/ward committees[155]		**X**	**X**
Collaboration with (inter)national) (non-)governmental organisations, research institutions, ministries, universities and policy-makers	**X**	**X**	**X**
Collaboration with & involvement of (innovative) farmers	**X**	**X**	**X**
Collaboration with local authorities & institutions	**X**	**X**	**X**
Encouraging interrelations between farmers, government & NGOs → institutional capacity building	**X**	**X**	**X**
Participation of staff in (non-project) training	**X**	**X**	**X**
Formation of women's groups	**X**	**X**	**X**
Collaboration with traditional healers			**X**
Evaluation of traditional land use systems			**X**
Formation of task forces			**X**
Formation of grazing associations			**X**
Using key facilitators	**X**	**X**	**X**
Land-use -/*in-situ* planning (for individual farms)	**X**	**X**	**X**
Special focus on *vulnerable groups*' like			
- women	**X**	**X**	**X**
- children	**X**	**X**	**X**
- sick/elderly people		**X**	
Special focus on medicinal & fruit trees		**X**	**X**
On-station technology development & evaluation			**X**
Demonstration plots	**X**		**X**
Village meetings - *barazas*	**X**	**X**	**X**
Set-up of nurseries	**X**	**X**	**X**
Mobile extension/ house-to-house visits	**X**	**X**	**X**
Involvement/training of influential individuals/ (women's) groups (folk catalysts)	**X**	**X**	**X**
Exhibitions			**X**
Eco-Museum,Cultural/Environmental Education Centre			**X**
Environmental Education Centre			**X**
Extension materials (booklets, posters, manuals, leaflets, stickers, t-shirts, caps, etc.)	**X**	**X**	**X**
Newsletter			**X**
Interactive video & cinema, narration, drama, music & dance performances (multi media techniques)	**X**		**X**
Radio broadcasting			**X**
Law enforcement (esp. local rules and by-laws)			**X**
Revival of indigenous institutions			**X**

[155] VSCCs are in many respects the equivalent of a catchment/sub-catchment soil conservation approach (NYAKI 1998: 46-47).

APPROACH, EXTENSION, FACILITIES			
Support of income-generating activities	X	X	X
School children/youth excursions/camping			X
Devolvement of village forest reserves under project management to communities			X
Follow-up studies	X	X	X
Library for researchers & staff			X
Rest house for researchers, evaluation teams, etc.			X
TRAINING			
Workshops/seminars/training for			
- policy-makers & technocrats (leadership cadres)	X	X	X
- staff	X	X	X
- other project/institution's staff	X	X	X
- environmental teams/committee members	X	X	X
- local leaders, young farmers	X	X	X
- local institutions	X	X	X
- school children & teachers	X	X	X
Study tours/visits (project staff, policy-makers)	X	X	X
Farmer-to-farmer visits	X	X	X
Farmer study tours/field days	X	X	X
Farmer training/seminars/workshops (> 1 day)	X	X	X
TRAINING			
Skills farmer training sessions (1 day)	X	X	X
Farmer training on			
- physical soil and water conservation measures	X	X	X
- tree management	X	X	X
- wood production	X	X	X
- domestication of high value (fruit, medicinal) trees	X	X	X
- improvement of the *ngitiri*-system			X
- tree nurseries	X	X	X
- medicinal plants	X	X	X
- non-wood forest products	X		
- communal and on-farm (rotational) woodlots	X	X	X
- kitchen/home gardens/horticulture	X	X	
- home processing and preservation of fruits	X		
- improved crop husbandry	X	X	
- soil fertility improvement; improved fallows	X	X	X
- water management (spring protection, water tanks, etc.)	X	X	X
- energy saving stoves	X	X	X
- zero-grazing, fodder banks	X	X	X
- bee keeping	X	X	X
- fish ponds	X	X	
- wildlife-management		X	
- socio-cultural measures (gender, etc.)	X	X	X
- economic measures (marketing, savings, book-keeping, micro-enterprises, etc.)	X		X
- land rights			X
- gender (on all levels)	X	X	X

9.3 Problems and constraints

In this chapter the focus will be on general as well as project-related problems and constraints. In several meetings with group members as well as informal discussions with the female farmers and family members, neighbours and friends problems and constraints impinging on a sustainable management of natural resources have been discussed. The problems and constraints indicated by the farmers as well as negative aspects named in project documents and evaluation reports are listed, sepa-

rated after the three project regions and ranked after frequency of occurrence. This has been done to see differences in perception, evaluation and estimation of problems between farmers and projects as well as between the three project areas. The focus of the problem analysis is directed to female farmers. However, as also male farmers were asked and as their views are reflected in the problem assessment as well, it is shown that these general constraints, not only perceived by the women.

As almost all problems are the result of a complexity of interrelated factors they are not categorised after ecological, economic, socio-cultural or political aspects. Problems directly related to the projects are handled separately. The problems are ranked after frequency of occurrence among the different categories (project areas).

9.3.1 General problems

As can be seen in Tab. 61 below many constraints are perceived by all farmers and in project documents in all three project regions. Some are directly linked to resource management, others indirectly affect implementation and maintenance of measures. The change of the climatic conditions over the time, thus, the delay or failure of rains as well as the extraordinary heavy rains in the begin of 1998, is regarded as a basic problem, impinging not only on farm-management, but on the whole livelihood-situation as it is directly linked to many other problems. The same goes for the general phenomenon of soil erosion, free grazing of livestock, loss of vegetation or lack of resources for natural medicine (last aspect has only been mentioned by farmers and HASHI-ICRAF project documents).[156] Pests and diseases are important hindrances as well.[157] All project documents and farmers not only referred to further factors like population pressure, shortage of agricultural land, water, firewood, food/fodder, bad health and hygienic conditions, but are also very well aware of relations and interrelations between all these aspects. Lack of finances and credits are generally regarded as major problems. These constraints are directly linked to many other aspects already named above as well as to insufficient use of manure/ fertilisers, lack of tools & materials such as seeds, pots, material for handicraft or clay for moulding improved cooking stoves (mentioned by farmers in the SCAPA- and HASHI-ICRAF project areas) and lack of time. Lack of time is linked to increasing workload on part of the women and means also lack of time for attending training, joining the groups, etc. An evaluation team of the NSWCP-project strongly advised not to incorporate

[156] Loss of biodiversity is a term only used in the project documents, although farmers are aware of loss of species, but this has been mentioned in discussions about nature perception, not as a problem itself.

[157] However, with different evaluations among the farmers: termites, nematodes and stem borers are perceived as a serious threat by all farmers. Quellea quellea birds were regarded as a problem only in the HASHI-ICRAF project area, and mainly by men. Wild animals are a problem for the farmers in the NSWCP- and SCAPA-project areas. All farmers as well as SCAPA-project documents mentioned the spread of weeds as hindrance for good farm management as weeding is a very time-consuming and labour-intensive activity.

credit in the programme as credit programmes very often fail in semi-arid areas. However, the cancellation of credit schemes cannot be a solution. Contrarily, it is argued that reasons for failure must be identified and loans given to promising projects which *do* exist: this has been shown by (female) farmers in the HASHI-ICRAF project area who successfully manage dairy-keeping based on credits, although farmers in this area mentioned the problem of paying back a loan after failure, e.g., death of the cow; this can, amongst others, also be linked to lack of care-taking, referred to by farmers in the same area. The poor quality of livestock, mentioned in documents and by farmers in all project areas, is directly linked to this aspect and might be an expression of e.g. lack of finances and time. Many female farmers in the study area expressed their need for credits, so it is a matter of course to find out possibilities for the integration of this highly important aspect.

Marketing-related criteria like lack of market access, low prices and bad road conditions are perceived by farmers and projects as major constraints. Additionally, farmers referred to the bad transport situation and long distances to market places.

Several problems are directly linked to improved land husbandry technologies and form a fundamental hindrance for the acceptance of soil conservation. One obstacle are long-term effects: e.g. tree plantings are related to long-term benefits whereas other measures show direct (short-term) benefits like soil fertility improvement through manuring or the use of an improved cooking stove, only to name some examples. Bad experience in the past due to forced implementation of soil conservation measures during the colonial and past-colonial period as well as loss of cultivation area through trees and physical measures (this last-named aspect has not been mentioned by farmers or documents in the HASHI-ICRAF project area as this project mainly concentrates on biological measures) are further constraints. Farmers also complained about lack of tree seedlings/seeds and especially mentioned problems to get indigenous seeds/seedlings.[158] Lack of live-fences which protect crops and tree seedlings from free-grazing livestock, poor substrates in nurseries and moaning of neighbours about trees close to their farm land are problems mentioned in the HASHI-ICRAF project area. Farmers in the NSWCP-project area mentioned saltification as a serious obstacle for raising tree seedlings.

Land tenure issues are crucial as farmers are more likely to refuse long-term investments in land if it does not belong to them. This directly leads to gender-related aspects: generally, a low level of women's participation on different levels can be linked to customs and traditions as is reflected by farmer's and in project documents. Whether it is the restricted participation of women in public decision-making proc-

[158] Generally, in the (Kenyan) project reports no hints on preferred species but only general quotations are given. In the SCAPA reports, too, little reference is given to tree species or to exotic species only like *Grevillea robusta* (see NYAKI 1998: 78). In reports of the HASHI-ICRAF project a lot more information can be found, especially on medicinal and multipurpose trees (see e.g. OTSYINA et al. 1998; URT 1998); URT (1998: 11) recommends that the "choice and selection of tree spp. should be based on people's preferences and Shinyanga ecological conditions."

esses, their limited access to land or that they may not be allowed to plant or cut trees: for instance, if a woman has no say about trees or livestock, how can she have a decisive influence on environmental issues? Further mentioned gender-related hindrances for a successful implementation of natural resource management are men's lack of (physical, financial, psychological) assistance, violence, alcoholism, polygamy and disrespect concerning contraceptives.[159] These aspects need more consideration within the projects.

When it comes to the question of tree planting, often statements like "Taking a particular look at the diminishing supply of firewood, strangely enough, only in rare cases do households practise tree planting as structural solution to the developing energy supply problem" (BUDELMAN 1996: 54) can be found in the literature. Accordingly, aspects frequently named to explain farmer's non-adoption are lack of commitment and lack of awareness (see e.g. HYUNA 1989, BUDELMAN 1996, OTSYINA et al. 1997b). However, this is not a reason *per se* but the result of deeper rooting causes.[160] Despite the limited success on a broad scale, many success stories can be found on the local scale; many female farmers are enthusiastic about tree grow-

[159] SHAO et al. (1992: 146) referred to the highly interesting aspect of the influence of the kind of marriage - arranged or love – on gender roles, ownership, inheritance and environment.

[160] In fact, reasons are manifold: according to MUGO (1999: 8) the expected adoption of tree crops by smallholder farmers has not been realised despite numerous efforts by governments and development agencies. A world wide analysis identified the following constraints: low priority given to tree crops by farmers and extension agencies, inadequate technology and lack of skill in tree management by farmers, inadequate processing technology and marketing of tree products, limited access to finances and credits, inadequate extension and marketing of tree support systems and research not oriented towards farmer's priorities. Especially tree-management aspects depend on the livelihood-strategy and the state of the resource base (HUXLEY 1999: 31). It also has to be reminded that trees can have adverse effects on the soil or crops themselves like allelopathy or competition in water, nutrients and light; nor must we forget the conflicts that can arise for inputs like labour, cash and material (ibid.: 10, 12; see also BUDELMAN 1996: 56) being actually often one of the most hindering factors for tree establishment since tree management often interferes with other farm activities, especially during the cropping season. Women often do not have the time for taking care of tree seedlings (see e.g. HYUNA 1989: 50, BLUME 1998: 136). Furthermore, the land size is crucial as well: a study on tree establishment among women in Tabora Region, western Tanzania, has shown that women with small land sizes preferred boundary planting to rotational woodlots (OTSYINA et al. 1997b: 94). The present study can confirm these findings since the minimum size of land for farmers to establish woodlots (or keep natural forest areas) was above 4 acre; of course, personal preferences play a role as well as farmers 2T-l and 4T-m preferred trees scattered on farmland or along boundaries. Hazardous natural conditions are another fundamental factor to be named (see also BUDELMAN 1996: 56). Moreover, traditions and customs can negatively impinge especially on tree management. Consequently, some trees may not be planted but cut instead. This can be seen in the area of HASHI-ICRAF where traditional beliefs like negative effects on crops, either by the trees themselves (4T-l, 5T-l, 4T-m) or indirectly as they host birds which eat the seeds/harvest (6T-l; see also SHAO et al. 1992: 82; TENGNÄS 1994: 70) or they hinder tree planting activities (see also SHISCAP 1992: 6). Due to these beliefs, men refuse the planting of trees on the fields, like e.g. the sister's husband of farmer 5T-l. The following quotation illustrates this aspect: Project manager HASHI-ICRAF: „We gave to you so many seeds and seedlings, why didn't you plant them all?" Chairlady: „Because our men don't want us to plant them since they believe they disturb the crops." Some trees may be regarded as evil and will not be planted close to the homestead, if planted at all. SHISCAP reported about the fear in the HASHI-ICRAF project area of having a forest too close to the homestead because of its attraction for hyenas and witchcraft (1992: 6; see also SHAO et al. 1992: 82; HATIBU & MTENGA 1996: 48-49).

ing as the quotation of farmer 4T-m elucidates: „Panda miti na unabadilika mazingira. Majani wanaleta mbolea. Panda miti!" (Plant trees and you change the environment. Leaves produce fertiliser. Plant trees!).

Tab. 61: Assessment of general problems and constraints within visited project areas

Constraints & problems (X = problem; ☐ = no problem)	NSWCP		SCAPA		HASHI-ICRAF	
	Farmers	Documents	Farmers	Documents	Farmers	Documents
Change of climate (delay/failure of rains/heavy rains)	X	X	X	X	X	X
Loss of vegetation, esp. forests/trees	X	X	X	X	X	X
Free grazing/overgrazing	X	X	X	X	X	X
Soil erosion/degradation, decline of soil fertility, bad soil structure	X	X	X	X	X	X
Pests and diseases (psyllids, termites, nematodes, stem borers, quellea quellea birds, wild animals)	X	X	X	X	X	X
Population pressure	X	X	X	X	X	X
Food/fodder shortages	X	X	X	X	X	X
Firewood shortages	X	X	X	X	X	X
Water shortages	X	X	X	X	X	X
Lack of inputs/tools/materials like fertilisers, seeds, pesticides, fodder, etc.	X	X	X	X	X	X
Shortage of agricultural land	X	X	X	X	X	X
Poor hygienic situation like sanitation, water quality, etc.	X	X	X	X	X	X
Lack of finances	X	X	X	X	X	X
Lack of credits & funds	X	X	X	X	X	X
Lack of fertilisers/manure	X	X	X	X	X	X
Lack of time, especially women (frequent absence in training, group meetings, etc.)	X	X	X	X	X	X
No market access	X	X	X	X	X	X
Low prices	X	X	X	X	X	X
Road conditions	X	X	X	X	X	X
Poor livestock quality (diseases, low milk output)	X	X	X	X	X	X
Long-term effects of some measures	X	X	X	X	X	X
High loss of cultivation area through trees	X	X	X	X	X	X
Cultures/traditions (restrictions for women)	X	X	X	X	X	X
Suspiciousness/mistrust against conservation activities due to history	X	X	X	X	X	X
Increase of women's workload	X	X	X	X	X	X
No allowance for women to plant/cut/sell trees	X	X	X	X	X	X
Education	X	X	X	X	X	X
Lack of women's participation in public meetings and decision making	X	X	X	X	X	X
Diseases - aids, malaria, cholera, etc.	X	X	X	X	X	X
No land tenure rights for women	X	X	X	X	X	X
Insecure land tenure rights, land conflicts)	X	X	X	X	X	X
Lack of (indigenous) tree seeds/seedlings	X	X	X	X	X	X
Theft (inclusive cattle rustling)	X	X	X		X	X
Lack of resources for natural medicine	X		X		X	X
Fees for membership in groups	X		X		X	X
Bad water quality (saltification, pollution)	X		X		X	X
Spread of weeds (e.g. striga, black jack, setaria)	X		X	X	X	
Weak status of farmer groups	X		X	X	X	
Alcoholism amongst men	X		X	X	X	
Violence against women and children	X		X	X	X	
Beliefs/biases, superstition	X		X		X	X
Power relations on village, ward/catchment level	X		X		X	X
Loss of cultivation area through terraces	X	X	X	X		

Constraints & problems (X = problem; ☐ = no problem)	NSWCP		SCAPA		HASHI-ICRAF	
	Farmers	Documents	Farmers	Documents	Farmers	Documents
Polygamy[161]	X		X		X	X
'Dependency syndrome' of farmers through former project's approaches ('food-for-work')		X	X		X	X
Transport	X		X		X	
Long distances	X		X		X	
Lack of material for handicraft like thread	X		X		X	
Missing assistance of the husbands	X		X		X	
Disrespect of men concerning contraceptives	X		X		X	
Lack of engagement ('waiting mentality'), no will to change	X		X		X	
Competition, jealousy, selfishness	X		X		X	
Loss of biodiversity		X		X		X
Lack of material for cooking stoves			X		X	
Bad eyes (no glasses)	X		X			
Lack of (live-)fences					X	X
Inadequate storage of crops					X	X
Paying back of credits (after failure)					X	
Cutting of branches out of fences					X	
Neighbours moan(trees at farm border too big)					X	
Accidents					X	
Lack of responsibility of some members concerning care for dairy cows					X	
Leasing out of land for cultivation, high number of absent landlords		X				
Inadequate land use planning policies						X
Poor potting mixture rations/quality of substrate in nurseries[162]						X

Group-linked constraints mentioned are the weak status (mainly of groups set up by the projects) and membership fees. Neither the farmers nor documents referred to negative leadership-related aspects. However, farmers as well HASHI-ICRAF project documents mentioned problems with local authorities like power relations or authority claims. Farmers also lack engagement because of the so-called 'dependency-syndrome', a generally recognised phenomenon, created through former projects which often had the approach of 'food for work'. One good example is the women's group of farmer 5T-m: within this group many women thought that they will get everything for free from the project which helped to established the group. When they realised that tools were provided for free only in the beginning, they stopped participating.

Education is regarded as a central aspect within this context from farmers and projects. This includes access to school education, especially for girls, as well as education on environmental issues.[163]

[161] For farmer 1T-l this aspect is not a problem at all. Also the other women in the family said that this is a very good tradition as the woman gets assistance concerning household and farm activities.

[162] In her article JAENICKE (1999: 31-33) offers advice on appropriate potting substrates for raising tree seedlings.

[163] Villagers in the study area of HATIBU & MTENGA (1996: 58) identified education, poor health, shortage of (clean) domestic water supply, low food crop production/food shortage, poor livestock quality, inadequate storage and marketing of products, insecurity, land tenure, shortage of firewood as the main constraints. That education is regarded as problem number 1 (also with regard to poor

Other negative impacts are theft (e.g. of tree seedlings or cutting branches out of fences) and general attitudes like jealousy, competition or selfishness. Besides this, farmers repeatedly referred to the personality of people who do not want to change, but just wait for things to happen.

Interestingly, leasing out of land for cultivation and the high number of absent landlords has only been named in NSWCP project documents. However, this aspect seems to be important in the frame of increasing soil erosion problems in many areas as also many farmers researched rented or leased out land and mentioned the degradation of their land (this has also been observed in the field).

Diseases (also accidents) sometimes seriously disrupt efforts regarding environmentally sound technologies. Here, not only aids, malaria or cholera are to be mentioned, but many female farmers referred to bad eyes which prevent them e.g. from participating in adult education. Many farmers simply lack finances to buy a pair of glasses which would solve the problem.

9.3.2 Project-related problems

Tab. 62 below refers to project-related constraints. In the documents of all three projects reference is made to constraints due to the dependency on the donor, lack of transport, (qualified) staff and facilities for knowledge transfer as well as internal problems like fluctuation of staff, management- and team work-related problems, etc.

Farmers complained that training and seminars provided are not arranged with the farmers although this is an especially important aspect for the female farmers since they often lack time to attend educational programmes. Furthermore, seminars are said to be too short, infrequently and not continued by follow-up seminars. These two aspects have been recognised only by the HASHI-ICRAF project. Farmers in all three project areas said that they lack regular contact with the project staff.

Five aspects have been mentioned only in the project documents of SCAPA and HASHI-ICRAF among which flaws in the monitoring as well as reporting system (also of partners); this e.g. means lack or insufficient inventory of various activities going on in the programme area. This is fatal since lack of out impact analyses and feasibility studies can result in negative effects instead of positive. An example is the exclusion of cattle from regeneration areas without provision of solution strategies for pastoralists in the HASHI-ICRAF project area. Or that HASHI has not carried out an impact analysis but sent seedlings to villages without initially gathering knowledge on the socio-cultural & political environment.

quality of teaching like lack of teachers and material!) shows the awareness of people regarding this aspect in the context of development.

Three aspects refer to weaknesses on the co-ordination-level between institutions, extension services and the projects. Only SCAPA mentions the critical aspect of the duplication of efforts which is in fact a direct result of these deficiencies.

Tab. 62: Assessment of project-related problems and constraints within visited project areas

Project-related problems & constraints (X = problem; ☐ = no problem)	NSWCP		SCAPA		HASHI-ICRAF	
	Farmers	Documents	Farmers	Documents	Farmers	Documents
No timing of training, seminars tours with peasants, esp. female farmers	X		X		X	X
No say on tree seedling species	X		X		X	X
Ineffective/non-sufficient extension service, lack of regular contact with staff	X		X		X	
Dependency on the donor		X		X		X
Inadequate facilities for knowledge transfer		X		X		X
Lack of transport		X		X		X
Insufficient distribution of training material, language problem		X		X		X
Fluctuation of staff /transfers, retirements, resignations, deaths, etc.)		X		X		X
Difficulties related to management, communication, lack of accountability, team work		X		X		X
Lack of (qualified) staff		X		X		X
Wrong time of seedling distribution	X				X	X
Seminars too short, infrequently and not continued	X				X	X
Lack of a co-ordinating instrument for different institutions				X		X
Poor/unclear monitoring/reporting system (also of partners)				X		X
Insufficient link between different extension services				X		X
Lack of a collaboration between project and other institutions				X		X
Increase of administrative units		X				X
Top-down approach/methodology		X				X
Lack of socio-cultural and interdisciplinary approaches		X				X
Late release of and/or inadequate funds		X				X
Incomplete planning teams/collaborators		X				
Selection, clustering of catchments		X				
'Election euphoria'		X				
Lack of inventory of various activities in the programme area				X		
Duplication of efforts				X		
No influence on marketing system				X		

The increase of administration units and late release of funds resp. inadequate funding are problems found only in NSWCP- and HASHI-ICRAF documents. Furthermore, both perceive lack of socio-cultural and interdisciplinary approaches and started with a top-down approach. Additionally, NSWCP-project documents mentioned incomplete planning teams, selection and clustering of catchments as well as 'election euphoria'. In SCAPA-documents it is criticised that the programme has no influence on the marketing system.

Farmers in all three project areas criticised that they do not have a say on tree species preferred; this aspect has been mentioned also in HASHI-ICRAF documents. Moreover, farmers in the NSWCP- and HASHI-ICRAF project areas said that tree seedlings are often distributed at the wrong time, e.g. during high labour peaks.

The projects concentrate on and differentiate data according to gender aspects. However, in some reports (e.g. HASHI-ICRAF OTSYINA et al. 1997a) no differentiation of data concerning gender has been made.

9.3.3 Summary

The assessment of hindrances and weaknesses perceived by farmers and projects is necessary for the project's development and improvement. Concepts have to adapt to changing conditions and situations. Therefore, impact studies have to be carried out. The farmer's views are a direct feedback to project activities. It shows how they are perceived and aspects which need to be improved. Of course, as has been shown in chapter 6.3 a lot of benefits have been mentioned by the farmers as a direct impact of the projects. However, benefits can give hints or show tendencies of the degree of impact; weaknesses help to develop improved project approaches.

Ways for enhancement are clear: prerequisite is a thorough consideration of constraints mentioned across the project to include the aspect of 'mutual learning'. For instance, to increase knowledge dissemination, NSWCP and SCAPA could extent their training and collaboration approach. The approach of HASHI-ICRAF concerning the 'environmental education package' has been shown to be a very effective means to reach the people. This includes aspects like school programmes, incorporation of local organisations and traditional healers as well as methods like drama, dance and music or educational centres.

To be effective, the projects must ensure that men's and women's roles and needs are taken into account for any particular aspect. Hence, it is necessary to produce a profile of gender issues; this should include socio-economic, cultural and traditional elements, patterns of energy/water supply and use, traditional management and control strategies of natural resources as well as women's constraints to participate, plan and take action in development.

9.4 Expert's views

"You train a lady, you train the whole family, you train the man, you have trained an individual. Women take up more in training than men. They are willing to share their knowledge more than men."

Note of an extension officer working with NSWCP as to his experience with female farmers in natural resources management.

In this chapter some light shall be shed on expert's views on questions related to natural resources management. This gives some ideas on how especially problems are perceived by various stakeholders in institutions, organisations on (non-)governmental level to be compared with statements of farmers or in documents.

Standardised/structured mainly written questioning/survey with project staff/leaders and experts from different organisations, universities, etc. (not only from Tanzania respectively Kenya, but from other countries, too) have been conducted by means of a questionnaire, especially designed for the interviews and questionings.

With all respondents preliminary discussions on the questionnaire and the research subjects, aims and proposed outcomes have been held. The questions have broadly been outlined and questions risen by the respondents been answered. The questionnaires have been left with the respondents as all did not have enough time for an oral interview and preferred to fulfil and send it back. These questionnaires form the basis for the following analysis and conclusions drawn.

In total, 18 questionnaires have been distributed between September 1999 and December 2000 to different experts in Kenya and Tanzania out of which 8 have been returned, thus, the return rate lies around 44 %. This is due to time constraints of the respondents accompanied by the fact that the questionnaire is relatively long which might inhibit enthusiasm in participation.

Another problem besides the return rate is the fact that the situation under which the questionnaire has been fulfilled is beyond the knowledge/authority of the researcher, that misunderstandings cannot be clarified and that the whole 'interview situation' cannot be controlled by the interviewer: On the other hand, there is the advantage to get more reliable and more detailed information as the informant has the possibility to take his/her time and to consider documents, etc. Also, this method is less time consuming (see also ATTESLANDER & KOPP 1984: 168-170; BORTZ & DÖRING 1995: 231, 234-235).

The respondents are between 38 and 50 years old, two did not give data. Out of the respondents five are male and three are female; four males and one woman are from Kenya resp. Tanzania. They work with organisations, institutions and ministries in Kenya and Tanzania.

The questions have been listed under different categories (see appendix 2 for the questionnaire). Some questions have been very generally phrased by purpose as

this gives more room for the respondents to concentrate on what *they* perceive as important. Others are very specific to come to detailed data on a special issue.

General problems stated concerning women were restrictive cultural issues pertaining to ownership and use of resources by women, difficulties in marketing their produce (due to lack of marketing avenues, lack of information about markets and prices, lack of transport to market their goods), etc. over-burdened by work (domestic and productive), too much responsibility on farms, economic and social hardship, violence by men, diseases and lack of many facilities. Generally, women face lack of power, lack of confidence in doing daily activities as decision-making is being centralised on men, lack of income generating activities, lack of education, and resources. They do not have access to development opportunities and thus lack knowledge on innovations due to different causes: lack of extension services (which may be caused by lack of reliable transport and inputs) and not enough time to participate in those activities. After one male expert not enough attention is paid to the fact that politicians, elders and husbands must agree to what is being done.

Generally, all experts agree that rural women's workload has increased, depending on the socio-economic level they belong to. On the other hand, two experts said that this has to be seen relatively and referred to the impact of gender-related activities by projects which eased women's situation as men now participate in activities.

How to increase the income situation of rural farmers? All experts agree that there are hardly any sources of credit for female smallholders in Kenya and Tanzania. There are few NGOs like Greenbelt or CARE Kenya which try to promote microcredits but still, the main credit sources are informal like family members or other villagers and local women's groups; often the communities are practising a marry-go-round system. The experts suggested that community projects have to be started, that projects have to work towards influencing local institutions to "tap" the energy and interests among young people in rural areas and that grain bank projects have to be initiated through fund-raising; this would enhance economic opportunity while ensuring food security and creating market opportunities for rural products; this again will increase profitability and engage more young people at the rural level.

Furthermore, all experts regarded the market situation and terms of trade in the rural areas of Kenya and Tanzania as non-favourable, supporting the general opinion as well as farmer's views. Main market outlets are local or middle men/intermediate traders. Generally, prices offered have been said to be low and unsatisfactory. Problems stated are too many rural producers producing the same things, poor infrastructure and lack of transport.

As to land ownership the experts agreed that women must have equal access to land. Suggestions were that laws need to be changed and policies be implemented which give clear guidelines on women ownership (inheritance, divorce) as only the government, political parties, etc. can help to change the situation to the better. Inte-

restingly, a female expert working with CARE Kenya remarks that it has more to do with decision-making rather then land tenure per se. Most women have to wait for their husbands to make certain critical decisions for resource management. This comment is according to the study findings in chapter 8.3 and 9.3.1 where it has been shown that even married women without title deeds are highly successful because they have freedom in decision-making from the side of their husbands. She suggests that advocacy and awareness creation to men may help change women to make critical decisions for those households where men are absent.

To all experts the encouragement of indigenous trees seems to be important: however, it has to be demonstrated that this will be economically or otherwise useful for the farmers. Promotion could be done by teaching farmers the way(s) of collecting/harvesting seeds and then teach them about tree nurseries (establishment and care). The expert working with the Tanzania – Sweden Local Management of Natural Resources Programme asks to consider that in all cases one must analyse the pros and cons for each species, independent of its origin.

Concerning organic farming the opinions differed. Although all experts regarded it as a valuable and environmental method, three experts are of the opinion that it only works on small scale basis. On the contrary, two experts highly recommend this method and referred to agroforestry which promotes some of these principles.

International/national politics resp. political changes/events have been unanimously stated by the experts to have an impact on the success/failure of the implementation of natural resource management activities; e.g., changes in local leaders and policies may affect land ownership and resource development. Most of the projects are donor supported/funded and any shift/change of the positive climate affects the implementation of the projects. According to one expert impact is so far negative.

Pertaining to aspects linked to the project approaches: networking through contact to different organisations and institutions on local, national and international level like widely practised by the three projects is regarded as highly important by all experts. Benefits named are avoiding overlapping and conflicting messages to the target group, harmonisation of efforts, better use of resources, trust building, enhancing sense of responsibility and cultivates joint efforts into solving development problems. However, all European experts and one Kenyan expert admit that in general, exchange is not sufficient and distortions occur. According to three experts the needs for linkages are not defined from what needs to be achieved in rural areas – resulting in lack of relevance to specific groups –, but rather from interests from donors and a national elite adopted to this system; hence, the impact on the rural population is almost nothing. Other weaknesses mentioned were lack of continuity and finance to follow-up, time consuming, expensive and that bureaucracy in some of the organisations makes it difficult to adopt a uniform approach. The experience of five experts has shown that response on activities for knowledge exchange is positive.

The main indicators of effective knowledge dissemination have been summarised by an expert from ICRAF as increased awareness, adoption or use, visual evidence of change or impact at landscape levels. According to another expert, generally, projects should target individual farmers with similar socio-economic conditions for to ease adoption. Farmers are not uniform in wealth, education, awareness and adopt differently, so knowledge passed should be user friendly and tailored for that class of farmers; important is transfer from one participant to another.

Concerning gender issues a female expert working with CARE Kenya summarises that, if specific gender concerns are addressed, there are livelihoods of success. She also admits that projects have to refrain from just isolating the issues through participating techniques but must address the issues isolated.

According to a female expert working with SCAPA the best approach to address gender aspects is in starting to teach men about gender issues and about equality between men and women. From that point other steps will follow.

Reasons for a successful realisation of activities concerning natural resource management given by the experts were mainly linked to extension and gender aspects: linkage between extension staff, experts of different field (researchers) and the female smallholders (through training, seminars, trials, study tours) is crucial. Women and men have to be involved in planning and implementation, issues affecting the women have to be addressed. Women are quite sensitive and responsive to innovations introduced. Generally, a close collaboration between men and women at all levels, better training and knowledge are important. Furthermore, working as groups is recommended to curtail labour problems in some instances. An expert working with the Tanzania – Sweden Local Management of Natural Resources Programme noted that one must have a realistic view on how power structures look in society today, and accept that they can only slowly be changed.

The experts see a high chance in incorporating strong women/successful female farmers in project concepts, because farmer-to-farmer extension has already worked well for men farmers, and because ‘strong women’ can perform their activities in a variety of conditions; hence, transfer of knowledge within agricultural extension will be easier. A female expert working with CARE Kenya mentioned that most farmers learn from their neighbours. Successful female farmers serve as local experts. Therefore, other farmers easily identify themselves with them. It might be women which train a group as core resource persons for knowledge transfer. After the leader of the HASHI-ICRAF project strong women or leaders are great assets and can be used to promote knowledge transfer and development as he has seen this work very well in several communities.

When asked to give characteristics of a ‘successful (female) farmer’ attributes like being innovative, a good social net-work, some capital (controls resources – e.g. financial – and can allocate them without reference), access to market, some educa-

tion, willingness to work hard, being able to employ labourers on the farm and disposing of family members who assist have been given. A strong woman is self-sufficient in basic food commodities and must be able to cover all the costs of production while at the same time having a surplus and diversified crops grain. Furthermore, a successful farmer is healthy, more relaxed, moderately risk willing, articulates and commands respect and has a personal drive. Interestingly, three (male) experts referred to the aspect of health.

As to the involvement of women's/mixed groups to address natural resource management interestingly, five experts said that mixed groups should be and are preferred as the experience is that they mostly perform better. However, one female expert working with the Ministry of Agriculture in Kenya qualifies that this is very much related to the local, cultural and social set-up. According to another female expert from NSWCP one should work with both pure women and mixed groups: some aspects of life are easier to discuss with pure women groups since men in Kenya and Tanzania normally are the ones making decisions. Of course, men have to be committed and concerned even if they are not engaged in the actual work.

All experts mentioned that extension has to become participatory (dialogue based), acknowledging local resources and knowledge, move away from top-down approaches. PRA involves working together with the target group in all steps of research; however, a weakness is that it needs a lot of time. Furthermore, farmer-to-farmer exchange has to be included and strengthened as well as the linking of farmers with other developmentalists.

Interestingly knowledge about the method of participant observation is very limited among the experts. Only one female researcher was able to describe the main objectives and approach of this method (two experts had at least vague ideas), and also only this expert has practical experience with it in regional planning. As a major weakness she referred to the aspect of being very time-consuming. All three experts said that this method is to be recommended as a valuable way for data collection since it is sensitive, leaves room for flexibility and directly involves the target group.

On the question whether research should also be carried out by researchers from the so-called industrialised countries, all experts (two did not give an answer to this question) said that the involvement of researchers coming from so-called industrialised countries is necessary. According to a female expert working with SCAPA findings from any research need to be compared by different researchers; therefore those from Western researchers will be compared with those from non-Western researchers; and the final one will be closest to reality. Two experts (a female expert working with NSWCP and a male expert working from HASHI-ICRAF) mentioned that research carried out by outsiders/externals has the advantage that it is easier to "see" social and cultural systems that are not your own. However, all experts agreed that this requires knowledge of and experience with the cultural/political set-up of the

communities. Also, according to a female expert working with CARE Kenya the results should be shown to people involved. Western researchers should actually carry out research for the benefit of those people and not merely for their successes. She criticises that more often they rely on interpretation which may give results that are out of context. On the other hand, the involvement of local researchers has been emphasised as well.

The role of the sex of the researcher has been estimated differently: a female expert working with the Ministry of Agriculture in Kenya referred to the aspect that women field researchers need to comply to a lot of rules (unwritten!) on behaviour and approach (men too but different). The female expert working with SCAPA recommends that if the research is gender sensitive, e.g. if one wants to deal/work with women only, the researcher should be a woman. According to two experts (the male expert working with the Tanzania – Sweden Local Management of Natural Resources Programme and the female expert working with CARE Kenya) the general personality is of a much larger influence than sex. But the female expert working with NSWCP asks to consider that the knowledge you will have from persons you meet is not always regardless of their gender approach. However, after her experience, measurable information is more sex dependent than other types.

According to the experts, the only way to address problems is to identify them and address the problem together. This can be done only at local village level and in a patient and understanding way. A male extension officer working with NSWCP suggested that women should be trainers, and appreciate themselves.

To summarise, the expert's views confirm general problems expressed by the farmers, the general literature as well as project documents pertaining to the aspects extension, women's workload, market access, decision-making, credit, land tenure, etc. Their estimations concerning methodical aspects as to the aspects of extension, the incorporation of strong women and groups, Western researchers, the sex of researchers and partly participant observation as well as aspects related to measures like incorporation of indigenous trees and organic farming reflect own experiences and general statements in the literature. This shows that main problems and major aspects within the development context are perceived on all levels involved.

10 Recommendations

In the following, farm- and project-related recommendations are given; they are deduced directly from the analyses made in this study like problem identification, farmer's quotations on training preferences, expert's views, etc. Other factors, mainly on the international and national level have been considered as well. The recommendations are subsumed under categories related to measures, empowerment and project activities for easier identification. It is not easy to set priorities on specific aspects. However, in some cases recommendations are given with special reference to certain projects. First, recommendations are given related to biological measures.

Fig. 119: *Acacia tortilis*, a multi-purpose indigenous tree near farm 2T-I

- Focus on **indigenous trees and shrubs** (like e.g. *Acacia nilotica*, *A. tortilis* (see Fig. 119)*, Albizia ssp.*, *Cordia africana*, *Erythrina abyssinica, Rauvolfia caffra*, *Sesbania sesban*, *Tamarindus indica*, *Vitex mombassae, Terminalia sericea,* only to name a few). Discussions held with the women and their families, women's groups, etc. revealed a high interest for indigenous species. Local perennials play a significant role in the context of traditional medicine: It turned out that medicinal purposes are the most important use aspect of indigenous trees/shrubs besides firewood (see chapter 5.2.1.4). The majority of the female farmers has a partly profound knowledge concerning local medicinal plants (see chapter 6.2.6.1). The widespread knowledge and use of traditional medicine (also for the treatment of animals!) serves several benefits, which have been described in chapter 6.2.6.1 and should be taken into consideration within the context of the propagation of trees and shrubs. Generally, "traditional medicine [...] should have full official recognition by the government and receive appropriate technical and other support [...]. [...] Recognition, support and regulation can provide additional legitimacy for traditional medicine, a condition for its further development and use by the public" (NYAMWAYA 1995: 30).

The demand for natural medicine is continuously increasing, not only in the so-called developing countries, but in the so-called Western countries, too. Most of the leaves, flowers, barks and roots of the medicinal herbs and perennials derive from wild-growing plants. This practice is jeopardising the stock and has already led to the extinction of some species (WWF 2000c: 15; TARDT 2000: 27; after DERY et al. 1998).

Therefore, it is highly recommended to support and initiate the implementation of **medicinal gardens** where these plants can be cultivated as well as the integration of medicinal trees in farms. By means of this sustainable practice the wild species will not only be protected from extinction, but the economic aspect is an important factor for countries like Kenya and Tanzania, too.

Furthermore, different studies have shown the high value of indigenous trees concerning food/fodder supply, especially during the dry season; here, fruits play an important role. Other positive aspects are well documented as well like the roles local trees play in culture and tradition, in handicraft, etc. (see e.g. OTSYINA et al. 1998, TARDT 2000).

It is an undisputed fact that many exotic tree species have several positive qualities/properties (see chapter 7.1.3) so that it makes sense to incorporate them in tree management; however, tree species should not be allowed to displace and substitute indigenous species; instead, they should function as a valuable additional source and supplement to the existing indigenous potential of perennials. After HUXLEY (1999: 35) a sensitive approach is to test both indigenous and exotic species (the last named under controlled conditions!); taking farmer's preferences and knowledge carefully into account.

- Where ever possible (natural seed potential) the **natural regeneration of trees and shrubs** has to be fostered and be preferred against plantings; it is not only a cost and labour saving method, it is also the one being the closest to nature and part of many local land-use systems - like has been shown in the project area of HASHI-ICRAF - which enhances adoption rates and sustainability of project measures (see also ROCHELEAU et al. 1988: 78-80; SHAO et al. 1992: 165; BARROW 1996: 234-235; HUXLEY 1996: xvi).
- Intensification of **tree plantings** (e.g. woodlots) with regard to firewood availability on the farms and/or within the groups (four farmers have additionally to collect wood in the governmental forests resp. to buy it on the market and one farmer still collects all her firewood completely (as her own trees are still too small for harvesting). The size of the land is a limiting factor as can be seen on farmer 3T-I who has a very small piece of land and is not allowed to plant trees on the hired plot. This limiting factor has to be considered when propagating tree/shrub plantings on the farms; another solution has to be found like group plantings (woodlots) etc.

- Within this context, the projects have to carry out educational work with regard to **superstition** on the evil spirit of trees which is still alive in the project areas.

- Support of **group and on-farm tree management/nurseries** (see also NYAKI 1998: 78): On the one hand the study shows that the engagement in tree nurseries is a very effective way for tree seedling distribution; furthermore, on-farm and group tree nurseries can raise tree species requested in the specific area like seedlings of specific indigenous tree species since one severe problem stated is the availability of these seedlings. By this, the distribution of and knowledge dissemination about indigenous species will be supported. On the other hand, tree nurseries form an important source for income-generating. TIFFEN et al. (1996: 20) recommended to drop the NSWCP support of catchment nursery management as in the areas that have been visited by the evaluation team all nurseries were in a poor condition. It may be an alternative to intensify the support of **women's group's tree nurseries**. Training should pay special attention to soil and seed preparation, and regular follow-up studies have to be carried out to assess the success of seedling raising, marketing, etc. (see also SHAO et al. 1992: 167-168).

- Intensification of the implementation of **(live-)fences**: In areas where free grazing is still practised fences are the only chance to keep livestock, especially goats, away from the farmland. Therefore, the projects should distribute knowledge about the implementation of live-fences as well as seeds and seedlings which are suitable for fencing like e.g. *Acacia*-species or exotic species like *Bougainvillea glabra*, *Dovyalis caffra, Pithecellobium dulce* or *Ziziphus mauritiana*.

- Support of the implementation of **homegardens**: No special efforts have been observed in any of the projects visited or special references been found in reports on this system. The positive effects of homegardens are diverse (see a. o. ROCHELEAU et al. 1988; NAIR 1993; BLUME 1997a, b, 1998); one decisive benefit is that homegardens are usually near the home and are most often managed by women and thus provide a legitimate place for them. Furthermore, homegardens play a valuable role in educating children about agroforestry (see ROCHELEAU et al. 1988: 105-106). The author (same place: 106) concludes: "Like establishing tree nurseries in schools, this process involves the next generation in improving the management of their land."

- Introduction of agroforestry practices into a **fallow rotation system** or improved fallows: On the farms visited no improved fallow systems have been established. However, various benefits can be named like soil fertility improvement, planting of specific tree species for special use aspects like medicine, firewood, etc. (see also ROCHELEAU et al. 1988, TENGNÄS 1994, NAIR 1993).

- Intensification of awareness-creation as to soil fertility improvement through **organic farming** (farmer 2T-I as well as all farmers in Shinyanga Region, Tanzania pro-

pagate the utilisation of organic fertilisers only); if farmers do not have sufficient access to organic manure, e.g. rock phosphate can be used instead of chemical fertilisers. Organic farming is cost saving, environmental sound and in general has no side-effects on man's health (see also NYAKI 1998: 79; WITTE 1998: 75-76). In this context the following six aspects have to be noted (see also TIFFEN et al. 1996: 71):

- The projects should provide training on a **better use of farm yard manure** and within this context should concentrate on the aspect of transportation as this often is a problem as has been revealed especially on resource-poor (neighbouring) farms. Often, manure is not collected at all or not stored properly which means loosing valuable fertiliser (see also HATIBU & MTENGA 1996: ix).
- (Increased) propagation of **green manuring** for soil fertility improvement (through nitrogen fixation, increase of soil humidity, etc.), for instance through leguminous plants, is highly recommended, especially in the project area of NSWCP. It is a cost-saving and highly effective method for soil fertility improvement; furthermore, the plants provide high quality fodder (see also SHAO et al. 1992: xi, 173-174).
- Improvement of **composting technologies**; it has been observed that many farms use inappropriate techniques for storing compost (purely on the ground, no cover, etc.) which results in a high loss of nutrients through leaching.
- Propagation of **trashlines**: Only one farmer in Tanzania uses trashlines on her farm as a biological conservation measure, no Kenyan farmer implemented trashlines although MOALDM (1998: 21) writes: „Trashlines as biological conservation measures are popular with farmers." trashlines are effective barriers against soil erosion and additionally provide nutrients.
- Promotion of **minimum tillage and sub-soiling**. These practices have not been observed on the farms. However, NYAKI (1998: 64) mentions that „These practices are particularly important in low potential areas [...] where improved moisture conservation technologies are very critical for optimum crop production"(see also HUDSON 1984: 220-22). Of course, negative side-effects like high labour demand for weeding, stated by villagers in the research area of HATIBU & MTENGA (1996: 36) or high demand for pesticides have to be taken into consideration as well.
- Intensified propagation of **fodder banks (fodder grasses/-plants)**, especially in the project area of NSWCP since fodder banks are mainly implemented on the Tanzanian farms (see also TIFFEN et al. 1996: 71). But a warning has to be included, too: "Care needs to be taken, when experimenting with, and introducing exotic species into a system, be they trees, grasses or crops, so as to have some idea of how they perform in that system and how they may affect other species" (BARROW 1996: 202).
- Knowledge dissemination on cheap technologies for **preservation and storage** of **fodder and crops** like treatment with natural products should be integrated in the

project activities as often no properly treatments are known to prevent stored products from pests and diseases (see also HATIBU & MTENGA 1996: vii).

- The projects should intensify their endeavour on the spreading of knowledge on **traditional food crops and vegetables** like e.g. millet, sorghum, cow peas, amaranthine or black nightshade; within this context they should put special emphasis on drought-resistant species, e.g. Bambarra-groundnuts. In the Kenyan project area, two farmers work in this field through their own initiative. The positive effects of local food crops and vegetables are obvious: They are nutritious, many of them are drought-resistant, not as exposed to pests and diseases like most of the introduced exotic species, and they are adapted to their ecological environment. However, preferences, interests, problems are location-specific; strategies have to incorporate this fundamental aspect.

Fig. 120: *Argemone mexicana*, a troublesome weed on a field in a high potential area in Tanzania

- **Intensification of farm trials** is another aspect to be mentioned within the context of the improvement of project activities, especially within NSWCP. Worth mentioning are the field trials carried out on farm 2T-I in co-operation with SCAPA concerning fodder grasses/plants; they have a high educational value as the farmer and her husband receive study tours, etc. Not only biological field trials like on weeds (see also Fig. 120) but field trials on physical aspects like soil erosion are needed, too. It has been stated earlier for NSWCP: „There is still a wide gap between research, extension and the farmer. The last review recommended intensified farm trial collaboration with the general extension service. This is still quite far from being accomplished“ (TIFFEN et al. 1996: 42).

Subsequently, recommendations related to animal husbandry are given.

- Since six farmers only practise partly zero-grazing and three not at all, it is recommended that all projects intensify propagation of and training on **zero-grazing** and **dairy milk production**. Apart from the positive effects on the environment zero-grazing serves several important benefits as has been shown by the farmer families which are engaged in this practice: It supports the empowerment of women through an autonomous respectively equally shared activity for income-generation

– also with respect to the female-headed households. The money from the sale of milk is of benefit to the whole family. Furthermore, milk is a valuable source of nutrients especially for the children. However, the projects have to carefully consider cultural and traditional aspects related to livestock since in many cultures, like, for instance, among the Maasai or Wasukuma, a high number of especially cattle means wealth, security and a high social status; special strategies are needed to change these attitudes. Furthermore, it has to be assured that activities which are in the women's domain (e.g. selling milk) are not taken-over by men through the integration of new technologies.

Within this context the projects should evaluate marketing facilities and explore opportunities for the improvement of preparation and preservation of **yoghurt** which is a valuable component in the diet as well as according to storage aspects; almost all farmer families stayed with relied on this milk product especially during the dry season (see also HATIBU & MTENGA 1996: ix).

- As some farmers also mentioned their interest in **poultry-keeping** the projects should focus on this aspect as well; the same goes for **bee-keeping** as a promising measure for income generation and food quality improvement.
- The implementation of **(fish) ponds** should be considered by the projects NSWCP and HASHI-ICRAF. This measure, implemented by the SCAPA-project, has shown to be a valuable contribution to the supply of the families with protein and cash.

The following recommendations given are linked to energy-and (domestic) water management.

- Intensification of the propagation of **improved cooking stoves**, especially through SCAPA and HASHI-ICRAF. This measure has been shown to be effective (see also SHAO et al. 1992: 181; BARROW 1996: 180) and already been spread in the areas. However, constraints have to solved like non-availability of clay or missing skills. Additionally, negative side-effects like increase of firewood consumption due to the better cost-benefit ratio (NEDA 1997: 14) have to be evaluated. Generally, other sources for energy have to be considered like
- **biogas cookers/bio-digesters** as an environmental friendly and cost-saving alternative to wood and charcoal (farmer 6T-l already prepares the installation; farmers 2T-h and 3T-h are also highly interested in this technology). The projects should either include this aspect in their own approach or closely work together with other projects in the region. Furthermore, the potentials of the integration of **solar energy technologies** should be evaluated as some farmers asked about this technology (see also SHAO et al. 1992: ix-x, 181; HATIBU & MTENGA 1996: vii, ix; NEDA 1997: 14).
- The implementation of **(rain) water harvesting methods** like water tanks, dams,

water reservoirs should be intensified, in particular in the project area of HASHI-ICRAF, since here all farmers visited suffer from (periodical) water shortages. Water management strategies should also be intensified regarding the protection of **natural water sources** like springs; during the farm stays several springs have been visited which were not managed well. Within this context tree protection and re-growing/planting has to be emphasised (see also SHAO et al. 1992: 172).

The following recommendations are related to empowerment which includes gender, economic aspects, education, land rights, decision-making, the youth, etc.

- Not only farmers, but even project documents criticise hindrances as to **gender aspects**. A NSWCP programme proposal states that women will be given attention (MoA 1996: v), but a study carried out in nine catchments mentioned that no attempts have been made by the extensionists „[...] or SCCs, or any other body or group, to address matters of special concern to the women" (ADMASSIE 1998: 97; see also MOALDM 1998: 12). NYAKI (1998: 79) concludes: „[...] more training is required in aspects related to gender to sensitise more farmers on the importance of gender balance". The aspects to be considered are elucidated in detail below.
- The strengthening of **women's participation in public decision-making processes** is to be considered by all projects since this still forms an obstacle for many women in the project areas as has been reported from various sides. This could mean, for instance, the strengthening of their roles within Soil Conservation Committees, because this aspect is crucial within the development context (see BLUME 1998: 46): Especially in the Tanzanian project areas, women still do not participate equally in public decisions, do not take part in public meetings, etc.[151] Farmer 3T-h said that project support is badly needed as to this aspect. She is almost the only woman to fight for this right and fears to face restrictions.
- This study leads to the conclusion that special attention has to be paid to **female-headed households** in all three project areas. The need to consider the women farm managers as a special category has e.g. been stressed by the NSWCP-annual report 1997/98 (MOALDM 1998: 16). It has been shown that female-managed farms in general are the farms with the most unfavourable conditions in total. The inclusion of a sample of female farmers in training, farmer field days, meetings, workshops, seminars, etc. will improve the situation of women farm managers as well as they can also function as mediators to reach other female-farmers. CHAVANGI (1998: 69) suggests: „[...] holding demonstrations and special training on

[151] TIFFEN et al. (1996: 73) write in the context of a NSWCP evaluation: „[...] in most Districts we found women participating fully in Catchment Committees, and well represented amongst District Agricultural Staff. The need to recruit women to the agricultural service has been recognised and practised in Kenya since the 1950s." Exceptions are partly linked to the size of the catchments: „Our recommendation is for smaller catchments, in which a general meeting is more likely to be the electoral mode" (ibid.).

women managed farms which would subsequently lead to holding field days on such farms. The special focus would make it possible for the women farmers to relate to each other and be encouraged to attend and visit their colleagues for further discussions [...]" (see also MOALDM 1998: 16 and chapter 7.3.2).

- This includes also that activities for **awareness creation amongst men** as to gender aspects have to be undertaken by the projects. There were many complains about the men pertaining increasing lack of care-taking for the families and other problems (see chapter 6.2.5). Awareness could be created through gender training like has been shown by farmer 2T-I (see chapter 8.2) and, like has been suggested by the husband of farmer 1K-I, through discussing this subject within the Village Council and with the elders. A project which has been visited in 1998 (SACDEP, Thika, Kenya) prefers to work with mixed groups for awareness-creation. An extension officer said: „SACDEP prefers mixed groups and encourages men to participate; men have to know what is going on so that they allow the women to join the meetings and understand the importance of taking responsibility and sharing duties."
- The strong interest of the female farmers researched in and engagement for education was very encouraging since education is generally agreed on to be the key to empowerment and development. Many farmers criticised the high (school) fees which they cannot afford to pay. Accordingly, the support of **girl's/women's education** could be transposed into action through the implementation of credit programmes, reduced (high)school fees or flexible payment schedules (see also CROWLEY et al. 1996, WILLIAMS 1996). Furthermore, it has been demonstrated that there is still gender inequality with regard to education; still, the education of girls and women is on a lower level, especially in Tanzania (see also SHAO et al. 1992: 174).[152] Strengthening education "[…] will increase farmer's awareness, positive attitudes towards new innovations, and self confidence in taking chances in the agricultural development process" (HATIBU & MTENGA 1996: 27).
- The female farmers as well as group members in all three project areas stressed that the **credit situation for (female) small scale farmers and groups** has to be increased; they said that their empowerment is directly linked to credit-access. As an example, giving loans to individuals and groups for to make improved cooking stoves has positive effects on the financial situation of the women/groups and on the environment (see also SHAO et al. 1992: 181). Some farmers said that in some cases it is more difficult for men to receive a loan than for women, and some men complained about this aspect. Accordingly, it is important to foster women and

[152] „It should be realised that Kenya differs from some neighbouring East African countries in that the status of women has risen considerably over the last few decades. [...] The 1989 Census showed that in the age group 20-24 81 % of young men and 71 % of young women had reached standard 5-8 of primary school and that 39 % of young men and 30 % of young women had at least some secondary education" (TIFFEN et al. 1996: 73).

women's groups on an integrative basis, taking men's interests into account as well, and not in an isolated form which can have serious contrary effects to the ones desired.

- **Land tenure issues** have to be taken into consideration by the projects, too as „Land tenure issues appear to be the second common factor affecting implementation, cutting across the republic" (MOALDM 1998: 44). „The more secure the tenure, the more there is investment in land husbandry practices" (MoA 1996: v). This is not only related to general land-rights, but to land rights especially for women as well as has been shown by farmer 2K-m. BARROW (1996: 179) suggests: "Women's ability to secure land and tree rights of ownership and access can be strengthened by clarifying their overall legal status, and removing the conflict in interpreting customary and national laws and regulations in actual practice [...]." Also the factor of sub-division is important: in the case of farmer 3T-l all family members inherited a piece of land almost too small for food security or for the planting of enough trees to achieve self-sufficiency with regard to firewood. ADMASSIE (1998: 95) mentions concerning NSWCP that sub-division „[...] posed a serious threat to the sustainability of the measures/structures induced by the programme. It jeopardised what had been achieved in the course of implementation by rendering most of them more or less irrelevant."
- The analysis has shown clearly that **women's involvement in and control of processing and the marketing situation**, e.g. for farm products, handicraft and tree seedlings has to be encouraged in all three project areas (see chapter 6.1.1.1). One possible activity is to form special marketing groups within existing groups like has been observed repeatedly (see CHAVANGI 1998: 70; MOALDM 1998: 16; NYAKI 1998: executive summary). NYAKI (1998: 66) criticises that "SCAPA has not had any substantial influence on the marketing system of various products in the programme area. In fact, SCAPA is only offering training on farm economics and marketing." Within this context, efforts have to be made with regard to **crop diversification** to reduce negative aspects like competition and low prices due to over-production of single crops. These problems have been reported by many farmers as being a common experience (see chapter 6.1.1.1).
- Furthermore, **the infrastructure** as to road conditions and the transport situation has to be improved. Bad or even inaccessible roads have been reported in all project areas by farmers and the projects (and according to own experiences) which not only hinders the market situation or distribution of seedlings, but also project activities like training, study tours, etc. (see also SHAO et al. 1992: x, 186).[153] After the leader of the Winrock's African Women Leaders in Agriculture

[153] For instance, in 1998 the author visited a women's group tree nursery in Morogoro. They had been given some hundred tree seedlings by an organisation, but had no transport; the chairlady said that they will loose the seedlings - and thus income! - if they cannot find transport. This example shows that organisations which distribute seedlings (for free) to e.g. women's groups must ensure

and Environment programme, Mrs KABUTHA, when starting a project on crop production, etc. the chain must be thought through in advance, from production through transport to sale and distribution (HINCE 1999: 4).

- According to the encouraging activities and engagement of the women's groups visited during the research, an intensified **incorporation of women's and mixed groups** is recommended, especially for reaching groups like the poor or female-headed households. This aspect has been stated to be missing within the concept of NSWCP (MOALDM 1998: 10). And NYAKI (1998: 79) mentions: "SCAPA in collaboration with other institutions/NGOs operating in the programme area should assist farmers in the formation of sustainable farmer groups or associations as one of the potential strategies to address the problem of lack of credit facilities for the procurement of improved inputs. Such groups will also address the market related problems which is also one of the major constraints experienced by farmers in all the programme area" (see also BLISS & GAESING 1992: 178; JONGKAMP 1996: 6; MOALDM 1998: 45; HAUPT & HORNETZ 2000: 108). KINUTHIA (1993: 41) notes: "Tremendous potential exists for using these participatory groups as a basis for wider community mobilisation and creation of wider grassroot networks free from any form of patronage, in pursuit of independently determined aspirations." MARTINE (1997: 19) gives some background information: "Whatever the reason for the current lethargy, environmentalism needs a new jolt of energy: **women's movements** could provide the stimulus. Just as in the case of environmental management, women do not have any inherent or genetic advantages in promoting environmental awareness. Nevertheless, culturally-determined circumstances have historically combined to make women a most vocal and effective force in 20th century social change. Thus, at this particular moment in time, we can envisage women's movements as potentially playing a primary role in the promotion of sustainability. Feminism has repeatedly proven capable of breaking down some of the most strongly entrenched and apparently-indestructible social structures. If it were now to turn their attention systematically to the environmental plight of our Planet, it could become the most important single force in the transformation to sustainability." BARROW (1996:184) concludes: "Existing groups-functioning women's groups should be used as building block for further development" (see also SHAO et al. 1992: xi, 186).
- The group members in general expressed the wish to get support from the projects concerning **contact to and exchange with other groups**, not only within the region (!), but in other parts of the country, too or even across the border. This includes hosting group members as well as visiting groups themselves (they suggested to send a delegation of 1-3 members).

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the marketing/transport situation, too, otherwise this well-meant gesture is likely to cause at least only trouble for the women, who care for the seedlings and in the end do not get anything out of it.

Within this research it has been referred to the various positive effects of the women, especially in leader positions (see chapter 7.3.2). However, projects should observe the leaders to prevent the risk that they might take control over the groups since they often are the more prosperous and well-educated ones within their groups.

- The projects should concentrate on an intensified **incorporation of innovative and successful female and male farmers** e.g. in farmer field days as an example for a sustainable land husbandry to motivate other farmers. The benefits of these farmers have been described in chapters 7.3.2 and 8.2. As has been shown, they are knowledge careers, pioneers and mediators within project activities. Positive experience with this approach within the SCAPA project has been summarised by NYAKI (1998: executive summary): "Some of the programme areas have been identified as ideal sites for intensive interaction between farmers, research scientists, extension staff, policy makers at the national, regional and international level interested in successful cases of technology transfer. The sites have been used as training sites through field visits by the scientific community as well as other institutions [...]. Such activities have to some extent influenced the attitudes and life styles of farmers in the respective sites. Such contacts have also promoted the rate of adoption of the technologies promoted by the SCAPA Programme."

  Generally, the projects have to be aware of the fact that a strong encouragement of women is not negative for men in the end, thus, they have to avoid a negative feedback through one-sided help like jealousy, etc.

- **Intensification of the involvement of the youth → young farmers** in project activities (e.g. support of youth-managed tree nurseries) is recommended. It is a promising method to reach the future farmers and managers of the environment like has been observed in the project areas were e.g. some farmer's children were engaged in youth projects (see e.g. JOHANSSON & WESTMAN 1992: 43; TIFFEN et al. 1996: 77; BARROW 1996: 240). Within this context the projects should undertake efforts to support the establishment of **'environment-related performance youth groups'** (like the one in Ufala, Shinyanga Region, Tanzania - see chapters 6.2.1 and 6.2.2.2), support group exchanges and contact of such groups to e.g. other schools for education and motivation: "The pupils can be used as a channel for reaching the community and will also be influenced themselves, thus changing the behaviour and attitudes of the new generation" (TENGNÄS 1994: 156; see also SHAO et al. 1992: 178).

The following recommendations are linked to project extension.

- Many farmers and members of the women's groups, especially in the project areas of NSWCP and HASHI-ICRAF, complained that contact to the projects is not sufficient (see chapter 6.3). Accordingly, it is recommended that the extensionists pay

regular visits to the participants. Irregular contacts jeopardise project activities on sustainable sound husbandry because the farmers feel abandoned; they may have questions, but receive no support. The resulting danger is that they might either loose interest in following the activities or might carry out activities in a wrong way due to lack of project support. Motivation and interest of the project staff are key elements. Constraints stemming from financial and logistical problems, such as lack of mobility which has been named as a major problem in all project documents, have to be taken as a serious issue within the project set-up. BARROW (1996: 196) writes: "Contact between extension officers and people is the critical interface. If inadequate or inappropriate, no amount of academic research could be threaded into the system, nor would local concerns and knowledge find their way to the government and research systems [...]."

- Closely linked to this aspect is the control of **individual and group activities** through **/follow-ups**: This aspect is fundamental since not holding contact to the people is likely to result in the fact that people loose interest or link engagement only to few individuals and not to the project itself. The conduction of regular meetings with e.g. Catchment/Village Committees is highly recommended - also with regard to the factor that in fact many committees are inactive, irregular or virtually non-existent (ADMASSIE 1998: 91). The same study, carried out in nine catchments within NSWCP, described that the soil conservation measures induced by the programme have been degraded or even completely disappeared. The report (ibid.: 95) emphasises that the „Absence of follow-up and periodically reappearing guidance has hindered the sustainability of measures, particularly in areas where the implementation had not been effective or where the achievement of the implementation year had been undone due to sub-division. [...] it is very important to underline the critical necessity for, as well as the different objective of follow-up in farms that have undergone basic transformation through sub-division (and also sale or merger)." Farmer 3T-h describes this problem and makes a suggestion how it could be solved: "Some contours have already been measured (see also Fig. 121), names registered, but no one is digging. I fear that the VSCC could fall apart because the people relate the committee to me and give

Fig. 121: Members of a VSCC in a high potential area in Tanzania conducting the measurement for terraces

to me the full responsibility for everything. I need support for being able to stress the thing. I have got an idea: SCAPA comes to the village, me as the chairlady of the VSCC give to them names and data already registered. Then after 7 days SCAPA comes back to control the result. You will see how quick they can handle their hoes." Farmer 3T-I noted: "Wazo langu (my thought): After SCAPA has conducted training the government should control the implementation."

- Farmers and group members emphasised the need in more **training, seminars, workshops and study tours** on various subjects inclusive **refresher courses/ follow-up training**. In contrast to SHAO et al. (1992: 180) who mention that there is *no* need to take people to other regions to see the success of environmental programmes, exchange with and study tours to other regions is highly recommended as especially this activity enhances and contributes to knowledge exchange as has been stressed by the farmers and group members.

- In general, the **timing of training** has to be made according to the timetable of the farmers, especially the women. It has been observed in the project area of HASHI-ICRAF that the trainers – due to a puncture – arrived hours later, leaving the women waiting in the sun with the consequence that they were already exhausted before the training started. Furthermore, through the delay the training had to take place during high noon, which caused impatience and restlessness due to unfavourable climatic conditions (→ hot sun) and the fact that the women had to prepare lunch for the children, etc. (see also WILLIAMS 1996: 9; IRACC 1997: 7). Such kinds of interference have to be avoided.

- **Improvement of knowledge dissemination** is an important aspect in general: farmers mentioned that their access to information is limited. Mass extension methods - besides seminars, workshops and study tours - are recommended like

  - **training/information materials** (books, pamphlets, newsletters, extension manuals, posters) (see e.g. TENGNÄS 1994: 156-157; T-SLMNRP1998: 41). NYAKI (1998: 64) mentions with regard to the programme of SCAPA: "[...] the impact of such documents in the programme area has been minimal at least in part because most of the documents have not been distributed to farmers in the programme areas."
  - **radio** and **television** programmes on environmental education issues which has been suggested by many farmers (see also SHAO et al. 1992: 179),
  - **videos and group performances → drama**, an effective method to spread knowledge and create awareness applied successfully by HASHI-ICRAF to educate and motivate people on environment-related themes through songs, dances and performances based on the socio-cultural traditions of the people (see also URT 1998),
  - **setting-up of environmental education and information centers and museums** (e.g. in combination with a restaurant) informing about tradition and culture

of the people living in the project area, their land-use practices and their natural environment like has been done by HASHI-ICRAF in Shinyanga, Tanzania, is a very effective method to spread knowledge and create awareness with regard to sustainable natural resource management (see also URT 1998: 28).

- **set-up of libraries and documentation rooms** for the collection of (project) documents, literature, newsletters, etc. for the enhancement of knowledge dissemination like has been done at HASHI-ICRAF Research Center in Lubaga, Shinyanga Region. One of the main constraints in the frame of the research was, in fact, the availability of material.

- Another important aspect to mention is the **availability/collection of project documents and project relevant material**. This is in general an unsatisfactory situation. Many documents, although being written by order of the projects, are not available at the offices. HASHI-ICRAF keeps a library, but even there the same problem occurs. All projects have to put more emphasis on this aspect if transparency and a good evaluation status shall be achieved for the progress of the projects in the whole.

The above given recommendations are an extract of the analyses made on the different levels and aspects. The most important aspects to be considered have been named. However, details can be considered according to Tab. 61 and 62.

11 Working in the field: 'the factors behind'

11.1 The general experience

> "[...] those of us who work directly with village women and men have a great responsibility. As outsiders who enjoy a certain degree of power, privilege and security, we must remember that many insiders do not."
>
> FAO (1998: 7).

This chapter discusses experiences made while working 'in the field'. Problems faced as well as solution strategies, positive aspects, reflections on inner processes and on the surrounding (the own influence and vice versa) while living in a different socio-cultural and ecological environment shall be made transparent to dissolve/ clear up the private character of the exploratory phase of investigation (see also SCHÜTTE 1998: 53-54). "Life in the field involves the same emotions as life at home: elation; boredom; embarrassment, contentment, anger, joy, anxiety, and so on. To these are added, however, the necessity of being continually on the alert, and the necessity of learning new routines and cues. These necessities are likely to force a heightened awareness of facets of one's personality of which one had not been aware before. This can be an emotionally devastating experience, but it is by no means inevitably so" (GULICK 1977: 90). One of the most far-reaching and lasting experiences for me was not the culture shock when starting the field work and while being in the field, but afterwards, when I came back to my home place. Like FRANKENBERG (1983: 50) mentioned, the sometimes quite irritating fact is that after such an experience, you can never look on society – and I would even go further and say: on all aspects of life – in quite the same way as before. Experiences made and impressions gathered during the field work belong to the most intensive chapters in one's life: you live with people, share their life, make friends, become used to everything and by this – at least a little bit – part of 'the other world'. It is no wonder that you are not the same person like before, and I guess that this feeling never will disappear completely again. At least, all experiences become part of our self, of our being, whether they are – from the first impression – 'good' or 'bad'; it is just the way how we deal with it.

Fig. 122: The author carrying a bunch of hay

During in total two field phases I lived within 18 different smallholder families in Kenya and Tanzania. I have been more or less completely integrated in social live and daily activities. A central element besides daily activities (cooking, doing the dishes, fetching water, collecting firewood, cleaning, looking after and playing with the children, going to the market, taking care of animals, field work, etc. - see Fig. 122) and doing some extraordinary work (repairs, restoration activities like room paintings - see Fig. 123, drawings serving as pattern for embroidery, etc.) formed visits to neighbours, friends and relatives as well as going to church on Sunday (not on all farms). Based on the method of participant observation (see chapter 1.3.3.1) I was able to collect information and data during informal meetings in various situations without confronting the women, their family members as well as their social environment with a conventional interview situation and the well documented (see same chapter) negative side-effects of this investigation method.

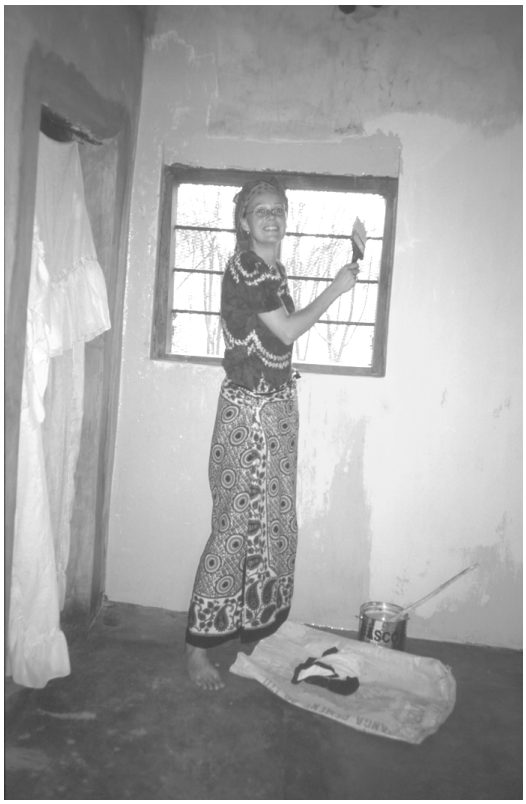


Fig. 123: The author painting a wall at a family's place

Intensive social contact and exchange is *the* fundamental element within all Tanzanian and Kenyan families visited as well as their social environment as this aspect is part of the culture and tradition within African societies in general. In the beginning, the confrontation with these intense forms of social interaction sent me several times into a state of high tension, keeping in mind my European background (although I had lived in Tanzanian and Kenyan families before). On the one hand, this upcoming feeling can be described as a feeling like 'loosing myself', simply due to the fact of the loss of any private sphere and possibilities for retreat. As GANS (1983: 58) mentions, carrying out field research by applying the method of participant observation requires the suppression or postponement of satisfying personal needs. Actually, this experience belongs to one of the most demanding tasks after my experience. On the other hand, the feeling of 'loosing myself' was caused by the fear that I might not reach my goal of getting answers to all the questions gathered in my question guideline when I might never find time for being alone, reflection, recreation, and so on; thus, I had the feeling of time pressure; several times I found myself in the situation of being impatient and had to bring myself down not to get upset by the initial inability to order and understand the constant influx of data (see also GANS 1983: 58). Gradually, however, I became used to the situation, was able to arrange myself and

could cope with the circumstances. The most helpful attitudes were being calm and patient. By this I experienced that in fact, many questions arose without having a hand in the matter; I learned answers without even having to ask the questions (see also FRIEDRICHS & LÜDTKE 1973: 44), and I learned that there was sufficient time. I can support the quotation made by FRANKENBERG (1983: 50-51) that "It is sometimes quicker and more economical to wait for questions and answers to come to you." This experience also includes that I learned a great deal about social status, values, etc. of the socio-cultural setting my participants lived in by the questions people asked me: *Have you got a car? Where do you live? Who are you belonging to (kinship)? What do you people eat? How far is the market? Where do your parents and relatives live?* This aspect ranks as one of the most important experiences of my field work as well as the fact that I have been hosted by all families and integrated in all parts of social life as if it was the most natural thing in the world. Altogether, these aspects are a confirmation for the success and value of the participative approach.

My experience is that the bigger the group the easier it is to cope with research difficulties (see also GANS 1983: 58) since the chance for retreat and taking the part of observer instead of active participant is the highest.

Like has been said before, generally, all families are distinguished by a deep hospitality. Guests are welcome and are appreciated as a gift. Farmer 1K-l explained this fact and said there is even the saying that "Wakamba wanatoka Kenya wanapenda wageni" (the Kamba people from Kenya like guests very much). Guests are even connected with God, which can be seen by sayings like "Wageni ni mpanga ya Mungu" (guests are instruments of god) (3T-l) or "Wageni ni baraka, watoke ya Mungu" (guests are a gift, they come from god) (2K-m).

My reception by families was uncomplicated and outspoken. If inter-action was difficult, it turned out that it was for the most part within those families and their social environment, where the differences with regard to education and socio-cultural aspects were the greatest (3T-l, 6T-m). At the place of farmer 3T-l, I felt very uncomfortable in the beginning. During a conversation it came out that I was right with my observation and feeling that something 'was wrong': the woman felt ashamed and wondered why she had been chosen to host a 'white researcher' („I am a poor single woman" – interestingly enough, farmer 6T-m said exactly the same). She told me that my visit meant a great honour to her. Obviously, she had prepared many things for her 'special guest': she had repaired her house (the mud had not completely dried up that is why I could see it), she lend a sofa (when approaching the house together with the extension officer, we saw people carrying it to the house and discussed this aspect), she had new plates and had requested a relative to help her with cooking. In fact, the analysis of different data showed that she is one of the poorest farmers in the sample, and this aspect might have formed an obstacle (in the beginning) for an unembarrassed contact.

The daughter of farmer 6T-m was the only child with whom getting in contact was almost impossible. She appeared to be very shy and suspicious. First, I thought that this only was due to my presence, but after a while I found out that she was not only the only child of her mother but the only girl in the whole neighbourhood. The boys around – her mother's brothers were almost of the same age - did not only pay no attention to her and simply ignored her so that she was excluded from participation in their games, etc., but they teased her or even drove her away. She was obviously lacking social contact to other children since there were no girls around in her age with whom she could play. In fact, a strange and sad situation. Anyhow, this information helped me to get over the feeling that her behaviour was a reaction only on me. Of course, the phenomenon of sympathy which cannot be described easily, plays a key role, too (see also FRIEDRICHS & LÜDTKE 1973: 183-184). There are people with whom you get along more easy, no matter in which part of the world you are.

In a few cases I not only had the feeling that the family or some family members anticipated or apprehended something from my stay, but some expectations have been mentioned directly like money, tools, linking them up with donors or support of children's education. As I was prepared that something like this could happen I was always able to solve the situation without negative effects. I simply described my aim and situation and told the people that my only possibility (and duty) is to spread the findings to as many different projects, institutions, etc. as possible they understood.

Several experiences strengthen the opinion that the lower the education level and exchange with/contact to the outside the more difficult the contact to the persons turns out to be. This experience confirms the assumptions made in chapter 1.3.2 that it would be more difficult to come into contact with poor people in general. I want to point out that this observation is not meant as a grading but only refers to research aspects.[151] It can be stated that the poorer the target group the more sensitivity is needed.

I did not recognise any negative side-effects like different behaviour when in contact to people outside 'my family' like e.g. group members due to the fact that one of 'my' family members, especially the woman, was active in the community (group leader, member of a village committee, etc.) and thus might belong to a different social layer (see GANS 1983: 56). This may be due to the fact that the research was not so much about personal aspects, but about problems and issues related to a more or less neutral and more general theme. Furthermore, I only stayed up to seven days in one family, and each family lived in a different village. The only exception were three families who lived in the same village. On the last evening of my stay on the third farm in that village, the two women with whose families I had stayed before came

[151] Research targeting a weak group like poor women/men should preferably either be carried out over a long time period to create a stable basis among the researcher(s) and the target group or should be carried out by a researcher belonging to the same culture and ethnic group (this should be emphasised within research anyway!).

along to say good bye, and we had a very nice evening together. The fact that the women had personal contacts, a. o. through involvement in the women's groups, may have had an influence on the decision to come along.

In general, the people were very much amazed about my intention to live with them. The time, they realised that I really was intended to sleep in their houses, eat their food and carry out all the daily work that belongs to the daily life of East-African small scale farmers, they were deeply impressed and showed their appreciation through a variety of reactions (open joy like starting singing a song, shaking hands, invitations, etc.).

Like GANS (1983: 57) outlines, the first problem (when finally in the field) is that of entry: One day I went to meet a women's group together with the project staff to inform them about my intentions. The project leader briefly introduced me to them; I saw them looking at me with suspicious expressions on their faces. The moment I opened my mouth, I saw the first women's faces to lit up; I told them about my plans, but they just could not believe; so, after I stopped, they turned to the project leader and started to ask questions like: "Where will she sleep, what will she eat?" After he had confirmed that I will really sleep in their beds and eat their food, they were not only delighted, but convinced that I can stay with them. After singing a special 'welcoming song', everyone came to me, took my hand or even embraced me and gave me a warm welcome.

After every successful entry, still feelings like fears of that I might be refused entry to the next situation or other problems came up (see GANS 1983: 58). Of course, also, little problems occurred like transport problems or a personal problem with one woman. More serious was the confrontation with the Ebola outbreak in Uganda during the second field work period. Since the area was close to my research area in Kenya, I had to drop this project in the end, mainly due to risk of life. However, in total, the field work was successful, with regard to personal experiences and data collection.

During my fieldwork, I realised that I did not only arouse amazement and delight through my presence and participation (see also Fig. 124), but contributed to cultural exchange and mutual understanding as well, especially through the fact that the people had time to get to know me, to ask questions about my personal and general background (life, food, climate, education, animal husbandry and agriculture, housing, energy, cars, etc.). The people saw

Fig. 124: Dancing with farmer 2K-I

that white people are not only either the ones who travel far (in Swahili, white people are called *wazungu* - the ones who travelled far) and enter their country for a few weeks without having contact to the population and showing interest in understanding their life conditions, etc. or the ones who ask a lot of questions in a very short time and disappear without a sign. They saw that there are also people who want to learn and understand by participating in their daily life as well as give them the chance of coming to know our culture, problems, etc. better, who want to create understanding of and awareness for their problems and solution strategies and by this contribute to knowledge exchange on an international level. Even though it is a small frame - a micro part of this world - here, insight - and by this - understanding and processes of change have already taken place - on both sides!

Again and again, people emphasised the importance of my presence for awareness creation - an aspect I did not think about before. They said, people's attitude is often not to take 'insiders' advises serious and put into action, but still to focus on outsiders. Farmer 5T-m explained: "I planted a lot of trees on my field, but the people only laughed about me; they cannot see the benefit. When they saw that a white lady stays with that poor farmer, having no husband but a lot of trees, they started to realise that there must be something about me. You will see, the people will start planting trees now; now they will listen to me."

This description is likely to reflect signs of still present relics from as far as the colonial system and power relations created by development aid strategies in the first decades which have to be eradicated. Empowerment includes that people find back to their own knowledge systems instead of relying on help or advice from outsiders. But these processes have to be started slowly by working with these attitudes and changing them, e.g. by just playing the role of a mediator, not of the one who has to judge. Visiting of and staying with key persons means empowering them and their social environment. My hope is to be a positive example and that any mistakes made, in particular concerning being sensitive against people who belong to a different socio-cultural environment, with different traditions, taboos and background, do not cast a shadow over the positive effects, but are part of learning.

I would like to emphasise that the people made it easy for me to become part of the rural society/community and their daily life - as far as this is possible during such a short period of stay. Furthermore, my background of having grown up partly in a rural area under 'simple conditions' and working with my grandparents in their home-garden was helpful to my scientific work in the field. Also my experiences due to longer stays in Tanzania and Kenya before turned out to be valuable for the design and carrying out of the field work. These facts were more important than the fact that I sometimes wished to have the possibility to reflect on and talk about my research with a friend or relative, etc. However, I sometimes had people to talk with like e.g. a

researcher couple who was carrying out research in the same project respectively community or a Kenyan friend. GANS (1983: 56) argues that the participant observer must have someone with whom he/she can talk personally about his/her work. I would say that this is basically right. Nevertheless, I like to admit that it is a valuable and positive experience – also with regard to data collection and analysis – to be without any 'outside contact' since this creates the situation to reflect on experiences, situations, persons, etc. from inside. Outsiders give comments or advises from outside; this might help objectivity on the one hand, but also provoke misinterpretation on the other.

Being a woman actually was a precondition to enter the women's world. Very often when we discussed 'women-related subjects' and a man approached, the women kept quiet or changed to another issue. Also I made the experience that my age of above 30 was ideal since it brought me into the position of not being too young for getting close too older women and not being too old for approaching younger women (age plays a central factor within Kenyan and Tanzanian societies as a whole (see also SILVERMAN 2000: 206-208). PUNCH (1994: 87-88) outlines: "But rather than concluding that fieldwork is not for the "over 40s", one could also argue that advancing age and increased status can open doors to fruitful areas of inquiry […]."

Of course, one of the very central criteria was the one of being married and having children. When I explained that I do not have children yet, and that, if I had, I would not be able to carry out research, especially not in Africa, far away from my children, the people understood immediately; in fact, this aspect never formed an obstacle for my field research.

It was of interest to me to find out what the people thought about research conducted upon them and researchers in general (see also SILVERMAN 2000: 208-209). Only few families had contact to a researcher from outside before (3K-l, 1K-m, 1T-l, 2T-l, 1T-h, 2T-h); they have been described in a positive way as friendly, engaged and open-minded as to people, their culture and problems. What has been noted by almost all of the people asked who had contact before was the fact that they miss contact and outcomes of the research. They felt 'being left behind' although they did not say it in a negative way. This leads me to the point to summarise that the fact of staying so close with people usually – if there is sympathy between the researcher and the people visited – inevitably leads to feelings like intimacy, security and a sense of well-being; every time you have to leave not only you but all the people around feel bad, too. It is one of my deepest experiences and beautiful remembrances when, at the point of leaving, not only family-members, but friends, group members, neighbours, etc. came along to say good-bye; these were very emotional moments for all of us. JANESICK (1994: 214) notes: "[…] [leaving] the field setting [is] often an emotional and traumatic event because of the close rapport that can develop during the course of a study."

As I mentioned above I had to stop my second fieldwork after two months (during which I carried out research in one project area) because of the outbreak of Ebola. This was a very traumatic experience: After arriving in Nairobi I received the message and from then on, a very strange period of re-organising the research plan under new and unsafe conditions began: Initially, I had planned to start my research in Kenya for logistic reasons and due to the fact that I still waited for the Tanzanian research permit although applied since long.

I stayed two weeks in Nairobi – with a break of three days just after my arrival from Europe were I went by bus to my research project near Homa Bay at the eastern side of Lake Victoria to discuss the situation with the project manager. He advised not to start my fieldwork now since Ebola was too close and the outbreak to fresh, but suggested to wait and start in Tanzania instead which was safer (inland, away from the main route of boat travellers - although, afterwards I think, it still was a dangerous situation). During these two weeks I felt weak, helpless, nervous, isolated, lonely, although I lived in a guesthouse of a friend's family. I spent many evenings alone as I lived in a big and dangerous city, my friends were away for their jobs; other people I knew were not around. In fact, these days were one of the toughest in my whole life. Not knowing when to start research in Tanzania, what about Ebola, phone and e-mail-contacts with friends and relatives – all these things contributed to a strange mixture of emotions. I really went down to the bottom of myself. But, when I finally got the permit and started off for my fieldwork, I was enthusiastic, full of energy and concentrated on my tasks. Of course, Ebola was present each and every hour, but as soon as I was among the families I was able to deal with it since we were all in the same situation, and I felt save through the way how they dealt with it.

During the weeks in Nairobi I contacted the authorities and various persons, and finally succeeded in getting the o. k. to start my fieldwork in Tanzania. After everything was re-organised and a date fixed for the begin of the research I took the night bus to Shinyanga, Tanzania which took 12 hours to Mwanza, Tanzania, arriving at 10 a.m. in the morning. Here, I had a stop overnight, also for logistic reasons. The next morning I took the bus to the research site of the project, 5 km away from Shinyanga where I arrived after two hours driving through a completely dry and desert-like landscape since the rains delayed again. I stayed almost a week at the site in a researcher's guesthouse to discuss research-related aspects with the project staff and to prepare for 'going to the field'. Furthermore, I had the chance to get an inside view on the project's organisation.

The second period in the field was more difficult, also with respect to life conditions in general so that I felt weak in between and took a short break (three days in the researcher's guesthouse of the project). For the first time I experienced my capacity limits while staying with one family: I had to leave after two days since I really was not able to cope with the circumstances (pests, sleeping room without windows, unhygienic situation, very noisy, strange social environment). I managed not to make

the family feel bad that I left by telling them that I had respiratory problems due to the grass-thatched roof, causing a kind of allergic reaction, which was accepted without any problem. I went to stay with another family they knew and who lived close to them, so that I was able to visit and stay with them during the day. Luckily, a solution had been found, creating a situation which was ok for everyone.

After my own experience I would say that it is important to think about a 'plan B' before starting fieldwork so that unexpected situations can be handled and a lot of energy, time and money saved.

Two things I have to admit: a) one is never objective (see e.g. STRAUß 1994: 36; KINCHELOE & MCLAREN 1994: 138-157; JANESICK 1994: 212): "There are no objective observations, only observations socially situated in the worlds of the observer and the observed" (DENZIN & LINCOLN 1994a: 12). But, express it with the words of JANESICK (1994: 212): "As we try to make sense of our social world and give meaning to what we do as researchers, we continually raise awareness of our own biases."

Somehow, my study has been among people who are stereotyped inaccurately (see also GANS 1983: 60): still, biases can be found in literature, mass media, etc. like Africans suffer because they do not know better. One of the central aims of this study is to correct this false picture, to make solution strategies of people transparent by choosing the group of farmers. Farmers are in contact with the land they live on – it is here, where the change starts.

Another aspect to be mentioned is b) no matter how sensitive one acts one will always have an influence/impact on the social environment. The influence not only happens through the exchange of thoughts, opinions and behaviour, but can find its expression in the changing of the behaviour of the target group as well. Although, of course, the degree of the influence depends on the personality of the researcher and the participant – or as PUNCH (1994: 84) expresses it: "(…) perception is shaped both by personality and by the nature of the interaction with the researched […]".

Concluding, I would say that my approach of a total integration in social life through overnight stays at the homes of the researched has been very encouraging and positive, not only for the process of data collection, but for the aspect of mutual exchange as well. Normally, even when the approach of participant observation is applied to research, researchers stay in a separate place, mostly in the research area like the village or compound. Even if the researcher participates in social life during the day, the process of integration is interrupted as soon as the place of research is left for the night. Of course, there are benefits like having time for note taking and reflection from the outside; on the other hand, one can learn to find niches for these activities. After my experience, resting on the bed, sitting outside, taking a walk, or taking yourself back for some time even while sitting in a group etc. leaves enough space (these practices do not create strange reactions since they are common among the people as well; furthermore, the people are very well aware that

researchers from a different cultural background have different needs; in general, the people are highly sensitive to this aspect and intuitively give you enough space). Reflection 'from outside' starts as soon as you do not participate, and even in crowded situations there will always be a chance for retreat. There is no need to physically change the environment by staying at another place, even not for note taking. In my personal case, having a break for the evening and night would have disturbed my entire research process, I wanted to be as close as possible to the people to really understand what is going on, to wake up among 'my family' when the air fills with thousands of sounds by the light of the dawn and activities start like fetching water, making fire or sweeping the compound. And I have the feeling that it was the same to the people. They saw that I am comfortable at their place. Knowing that we share everything for 24 hours a day creates trust and connects one another, a precondition for 'real' participation. To sum up, there are many different ways of carrying out research, and everyone has to find the method that fits best to circumstances and personality.

As can be seen above, I was confronted with a lot of different positive and negative experiences during my field work. Difficulties occurred in 'normal' life, sometimes very unexpected. To give some examples: for instance, questions were interpreted differently (not only due to the different cultural background or because of language problems). It happened several times that to my question on which crops are cultivated on the farm farmers listed all crops cultivated in the *region*, although I had made clear that I just meant the farm. Luckily enough I had made that experience before so I knew already how to ask properly and explain clearly what I really wanted to know. Often, people use *one* local name for different trees or plants; wild plants used as vegetable sometimes have a Swahili-name which in the local language refers to another plant (e.g. *mlenda* within the Sukuma tribe); the only chance to be sure is to have a look at the plants yourself and a good species knowledge. When I asked about livestock kept, chicken were not necessarily mentioned since they are regarded as 'vegetable' (*mboga*). Asked about the number of fields it can happen that farmers only refer to the fields nearby. It is important to tell precisely what you want to know since what might be obvious and clear within our cultural context can mean something different in another society. In general, one needs tact and sensitivity to avoid misunderstandings and mistakes.

Problems come from outside, but are also closely linked to inner processes. One central aspect is e.g. the confrontation with the socio-cultural traditions, norms and values of the target group which might, as a result of the own different socio-cultural background, lead to distortions of perception due to ethnocentrism or other reasons. All in a sudden, familiar self-evidence, norms and practices lose their normality (see also FLICK 1998: 146). STANSFIELD (1994: 184) argues that phenomena like time, spirituality, space, and relationships between humans and nature are culture bound as well as the most fundamental configurations and contents of communication and in-

teraction in a culture. Hence, in Western culture, time is linear, viewed as a commodity and as a horizontal sequence of events; space tends to be defined and to function in a privatised, individualistic way. Spirituality has been defined in institutional terms, being 'something inherently separate from human affairs. Human beings have been viewed as dominant over and separate from their natural environment. These definitions are in contrast to the views of Africans: generally speaking, in Africa social, emotional and spiritual aspects are viewed as integral parts of human-beings within their physical environment: they are grounded in a holistic rather than in a fragmented and dichotomised notion (ibid.: 184-185). The different socio-cultural background can provoke contrasting feelings and lead to inner and/or outer conflicts;[152] I kept a field journal during the whole period of field research to document (not only) these inner processes. One of the most difficult experiences was the lost of private sphere: „Eyes are everywhere, even when you think you are alone." (06.11.'99). [153] Strenuous was the adaptation to all circumstances with at the same time 100% attentiveness: „Dieses permanente auf-Hochtouren-laufen, anpassen, freundlich sein, keine Bedürfnisse...- es ist verdammt anstrengend" (Permanently running at full steam, adapting oneself to the situation, being kind...- it is damned demanding) (26.10.'99). On the other hand, feelings came up, showing that I had laid down by and accepted the situation: „Die inneren Widerstände bröckeln, machen Raum für andere Gefühle wie Liebe, Dankbarkeit, Freude, Demut - letzteres scheint mir ganz wichtig" (Own inhibitions crumble, make way for other feelings like love, thankfulness, joy, humility) (21.10.'99).

All these factors have an influence on the research itself and should be seen as an important part of data analysis. GSTETTNER (1979: 165) suggests to carry out a *restriction analysis*. For an overview and to allow a comprehensible valuation of the situation, the curtailing influences I experienced are listed in Tab. 63 below. Hindrances can be differentiated in external and internal factors, there can be pure technical problems, but also distortions from people. And there are problems linked to myself.

[152] Problematic aspects are e.g. related to personal relationships: The more the researcher has her-/himself adapted to the surrounding, has become part of the family, the more difficult is the farewell (see BORTZ & DÖRING 1995: 316-317).

[153] *"Das Wichtigste ist die Verschriftlichung der eigenen spontanen Assoziationen"* (NADIG 1986: 40).

Tab. 63: Problems and constraints (grouped) during field work

Problems & constraints (X = problem; ☐ = no problem)	**myself**	**Family** (house-hold)	**friends, neighbours, relatives**	**project**	**others**
External (→ **technical, infrastructural**)					
time table	X	X	X	X	X
communication problems (language)	X	X	X		X
Tools & materials (project documents, maps, copy machines, electricity, etc.)				X	X
communication systems (brake-down, none)				X	X
general living conditions (hygienic situation, climate [→ height, humidity, etc.], food/beverages [→ kind, amount, quality], daily time table, small bed, noise, insects, bad light, dust, mud, smoke, etc.)		X	X		
difficult farm setting (relief features, inner-household structures)		X			
availability/quality of transport → road conditions					X
bureaucracy (research permit, etc.)					X
coordination of 'technical things' (e.g. attending camera, recorder; writing down notes, looking after stuff)	X				
data collection & drawing farm sketches	X				
Psychological / physical problems					
physical constitution in general (→ diseases)	X	X	X	X	X
socio-cultural background like religion, taboos, level of education, age	X	X	X	X	X
interpersonal problems	X	X	X	X	X
expectations/demands (100% attention, frankness, being outspoken; financially/material things, contacts, attending social events like worships, visits, etc.)	X	X	X	X	X
own inhibitions (not being sociable, insecurity, shyness, problems with adaptation to circumstances, impatience, inattention, restlessness)	X	X	X	X	X
disturbance of familiarising process between researcher and family & data collection process through (too many) people → 'overstressing' (see also RUGIMBANA & NYANGA 1996: 20)		X	X	X	X
problems to interpret behaviour & mentality of contact persons (e.g. whispering)		X	X	X	X
socio-cultural background, e.g. with regard to private sphere (no possibilities for retreat, neglect of needs, taboos, expectations & pretensions), taboos (→ wearing trousers, semi-luxuries, etc.)	X				
socio-cultural traditions (e.g. eating from one plate, sitting on the ground, clothes)	X				
internal resistances (listlessness & homesickness)	X				

As mentioned above, positive influences are to be named as well. They are crucial to stabilise insecure situations and own distortions. They not only come from outside, but can also be a personal attitude or an expression of a present mood or feeling. The aspects I felt to be important are listed below in Tab. 64:

Tab. 64: Supportive aspects during field work

Support	myself	family	Friends, neighbours, relatives	project	others
warmth & kindness	X	X	X	X	X
being unembarrassed, unaffected, uncomplicated	X	X	X	X	X
joy & happiness	X	X	X	X	X
being ready to help, support	X	X	X	X	X
patience, indulgence, e.g. concerning language problems	X	X	X	X	X
courtesy	X	X	X	X	X
hospitality, frankness		X	X	X	X
taking care of well-being (e.g. inclusion in praying)		X	X	X	X
Integration in social life (social contacts like e.g. visits, church, etc.)		X	X	X	X
peace, leisureliness		X	X	X	X
sympathetic understanding, e.g. for necessity to write, sleep longer etc.		X			
contact to 'outsiders'	X				
writing, reflecting	X				
contact to 'nature'	X				

Of course, the different aspects listed above are inter-linked; the resulting reciprocal effects and interactions can have positive as well as negative impacts on a respective situation. It is important to be aware of these effects for being able to handle a situation like the conduction of a field research within a completely different socio-cultural, ecological, economic an political environment.

11.2 Some words concerning field methods

The approach has been found to be successful, useful and appropriate for the research demand. It revealed that a qualitative approach based on the combination of multiple methods with main emphasis on participant observation has various positive implications:

- Through this method specific and detailed data have been collected which would not have been possible in that way through other methods.
- These data can function as additional and complementary sources to data collected through quantitative methods and can be used for their verification.
- The combination of participant observation with the concept of 'learning by doing' and feedback/backstopping from project staff, agricultural extensionists and experts is a possibility for the control of objectivity of qualitative results, taking into consideration the subjectivity of the researcher (see also AUGUSTAT 1994: 178).
- Especially, the benefits of participant observation listed in chapter 1.3.3.1 can be confirmed and replenished/completed with the positive experiences made; the

(overnight) farm stays allowed a total integration in social life. In particular the close contact to the participants has been found to be very encouraging - not only concerning the process of mere data collection, but also because of the aspect of mutual (knowledge) exchange and pertaining to the inter-cultural aspect. Respect, understanding and friendship are created. Maybe this method even has the least negative impact on participants compared to other methods. Summing up, participant observation, especially when it is combined with (overnight) farm stays puts one about as close to real situations as is humanly possible. Besides collecting valuable data, there is the enjoyment of being in the middle of things, of meeting new situations and people (see also GANS 1983: 57).

- One of the most important potentials of this study is seen in its applicability: specific solution strategies and outcomes can be used as starting point for and transferred to further studies and other fields of research as well as to other regions in East-Africa or even outside the continent. Comparability of data and thus output in general are enhanced.
- Through enhanced problem identification in terms of quality and time the approach can help to save time, money and labour resources.

As the field experiences are encouraging, it is recommended to support and strengthen this research method.

Of course, critical aspects have to be considered as well: for sure, this approach is time-consuming and labour-intensive. Hence, can (and should) this method be transformed in such a way that it is suitable also in a more condensed research setting? As to these aspects the following can be said: first, research in a similar complex setting needs to consider the various ecological, socio-cultural, political and economic aspects on different research levels. There is no way out of it if the requirements of completeness are to be met. The more complex a research question is, in general, the more complex the method applied has to be and the more time-consuming the research becomes. Consequently, if the time-consuming aspect is to be reduced, the only way is to reduce the research content and to simplify the research question and/or to reduce the sample size. Then, in the first case, less time-consuming participatory methods like PRA or RRA might be applicable, in the second case, research can be conducted with the same method, but in less time. With other words: for this special research setting the less time-consuming method has been chosen already! The maximum time spend on a farm has been set to be one week (see chapter 1.3.3.1). Out of the experience gathered, it is not recommended to carry out similar research in less time! Also, the participants must be given the chance to gain from this research. Principally, one-sided research has to be avoided. Mutual exchange should form a prerequisite for research on similar topics and with a similar approach.

As has been outlined already above: through this research a method has been developed which helps to save time if applied to similar research settings. Aspects like key indicators, trickle-down effects, weaknesses, etc. can be used as a guideline for research on related topics. Furthermore, the aspect of applicability reduces time and

enhances data output, speeding-up a) the pre-phase where questions, setting, etc. have to be outlined b) the fieldwork when it comes to data assessment and c) the process of evaluation and analysis of data. These aspects have to be taken into consideration when talking about time and labour.

For the reasons named, it is not only of use to conduct similar studies or to integrate further research aspects like putting more emphasis on the role of men, etc. But a follow-up in the same families and project areas would mean a valuable contribution to research on trends and changes.

12 Synthesis

„Agreeing that access to sufficient food to live a healthy and productive life is a basic human right for all, rings hollow if those in power do not make every effort to assist individuals and communities in getting access."

PINSTRUP-ANDERSEN & PANDYA-LORCH in their article on what is needed to change the situation of the poor (2001: 269).

Project-measures within the frame of natural resource management in rural areas can only be called successful if they directly result in the enhancement/betterment of the living-conditions of all participants and ideally contribute to the safe-guarding of the resource-basis in a long-term perspective for future generations. As women have often been (and are often still) neglected in project approaches, despite their deep involvement in natural resource management, they have been the focus of a success analysis. This analysis concentrated on successful female farmers and asked for their role within their natural and social environment as well as for the reasons of their success. Although projects work with key-farmers, hardly any assessment studies on their ecological and/or socio-cultural environment or studies on this group itself have been carried-out so far.

Obviously, being a successful female farmer means adoption and implementation of (project)measures with primary, secondary and tertiary effects: a) reduction of negative aspects like soil erosion, soil fertility depletion, water- and energy scarcity, etc., b) resulting in the increase of quality and quantity of food, water and energy and c) leading to betterment of the financial situation, education, health, social status, etc. This causes various positive trickle-down effects across the household-/family level, not only related to natural resource management but also in terms of social policy.

An analysis has been carried out to identify 'success-indicators'. The factors assessed have been grouped according to economic, socio-cultural and political as well as ecological contexts. As has been shown, these indicators vary from farm to farm according to different parameters like country/AEZ/project region and parameters like married women, female-headed households or women leaders. The role of (former) husbands was of interest as well, and additional indicators related to socio-cultural aspects have been identified (see chapter 9.1.3).

Based on Tab. 54 in chapter 9.1.1 an overall estimation of success can be determined for each farm through applying an estimation method ranking from high via mid to low[170] as shown in Tab. 65 below. This results in the identification of three levels of success respectively three different success types:

[170] For being able to do this, first, the categories with economic and ecological factors have to be brought down to a 3-layered scale (in the economic category, groups 2 and 3 have been subsumed under one group, within the ecological category groups 1 and 2, 3 and 4 as well as 5 and 6 have been summarised. Subsequently, the achieved number for each category has been added

a) farms with high level of success (= **1**) → success type 1,
b) farms ranking between high and low (= **2**) → success type 2 as well as
c) farms with success on a low level (= **3**) → success type 3.

Tab. 65: Overall estimation of success for each farm and assignment to 'success'-levels/generation of success-types

Farmers	Economic category	Socio-cultural & political category	Ecological category	Total	Success-level / success type
Scoring					
1K-m♦	1	1	1	1	**1**
3K-l♦	1	1	2	1	
2T-l♦	2	1	1	1	
2K-l♦	2	1	2	2	**2**
3K-m*♦	2	2	1	2	
1T-h♦	2	2	1	2	
3T-h♦	1	2	2	2	
2K-m*♦	2	2	2	2	
6T-l♦	2	2	2	2	
2T-h*	2	3	2	2	
1K-l♦	2	2	3	2	
4T-m	3	2	2	2	
1T-l*	2	3	3	3	**3**
5T-m*	3	3	2	3	
3T-l*♦	3	3	3	3	
4T-l*	3	3	3	3	
5T-l	3	3	3	3	
6T-m*	3	3	3	3	

Legend:

* female-headed household; ♦ group leader; **1** = high; **2** = mid; **3** = low
K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA

As can be seen, most farms have been assigned to the mid level. It is striking that in general, the farms within the HASHI-ICRAF project area rank lowest and that no Kenyan farm scores the lowest level. Furthermore, the differences between the scoring of categories per farm are never more than one level which elucidates that all factors are closely connected and balanced. The same can be assessed, if only these two categories are considered to determine their relation to the scoring of success on the ecological level. It can also be seen that the decrease of the success-level of these categories determines the ecological success-level.

Of course, a variation of the success-level/success type is to be identified in a shift of indicators. Fig. 125 below illustrates constant indicators as well as the increase of weaknesses among the identified indicators with the decrease of success. These va-

up for each farm; the derived numbers score between 3 and 9 and are applied to the 3-layered scale: **1** = high = numbers 3-4; **2** = mid = numbers 5-7; **3** = low = numbers 8-9.

riations show a special pattern which can be assigned to different levels/ types. Each indicator is listed according to its position within this setting.[171] On the one hand, it can be seen that some indicators are constant, thus, they do not change over the level (all indicators score relevant except group engagement and active knowledge dissemination on snrm which score high). It may be concluded that they form the overall basis on which changes take place. On the other hand, there are indicators which together are responsible for the shift to a lower success level through indicating weaknesses, either already on the mid or only at the low level.[172] Five indicators (firewood, plough and ox-cart within the economic category as well as public position of the [former] husband and church group position within the socio-cultural and political category) even shift two times, thus, from high relevance to low. Three indicators (road condition, vocational training, community/job position of the parents) leap to the next lower level, but turn back to the starting position only to indicate that indicators can deviate from the rule but without any impact on the overall situation.

Indicators play a role in different degrees and with changing variations and contributions according to the specific situation on the respective farm. There may be indicators having a stronger negative or positive impact on the farming-system stability than others, but in total, the sum of all indicators determines the degree of success. However, this is not a static situation. A shift of only one indicator might change the whole setting through causing a chain reaction to the one or the other side as all indicators are interrelated and connected with each other. Furthermore, a different setting might show different constellations, indicating the necessity for further studies.

[171] Basis for this figure forms Tab. 55. The scoring of each indicator for each success-type can be estimated after the same method as described in chapter 9.1 (by adding the fictitious numbers and dividing them through number of farms).

[172] Indicators showing weaknesses at the mid level stay weak also at the lowest level if not specially shown to shift again to a higher level (through the combination of an arrow with the term ‘better’.

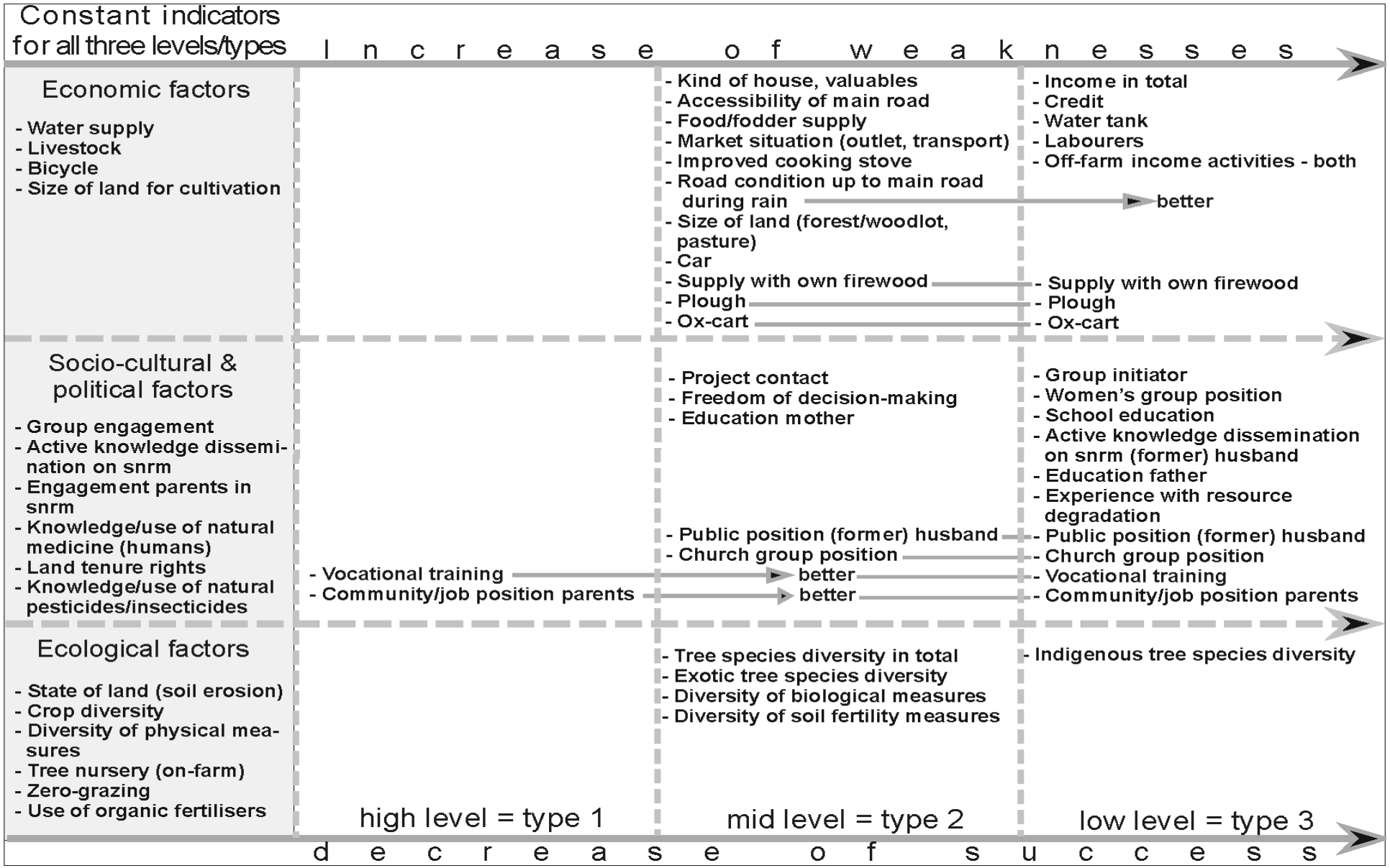


Fig. 125: Increase of weaknesses among indicators with decrease of success according to the three levels/types and constant indicators for all levels/types

Fig. 126 demonstrates the shift of crucial factors (marital status, group-leadership, country and AEZ) according to each success-type/success-level. What has been shown partly already for each category respectively single farm (chapter 9.1.1) can be confirmed in the general overview: increasing success within this sample is directly linked to the aspects group status, marital status and country. The factor 'AEZ' shows a slightly better scoring of mid and high potential areas.[173] Talking in contrasts, the most successful farmers are the married group leaders in Kenya, the less successful farmers are the female farm managers without a group-leadership position in the LPAs in Tanzania and especially in the HASHI-ICRAF project area in total. So far, the outcomes support general statements in the literature that female farmers without a husband are in a worse position than married farmers as to economic as well as socio-cultural and political aspects (e.g. leadership) (see chapter 1.3.2) and that women leaders are in a better situation as to the livelihood-conditions in general (see chapter 8.4). Which indicators are most important according to AEZ, country and farmer sub-groups has been determined in detail in chapter 9.1.

The identification of success-indicators is simultaneously an effective method for the detection of problems and weaknesses. Investigations in self-help groups and contact to other farmers lead to the conclusion that the identified problems are not only relevant for the group of successful farmers, but can be transferred to other, resource-poor farmers as well. Hence, research on successful farmers is also a means to come closer to aspects related to the most vulnerable groups within a project area.

Furthermore, general problems and constraints (identified by the farmers, self-help group members, other farmers, in project documents and by experts) have been analysed; together with the success-indicators they form the basis for recommendations to accomplish strategies to enhance project's success.[174] This is one aspect illustrated in Fig. 127. But the main intention of this figure is to elucidate another crucial research objective: which role do innovative farmers – in this case successful female farmers – play within their social and natural environment as well as in the project context? The various trickle-down effects shall be illustrated within their interrelations to success indicators as well as problems and weaknesses identified. The text below the figure explains the main correlation.

[173] It has to be kept in mind that neither distribution of female-headed households nor the distribution of being a 'women leader' on the zones and countries has been a selection criterion beforehand (the only criterion was two female-headed households at least per project area and being at least a member of a women's group), thus, these criteria are spread randomly. Due to this fact, a generalisation of outcomes as to these aspects is made with caution. However, tendencies are to be seen.

[174] Consideration of uncovered weak and strong factors on different levels may also help to evolve solution strategies for the improvement of the effectiveness of project's work even outside the research area or can even be transferred to other countries.

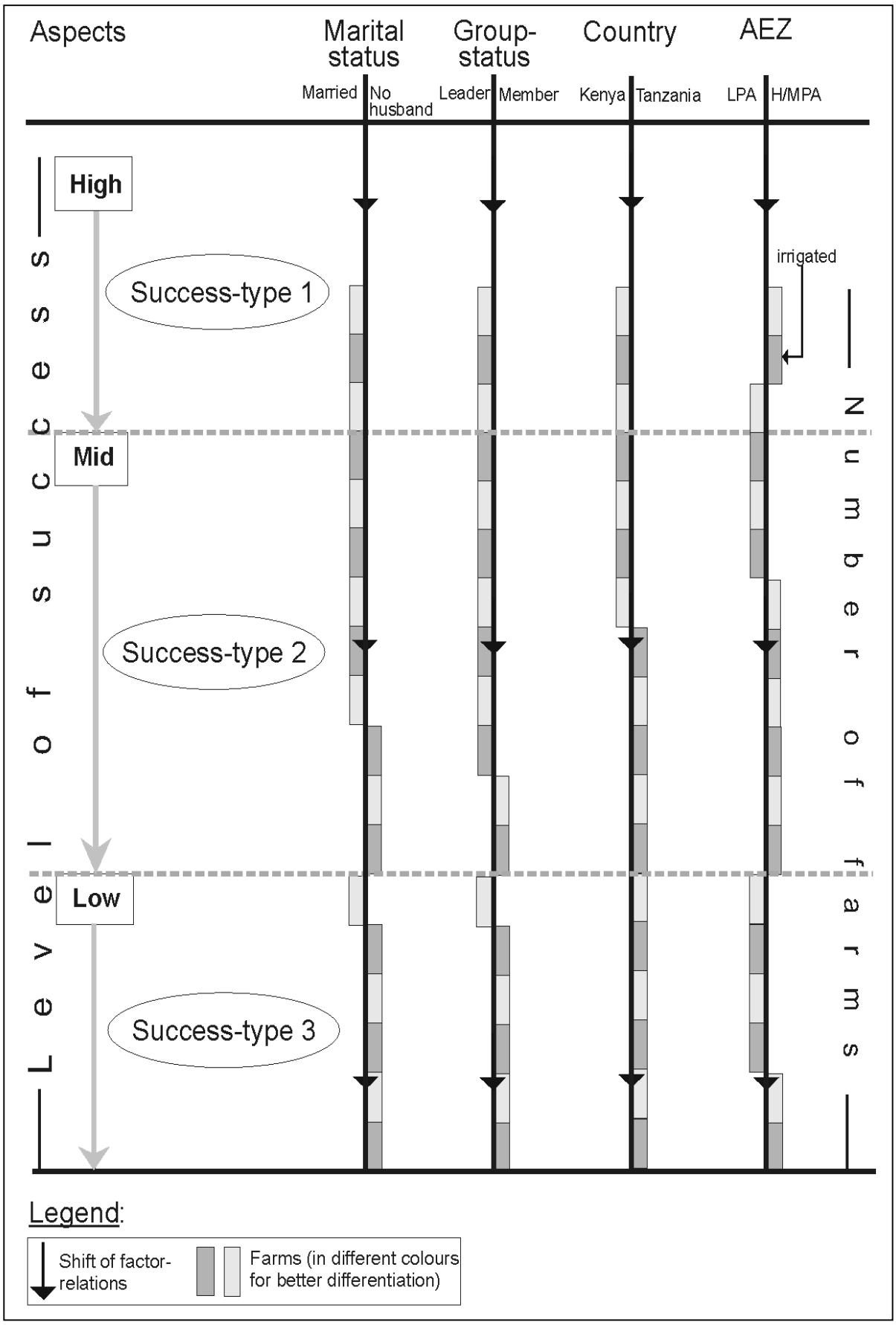
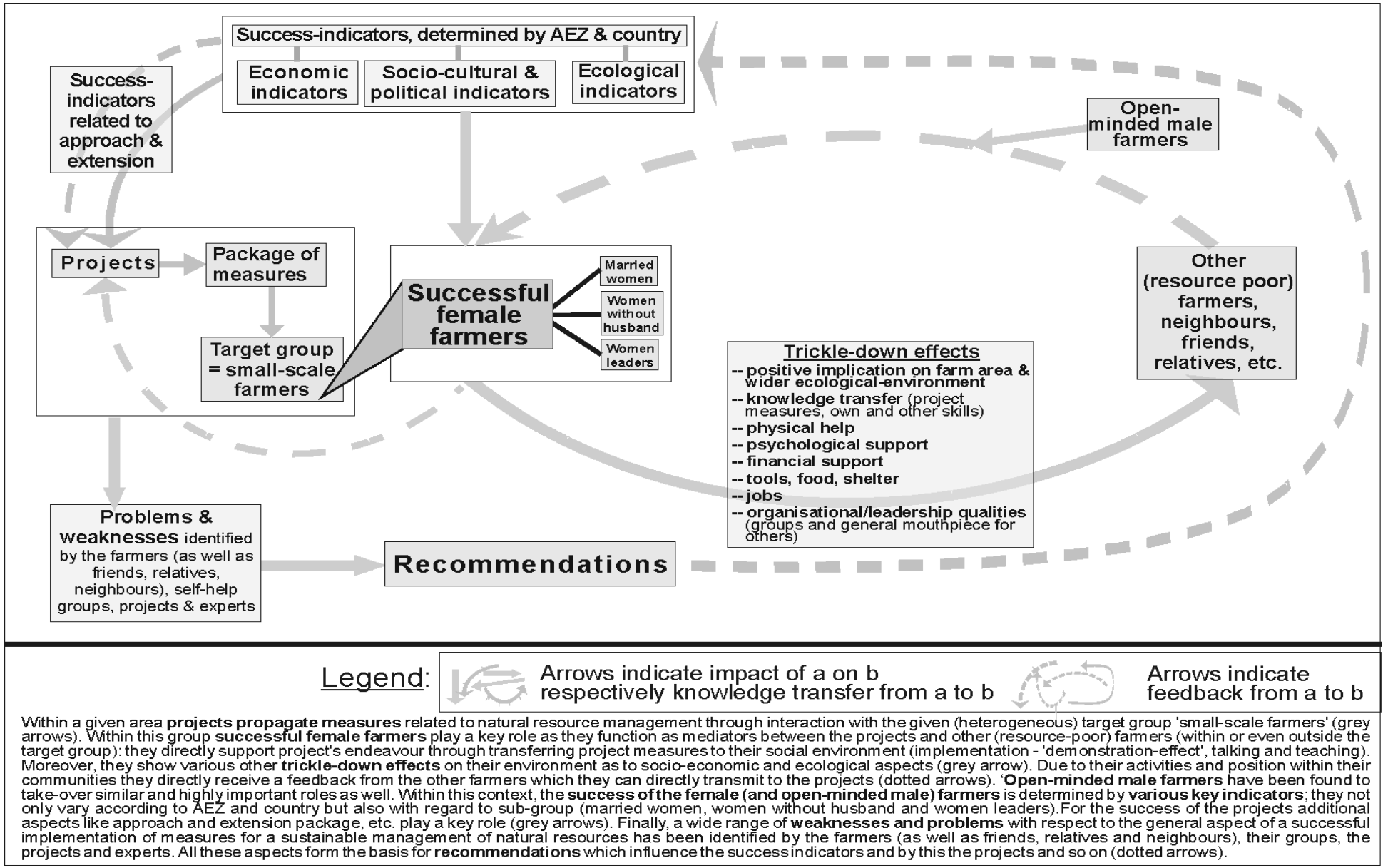


Fig. 126: Shift of crucial factors according to success-level/~type



Within a given area **projects propagate measures** related to natural resource management through interaction with the given (heterogeneous) target group 'small-scale farmers' (grey arrows). Within this group **successful female farmers** play a key role as they function as mediators between the projects and other (resource-poor) farmers (within or even outside the target group): they directly support project's endeavour through transferring project measures to their social environment (implementation - 'demonstration-effect', talking and teaching). Moreover, they show various other **trickle-down effects** on their environment as to socio-economic and ecological aspects (grey arrow). Due to their activities and position within their communities they directly receive a feedback from the other farmers which they can directly transmit to the projects (dotted arrows). '**Open-minded male farmers** have been found to take-over similar and highly important roles as well. Within this context, the **success of the female (and open-minded male) farmers** is determined by **various key indicators**; they not only vary according to AEZ and country but also with regard to sub-group (married women, women without husband and women leaders).For the success of the projects additional aspects like approach and extension package, etc. play a key role (grey arrows). Finally, a wide range of **weaknesses and problems** with respect to the general aspect of a successful implementation of measures for a sustainable management of natural resources has been identified by the farmers (as well as friends, relatives and neighbours), their groups, the projects and experts. All these aspects form the basis for **recommendations** which influence the success indicators and by this the projects and so on (dotted arrows).

Fig. 127: Role of successful female farmers within projects

Successful female farmers function as environmental agents through their engagement in different ecological sound measures with a positive implication on ecological aspects. Furthermore, they have got a decisive influence on their social environment like contributing to the enhancement of economic and socio-cultural stability. Moreover, they take over the position of knowledge careers and multiplicators and are stakeholders within the process of knowledge transfer as they give their experiences to their social environment. The women in general show a high degree of responsibility and solidarity for their groups and the community as a whole. But their influence even goes further: the farmers function as important mediators between the project and the people; this is an important aspect as they ease the process of linking-up especially marginal groups like poor farmers or female-headed households. Over and above that, the analysis also reveals - contrarily to statements in the literature (see chapter 1.3.2) – that the group leaders do not act selfish but take over power for the benefit of others.

Several comparable benefits have been assessed for the groups as well. The findings of this study support KINUTHIA (1993: 39): „[...] [w]omen have the potential to change the nature and tempo of development, not only for their own welfare but also for the welfare of the community and society as a whole." Accordingly, it can be concluded that "[r]ural peasants' and women's organisations [are] the most effective means of securing poor rural people's participation in both the planning and the benefits of rural development" (CECELSKI 1985: 67).

One of the most interesting and promising outcomes of the study is the revelation of the positive implications of 'open-minded' male farmers: through various activities in the context of successful natural resources management as well as giving physical, financial and ideological support to their families, groups and their social environment as a whole, they directly contribute to the improvement and stabilisation of ecological, economic and socio-cultural conditions. Moreover, through their behaviour based on the thought of gender equality (expressed e.g. in activities like equally participating in household- and farm-related activities, talking about gender aspects to other people - especially men - or the conduction of gender training), they create awareness and contribute to the empowerment of rural female farmers, and thus to gender equality.

The analysis shows that 'open-minded', innovative and successful women and men are key persons with regard to sustainable resource management and knowledge dissemination in general as well as especially for empowerment processes of rural women. Innovative female and male farmers with strong personalities and leadership qualities should be trained in special seminars to act as multiplying forces in the project area (see also AUGUSTAT 1994: 211). As again and again women said that their husbands do not take over responsibility for their families the strategy of integrating men e.g. as gender trainers can be one effective means to contribute to awareness-creation on gender aspects.

The poorest of the poor are to a high percentage female-headed households. They have been shown to be in a weaker position regarding financial resources and other empowerment-related aspects. The lower level of empowerment of the women farmers – which is directly linked to success (success helps empowerment on the way and vice versa) can, amongst others, be related to the fact that they are alone: success in natural resources management is linked to physical, financial and ideological support of male family members, mainly husbands. Reduction in asymmetries between men and women is essential for sustainable livelihood strategies - which encompasses a sustainable management of natural resources – and thus for the combined aims of poverty alleviation, food security and ecological interests like nature conservation. It also means that programmes have to pay special attention to the improvement of the situation of female farm managers to let them equally share and benefit from project interventions. Therefore, a gender-sensitive approach, which ensures that men and women's roles and interests are taken into account for any particular activity, is a must (see also Fig. 128).[175]

Fig. 128: Women and men in a group-meeting in Kenya

Appropriate project concepts to address the various gender-related aspects and their translation into action will enhance the success of project strategies for a sustainable management of natural resources through multiplicator effects of contact and feedback. The same goes for the strengthening of the position of innovative and engaged female and male farmers within projects through integration in gender workshops, training on resource management, study tours, etc. People differ, so do farmers: even, if they live under the same conditions (economic, ecological, socio-cultural, political) there are always some who are more innovative, who care more for the environment, e.g. through preserving a natural forest as provider for medicinal plants and trees. These people have to be found and integrated into projects – not only to spread their knowledge, but also their ideas and convictions that things can be changed to the better through own initiatives. One Kenyan farmer ex-

[175] An evaluation on interrelations and villager-induced development activities within the Land Management Programme in Babati District, Tanzania supports this assumption (T-SLMNRP 1998: 32). The report notes that exposing men and women to the idea of gender equality and giving women equal opportunities leads to positive results for everybody; observations show that men start to behave nicer and pay more respect to women.

pressed his engagement for natural resources with the words: “We often only think about our self and forget about the others in the region. We cannot live without trees. What do we do with a field without rain?” (see EVELEENS 2001c: 8-9).

Gender-sensitive approaches within the context of the implementation of soil conservation measures, the management of water resources, energy, etc. for the improvement and stabilisation of natural conditions will lead to a better quality of life of the target group as a whole. This again will result in positive effects and implications even on the regional, national and international level. Males and females bring into the discussion an equally rich set of experiences and body of knowledge. Both are of importance in efforts to raise awareness and create communal actions towards a more sustainable use of natural resources (BUDELMAN 1996: 53). And the FAO (1996: internet) summarises: “Given equal access to opportunities and resources, women like men have proven to be efficient, dynamic and indispensable partners in development. Together, on the farm, and at all levels of society, women and men constitute a formidable partnership to achieve food security in the 21st century.”

A close contact to key persons (innovative and men and women’) through follow-ups, intensified extension activities, etc. might be a successful strategy to reach this aim. These persons will function as mediators between the projects and the communities. Through this strategy the most invisible vulnerable groups like female farm managers, elderly and sick people as well as children can be reached.

It has been shown that success spreads; hence, it is not the case that ‘empowering the empowered’ or the ones who take action to change their situation means lowering, disrespect or even further marginalising the powerless. In the contrary, it has been shown that the open-minded, innovative and successful ones function as a vehicle to drag the cart of empowerment to all people. The assumption that giving power to the already powerful people has no positive impact on the powerless might be based on Western experience and history. However, especially in the rural areas of Tanzania and Kenya actions are still taken on community-based approaches. Although these countries cannot escape global influences which are likely to disrupt the inner structures of the community-based thought, the development in an increasing direction of individualisation, isolation and ego(t)ism can be counterbalanced by supporting and strengthening community-oriented movements. This study showed one possible solution out of many towards this direction.

To return to the projects: as their approach, training and extension service generally plays a fundamental part for a successful and sustainable adoption and implementation of measures for the improvement of people’s living conditions, these aspects have been considered as well. Their role within the development context has been elucidated in Fig. 127. Main strong aspects which directly seem to be responsible for their success have been found to be the site-specific, participatory and inter-/transdisciplinary approach, the integration of gender and local knowledge/institutions as

well as networking/collaboration not only with the farmers, but also with other projects, research institutions and policy makers. However, there is a need for more detailed research pertaining to these aspects. Of course, weaknesses have been detected as well which need to be addressed by the projects, keeping in mind the fact that any attempt to overcome a constraint needs time; consequently, projects need to be flexible on all levels of concept and implementation.

Furthermore, projects need to build on what is already there ('practical start') to implement an improvement - even if this means that action is small in the beginning – and then proceed in stages ('package approach' - SHISCAP 1992: 4/2). The report continues (ibid.): "if this is successful the beneficiaries will be more likely to listen to new ideas, and the project can be expanded in a series of actions until the Programme goals have been reached." Projects should have an open-ended, step-by-step approach. A constantly re-writing „[...] allows the emergence of local capability and appropriate course of action and thus promotes sustainable development" (de GROOT et. al. 1992: 81).

Central within the whole complex of the success of natural resources management stands empowerment which is closely linked to gender and aspects like land tenure, customs and traditions, education, participation in public decisions, labour support, etc. This shows that strategies need to be enclosed in a wider concept: „Local communities need short-term benefits and a minimum of risk from any project failures. Thus environmental concerns cannot be addressed in isolation from other community needs, such as cash, education or health care" (de GROOT et. al. 1992: 79).

Within this context, the consideration of customs and traditions is crucial since they determine moral concepts and social norms (BMZ 2000: 221). Accordingly, projects must not only deal with and combine various and complex aspects out of a variety of disciplines, but local knowledge, traditional land-use systems and indigenous practices have to be fully understood and taken into consideration, too, if problems and constraints, needs and concerns are to be fully addressed. National and donor attitudes have to be improved and should pay more attention to such resource conservation and use through e.g. a better economic understanding (see e.g. BARROW 1996: 193). For awareness is what might inhibit the application of inappropriate, unsustainable and by this damaging projects (ibid. 191). WITTE (1998: 76) mentions: "An important bottleneck in many research efforts is that of insufficiently understanding the farmer's logic in their choice for certain technologies." This also includes that projects must have a 'site-specific' approach: "All projects should be division, ward or village specific given that there are variations at all levels" (SHAO et al. 1998: ix). Of course, also traditional practices have to be seen critically since a) the term 'traditional' has to be defined with regard to the respective context and b) not all traditional practices are environmentally sound per se; furthermore, some practices may not fit to changing conditions anymore (see also RAUCH 1994: 122-123; BAUM 1995: 40-41; BMZ 1997: 155-156).

This also means shifting the responsibility to local people and working "[...] closely with local land users as clients and co-workers in a spirit of service and cooperation" (ROCHELEAU et al. 1988: 31). In general, active involvement/participation of local communities is a prerequisite and can make the critical difference between success or failure of a development project. Distinct groups have to be identified within the target group if project measures are to benefit all people within the project areas (GUGGENHEIM & SPEARS 1991; CERNEA 1991; BLISS & GAESING 1992; WILLIAMS 1993; AUGUSTAT 1994; BLUME 1998; BMZ 2000: 220-221).

Concerning the overall structures in which all these aspects and the whole research setting is embedded, the following can be said: generally, networking and collaboration is necessary on all levels; this aspect has been outlined by PENDER et al. (2001: 120): "Success will depend on the development of stronger linkages between agricultural researchers, local governments, farmers, community leaders, nongovernmental organizations, national policymakers, and donors. On their own, none of these agents are likely to succeed." This also means that innovations have to take place on *all* scales, not only on the local level: "Continuation of support through national and regional development policies and provision of the necessary infrastructure (financial, technical, research, marketing) may be essential for the wellbeing of many forms of landuse […]" (HUXLEY 1999: 31).

A major constraint for development aid projects are the poor and weak structures on all levels of governmental administration and low coordinating capacities (HOFMEIER 2000: 19). Hence, general aspects to be considered are decentralisation on the political level through policy formulation which means a) transferring responsibility down to district, community and village level and creation of implementing institutions and b) co-operation and networking between formal ministerial organisation units/departments (see also STÅHL 1992: 5; MUGABE 1992: 27-28; HOFMEIER 2000: 21). The empowerment of grass root institutions, communities and local authorities in general is an important step towards promoting democratic systems, improving accountability and restore the confidence. Especially for the poor, membership of local organisations provides a general safety net. On the other hand, initiatives have been started on the macro level to change the partly high aid dependency, both from a financial and a mental point of view, of the countries Kenya and Tanzania, but much remains to be done before the new attitudes and work methods are assimilated by the lower levels of the administration and the society (see also REPOA 2000: 34; SIDA 2000: 2, 6, 12). A sustainable development in most African countries will not come merely through financial aid from the industrialised countries: "Unless African governments create a suitable political and economic environment for sustainable development, current efforts from the international community will be rejected to where the political will exists" (MUGABE 1992: 27). Further challenges are reducing the pressure on land by effective programmes which also include innovative and site-specific aspects of family planning and creation of off-farm income op-

portunities and employment on a large scale to absorb a substantial part of the rural population (see also STÅHL 1992: 7).

A global challenge is to proactively guide globalisation by international, national and local policies and institutions so as to assure an acceptable distribution of benefits and losses and to benefit poor, food-insecure people since it is clear that rural poor will not benefit from globalisation if they are excluded from participation or fair competition in the mainstream market economy (PINSTRUP-ANDERSEN et al. 2001: 15; PINSTRUP-ANDERSEN & PANDYA-LORCH 2001: 270). One solution could be an enhanced regional cooperation in the fields of trade and economic policies. However, main goal will be the building up of a basic infrastructure, the qualification of labourers and the development of the education system. Further points are to combat criminality and corruption as well as determination of social and legal environmental minimum standards. Although development aid still forms an important element for a development perspective of the least developed countries, stimulating direct investments → creating an 'enabling environment' (MUSKENS 2000b: 15-16) and mobilising indigenous resources is important for the creation of infrastructure and production capacities in the least developed countries (FES: 2001: 46; see also MANSHARD & MÄCKEL 1995: 6). This can be combined with investments in the marketing of ecologically sound-produced agricultural products like is done by the Dutch government. This measure not only supports a sustainable development of the local economy but a sustainable management of natural resources as well (COOLEN 2000: 5). A next step has to be expanded access to the market of the industrialised countries for products of the south by increasing the volumes of imports allowed and reducing high tariffs on some key products (DIAZ-BONILLA & ROBINSON 2001: 230; FES: 2001: 46). Furthermore, possibilities for export of labour force have to be improved. In general, discrepancies on the trade level between North and South can only be equalised by 'new consumption patterns' in the industrialised countries (MANSHARD & MÄCKEL 1995: 6, 42).

The agricultural sector needs particular attention such as provision of extension services and other inputs to enhance growth and job employment. However, many of the constraints to the sector's development are of a non-agronomic nature such as infrastructure, rural financial services, land ownership and governance (see also SIDA 2000: 15, 18).

Within the whole context of farming-system analysis the crucial role of off-farm income needs further attention: many farmers rely on off-farm income sources. Is this phenomenon only linked to the target group of the research - thus, is there a direct link between success and off-farm income in the way that other farmers are not so successful because they cannot fall back on off-farm income? Are the findings signs for the process of de-agrarianisation said by different authors to take place over whole Africa? More research is needed concerning these aspects.

Recent studies have assessed the shrinking of the agricultural sector in many countries of Sub-Saharan Africa (BRYCESON & JAMAL 1997; MADULU 1998; Bryceson 1999, 2000). On the other hand, according to researchers, increasing agricultural productivity in both the fragile and the more productive areas of the so-called 'developing countries' is one of the most important ways to come to a better management of the world's natural resources (WILSON 2001: 104). "[…] the current state of malnutrition and the predictions for world population growth and food supply clearly indicate that *any* form of landuse that offers sustainable production must be given serious consideration" (HUXLEY 1999: 280). Both, actions for the enhancement of off-farm income opportunities on the one hand and strengthening of the agricultural sector should be taken.

The keywords biodiversity, sustainable land-use systems, gender, participation and food security are closely linked to each other: When talking about food security, it has to be kept in mind that biodiversity plays a key role within this context: it is supposed that the better a land-use system is integrated in a respective natural environment the higher the degree of sustainability - and thus food security.

These interrelationship can be transferred to political, socio-cultural and economic aspects as well: the better a social system (household, community, regional level, etc.) is integrated in the institutional and political frame or, with other words, the better the institutional and political frame responds to the interests, needs, potentials and problems of its sub-systems down to the smallest unit of a social system: the individual, the higher is the chance to reach the aim of eradicating poverty and food shortages on the one hand and to conserve the natural potential as basis for food production (to leave other facets like relaxation out of consideration) on the other hand: "Only if people's needs and priorities are put first can true support and participation be secured. Without this, there can be no long-term sustainability of initiatives beyond a project cycle. [...] Participation and enablement are the keys to success, allowing rural resource users […] to accrue the benefits from an improved, more sustainable and secure livelihood" (BARROW 1996: 236, 248).

Still, there is a high necessity for research on gender in natural resource management (gendered access to, control over, knowledge about and responsibility for natural resources) at inter- and intra-household, community and national levels. In understanding male and female farmer's decision-making processes in respect to their farm management strategies "[...] through the lens of their particular motivations and constraints, research and development agencies may be better equipped to identify appropriate interventions and develop more effective ways to address their needs and concerns" (WILLIAMS 1996: 9). Gender aspects need not only to be dealt with on the project level, but on the institutional and policy level as well. After MBUGHUNI (1994: 212-216), women's position in Tanzania remains the same despite the presence of numerous development projects working to improve their position. This points to the fact that the basic roots of women's oppression are not dealt with,

namely the patriarchal social structures, expressed in rules and practices especially on marriage and inheritance, the gender blind policies of the state – together with female minimal representation in parliament – and the patriarchal hegemony of knowledge which have pushed women to the background. According to OTSYINA (1998: 53-57) one task has to be the removal of traditional institutionalised forms of discrimination against women, the making of new laws which favour women and the reinforcement of already existing laws. Furthermore, mechanisms have to be put in place to control the enforcement of these gender-specific laws and how women can make use of them. This should be followed with community education programmes for women and men as it is education which brings about a transformation. Seminars, to be held in series, should also deal with family life and the place of women and men in society, helping to address women's empowerment. People have to be involved and be responsible for provision, maintenance and sustainability of facilities themselves. Mobilisation should take place through development committees and the village councils which are available in every community. Furthermore, activities already taking place in areas by other institutions and projects have to be integrated and to be build upon to increase improvement and avoid doubling.

First priority for a sustainable development strategy has to be to change the unequal use abilities of growth in favour of the so-called 'developing countries'. Consequently, the industrialised countries have to reduce their wasteful use of resources; in the so-called 'developing countries' the increase of growth has to be used for the satisfaction of basic needs and poverty elimination. According to BECKER (1999: 57-59) solution strategies can only be found if, on the one hand, a deep change of forms of production and consume and on the other hand of relations between gender and the generations takes place. And, if really something new is to result out of the catchword 'sustainable development', the concept to evolve solution strategies has to encompass economic, socio-cultural and political as well as ecological aspects; ecological, economic and cultural phenomena of disruption and degradation have to be discussed as interrelated aspects (see also ibid: 55, 59).

The above given recommendations on the national and international level are – maybe with little variations – well-known within the development-context, and it is necessary to highlight main strategies. But, on the other hand, it could be that it is not the time anymore to formulate 'recipes'. Could it be that the question is not anymore "what to do?" but rather "why do things not change?" Maybe, it is worth to concentrate on 'the reasons behind' instead of only propagating the same. Finding answers to this pressing question might give room for manoeuvre and provide a tool to translate these recommendations into practice. In my opinion, it makes sense to put more emphasis on this idea while simultaneously enhancing efforts to bring actions taken on the local level - thus, in communities - into the open. This is to create awareness in the so-called industrialised countries for 'success-stories' as a counterbalance to all the negative reports spread through the media. 'Success-stories'

function as stimulus and positive feedback, demonstrating that it is worth to engage in activities related to development aid. Of course, still activities should be taken on the various aspects elucidated above but the proposed idea might indirectly contribute to reaching this aim.

Public agricultural research has to be increased, and research should embody all relevant approaches (such as agro-ecological and conventional) and focus on transdisciplinarity (see also PINSTRUP-ANDERSEN & PANDYA-LORCH 2001: 273). It has to be kept in mind that there exist no general valuable solution strategies within the frame of rural development; each plan has to adapt to the respective local situation which derives from the needs of people and the cultural and ecological conditions (BMZ 2000: 275). Moreover, because the circumstances are not static, the focus of research must shift from descriptions of pattern to studies of processes (see also FROST & DESANKER 2001: 4). RAUCH (1994: 126) summarises: "Situationsgerechte, d.h. nicht nur ökologisch, sondern auch ökonomisch, sozial und institutionell angepasste Problemlösungen liegen nicht immer auf der Hand; sie müssen unter Einbeziehung von lokalem und externem Wissen oft erst gefunden und erprobt werden."

The role of the researcher is important within this context: his/her responsibility is to contribute to the betterment of the target group and to help bringing problems and hindrances into the open (see also AGEE 1999).

Concerning the methodical aspect the study reveals that a qualitative approach based on participant observation contributes to the collection of additional, complementary and specific data as well as to intercultural exchange. The various findings also strengthen the importance of a gender-sensitive approach within farming systems research (see also T'HART 1992: 61).

The approach, although broad and based on multi-/transdisciplinarity, paints a static picture in what is clearly a very dynamic situation. Nothing is static, and the same research carried out only one year later, to give an example, might reveal completely different situations and trends of changes. The smallholder economy is changing rapidly in both countries, thus, most investigations have to be seen as temporary and rapidly changing patterns. Still, the study was able to demonstrate trends, the nature of change, cyclical patterns and the influence of extraordinary events like droughts or the extraordinary heavy and long rains on the whole system. Additionally, socio-cultural, ecological and economic dynamics have been identified which are expressed in the land-use systems on farm level and which contributed to a better understanding of it; by this, it eases the task of defining and selecting development options. A basis has been provided for interpreting the static visible landscape from a more dynamic perspective, with respect to different issues such as agroforestry and other conservation measures, farmer's actions, gender roles, etc. (see also BRADLEY 1991: 317-318).

Approach and methods chosen should not be regarded as a blueprint, but as an attempt to investigate a special issue by tackling and involving as many relevant aspects, factors and criteria as possible. However, particular solution strategies and outcomes can be transferred a) to other fields of research and be consulted for the identification of problems and potentials in a different research setting b) to other regions in East-Africa. In terms of replication, both methods and results of this study can be simplified for other contexts. Over and above that, through enhanced problem identification in terms of quality and time the approach can help to save investments which thus can be directed to other sectors. Besides this, using the same approach enhances comparability and thus data output.

More support of research carried out by local researchers is needed to come to a more balanced research structure, allowing to integrate views and solution strategies from within the countries where research has been carried out.

Furthermore, the complex outcomes on various levels and concerning different aspects support the assumption that it is important to carry out a complex analysis under integration of different economic, socio-cultural, political and ecological aspects and that all criteria have to be analysed on the various levels (micro, meso and macro). Thus, this study is a valuable contribution to the recent pledges for complex and integrative approaches, not only in the field of natural resource management.

The outcomes and contributions of this study to the recent level of research can be summarised as follows:

- new data on farming-systems through detailed analysis on different levels under integration of various aspects. This includes that
- measures related to natural resource management have been assessed, classified and described
- furthermore, socio-cultural, political and economic factors have been elucidated and their interrelations been revealed
- evaluation of project's roles, activities and limitations as well as comparison of different projects in different countries as a direct contribution to networking and knowledge exchange
- the analysis on successful female farmers and women's groups shows new results concerning the involvement of women in natural resource management, their activities (trickle-down effects) and positions (mediators and knowledge careers). Contrary to the literature it has been shown that the group leaders do not act selfish and tend to take over power for their own benefits but that they act community-oriented instead, elucidated by various examples
- within this context, new aspects have been identified as to the importance and crucial position of open-minded and engaged men as direct contributers to stable livelihood conditions of the farm households, to a stable and successful social and economic position of their wives (supports literature statements, see two points below) and groups as well as to the empowerment of women through gender-specific activities in general. The husband's (ideological, physical and financial) sup-

port seems to be a crucial factor for the women farmer's success, even more than land tenure rights. Moreover, it has been detected that the wives' activities and social position have a decisive influence on the husbands as well

- indicators have been identified related to economic, socio-cultural and political as well as ecological categories and their interrelations been elucidated to define what makes a female farmer to be successful
- besides the assessment of success indicators, light has been shed also on variations of these factors pertaining to different sub-groups among the female farmers like married women, women without a husband and women leaders; furthermore, aspects related to the husbands have been analysed and discussed. Also shifts between agro-ecological zones and country have been taken into consideration. Not only has each farm been subsumed under a specific success-type/~level, ranking from high over mid to low, and differentiated after the three categories, it was also possible to identify certain patterns: accordingly, the most successful female farmers seem to be married Kenyans in leadership positions. Female farm managers without leadership positions in Tanzania face the less favourable conditions. Disregarding the constraints, these women are potential mediators for projects to reach the 'poorest of the poor' – mostly single women. Within this context, the duration of project contact plays a key role as well
- general problems and constraints have been identified, a. o. under consideration of expert's views
- resulting recommendations given can be used as a guideline for the improvement of project's endeavour in general, also in other areas
- this study attempts to be an example for a transdisciplinary and integrative research and to elucidate potentials and benefits of such an approach
- it is also a direct contribution to the evaluation of qualitative research methods and has shown their advantage, with special reference to participant observation
- an attempt has been made to make field experiences more transparent.

I hope that this study has shown that it is meaningful to apply a broad-based, multi-faceted and multi-dimensional approach within research on natural resource management. Of course, the same goes for practitioners which have to put strategies into effect. As there is more need for in-depth studies on the local level which investigate the role of different people and groups in natural resource management – as to name a general aspect - I also hope that this study can motivate other researchers to carry-out field work under application of participative and gender-sensitive research methods.

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Appendix 1

Question guideline

Anja Blume
9/'99

Project:	
Date:	**Nr.:**
***Name*:**	

1: ECOLOGICAL ASPECTS

1.1 Natural conditions

District:	**Division:**
Location:	**Sub-location:**
Catchment:	**Village:**
soils:	**altitude:**
climate:	**annual rainfall:**
short rains-*vuli* (X-XII):	**long rains - *masika* (III-VI):**

natural vegetation:		**agro-ecological zone:**	
Vegetation cover in general	**increase**	**decrease**	**constant**

soils:				
	uplands	**slopes**	**depressions**	**other**
soil class				
soil group				
texture				
drainage				

Codes:

texture:
1. sandy
2. loamy
3. clayey

drainage
1. well-drained
2. moderately drained
3. poorly drained
4. seasonally waterlogged
5. permanently waterlogged

I.2 Basical farm related information

I.2.1 Agriculture

farm size in total:
uncultivated land/fallow - size, where:

I.2.1.1 Food crops

land for food crops/no. & size of fields:		
Weeding practices	**which** (hoe, oxen, herbicides)**:**	**who?**
Control of pests and diseases	**kind:**	**how?**
How are the residues managed after harvest?		
Average harvest per crop (bags per acre):		

Yields	**increase**	**decrease**	**constant**
Inputs	**increase**	**decrease**	**constant**

Quality of land	**increase**	**decrease**	**constant**

garden plot (*bustani*), size:

Food crops cultivated:	**intercropped yes, with**	**no**	**harvest period**	**seeding period**	**who seeds**	**who harvests**	**problems (diseases etc.)**

I.2.1.2 Cash crops

Land for cash crops/no. & size of fields:

Weeding practices	**which** (hoe, oxen, herbicides)**:**	**who?**
Control of pests and diseases	**kind:**	**how?**

How are the residues managed after harvest?

Average harvest per crop (bags per acre):

Yields	**increase**	**decrease**	**constant**
Inputs	**increase**	**decrease**	**constant**

Cash crops	**intercropped yes, with**	**no**	**price**	**harvest period**	**seeding period**	**who seeds**	**who harvests**	**market**	**problems (diseases etc.)**

I.2.2 Livestock

Fish (pond)			**yes**	**no**	**Bees (hives)**	**yes**	**no**
Buck-keeper:	**no**	**yes**	**sort:**		**Price:**		

Animal species:	**up-breed**	**local**	**zero-grazing**	**free**	**where**	**tied**	**fodder**	**problems** (diseases etc.)

Fodder grass	no	yes	species:	Amount:

Average yields and quality of milk	improved breed	local breed

How much farmyard manure from z-g animals per year?
Applied on the fields? Where?
Do you keep cattle for someone else? How many? Owner
Do you sometimes lend cattle to someone else? How many?
Who looks after the free-grazing cattle?
Did you change the pattern of livestock keeping (species etc.) Why?

I.2.3 Water management

I.2.3.1 Water supply

water-supply		water quality	water shortage
river			
spring			
well			
public taps			
own water pump			
channel			
sea			
other			
problems:			

I.2.3.2 Water harvesting/saving

Activities			
ferro-cement water tank		micro-catchments	
underground water tank		double-dug	
water-pump		hole-planting	
hole		planting in ditches	
well		planting along waterlines	
road-harvesting		covering of tree seedlings	
roof-harvesting		covered seed beds	
ditches		others	
problems:			

I.2.3.3 Irrigation systems

Irrigation-systems			
channels		hand-watering (using buckets)	
tubes		self-constructed system with buckets & tubes	
sparkler		others	
problems:			

1.3 Data about conservation activities

1.3.1 Field trials/demonstration plots

Kind	biol.	phy.	b-p	location	size	since when	problems
soil improvement →nitrogen fixing							
soil erosion measurements							

Which institution/organisation?

1.3.2 Physical soil conservation activities

Activities:			
bench-terraces		contour ridges	
fanya juu		contour ploughing	
fanya chini		contour planting	
retention ditches		trash-lines	
(small) dams/check dams		stone walls	
tied ridges		others:	
furrows			
problems:			

1.3.3 Biological soil conservation activities

1.3.3.1 Data on trees/shrubs in agroforestry systems

Trees/shrubs (incl. banana, papaya, palm tree)	Spatial arrangement					Purpose											
	boundary farm field		alley - crop.	inter-crop.	contour	live-fence	shade	ornament	fuel-wood	timber	fodder	medicine	mulching	fruits	SI	cash	sub

Trees/shrubs (incl. banana, papaya, coconut)	System			indigenous		exotic	Status				problems
	agro-silvo cultural	agro-silvo pastoral	silvo-pastoral	local	grafted.		newly planted	young non bear.	prod. bearing	over-aged	

Control of pests and diseases	kind:	how?

Would you like to plant more trees/shrubs?

If no, why? If yes, why and where?

What kind of tree species do you prefer: exotic or indigenous ones? Which?

1.3.3.2 Tree nursery

Trees/shrubs (i/e)	prices	number	problems (theft, diseases, avail., water, transport)

Control of pests and diseases	kind:	how?

If there is no tree nursery, where do you get the tree seedlings? Price? How far away? Difficulties?

Do you get assistance concerning tree management? If yes, from whom?

Would you like to have more trees/shrubs? Why?

What kind of tree species do you prefer: exotic or indigenous ones? Which? Why? Where?

1.3.3.3 Forest related aspects

Woodland - size, where:
Purpose, tree species:
Problems:

Firewood availability	increase	decrease	constant
Firewood collected/bought where? Price? How much?			
Which trees do you prefer for firewood? Why?			

Making of charcoal? If yes, who? Wood derives from where?

1.3.3.4 Organic farming

Activities			
compost		mulching	
(cow-)manure		liquid-manure	
other manure		*problems*:	
others			

Where do you practice this activities/put the manure?

2: SOCIO-CULTURAL ASPECTS

2.1 Household-structure

Sex:			**age:**		
Status:	**since when:**		**polygamous**	**monogamous**	
Tribe:			**religion:**		
Husband:	**age:**	**on-farm:**	**off-farm activities:**		
post/function in government/party/church/clan:			**Religion:**		

Number of household-members in total:				
Number of *adults* in total:	**female:**	**Nr:**	**male:**	**Nr:**
	ages:		**ages:**	
Number of *children* in total:	**female:**	**Nr:**	**male:**	**Nr:**
	ages:		**ages:**	
Leader of the household:				

2.2 Labour-division & workload → gender aspects

2.2.1 Household

Household			
Target	**who**	**decision-making**	**time**

Workload	increase	decrease	constant

Notes:

2.2.2 Farm

Farm–related activities			
Target	**who**	**decision-making**	**time**

Workload	increase	decrease	constant

How far away is the farthest field you have to go?

If you think your workload is too heavy, what could be done to reduce it?

Which is the busiest period of the year for you and your family?

Did your workload increase through z.-g.? If yes, please specify.

Did the division of labour resp. did decision making processes change due to new inventions (like high-breeds, tree species etc.)?

Notes:

2.3 Education

2.3.1 School

Primary school:	when	where
Secondary school:	when	where
Others:	when	where

Did you like going to school? Why?

Can you remember a key event making you like/dislike going to school?

2.3.2 Further education

Type (courses, vocational training, etc.)	**when**	**where**

What role plays education in your life? Why?

Can you remember a key event making you like/dislike learning?

Is education important to everyone in the same way? Is there a difference between girls/women and boys/men? What kind?

Are you a trainer? In what? How often? Whom?
How did you become a trainer

Children

Type (courses, vocational training, etc.)	**who**	**where**

Husband

Type (courses, vocational training, etc.)	**when**	**where**

Do you know about further education of your parents?

2.4 Traditions, beliefs, religion

2.4.1 In general

What role play traditions in your life?
Are there existing any restrictions for women in general because of tradition, cultural belief, religion etc.? Which?
Have some traditions or social values associated with livestock/agriculture/tree management changed as a result of project interventions e.g. relation m-w?
What role plays religion in your life?

2.4.2 Beliefs/traditions concerning trees

Women are allowed to plant trees:	yes	no	which not:
Women are allowed to cut trees:	yes	no	which not:
Some trees have an evil spirit	yes	no	which ones:
Some trees/places are ‘holy’	yes	no	which ones:

2.4.3 (Indigenous) knowledge

Do you use primary and secondary forest resources from the surrounding bushland? Which and for what purposes?
Who has taught you to grow this food/cash crops?
Who has taught you to keep this animals?
Notes:
Can you remember the cropping pattern of your parents/grandparents/...?
Did you make major crop/tree changes (e.g. expansion/reduction of resp. new cash/ food crops, trees)? Which? Why?
Are you a traditional healer? Do you have knowledge about medical purposes? Who taught you this knowledge? Whom do you teach?
Do you use natural medicine (e.g. made from dung and urine against ticks)?

2.4.4 Comprehension/appreciation of nature

1. How would you describe **'**nature'?

2. What role plays nature (conservation) in your life?

3. How is nature being regarded within your family/friends - has there been a change from nowadays to the past?

4 Are there 'parts of nature (e.g. tree-, animal-, plant species, areas in general) which you find have to be conserved resp. not to be conserved at all? Why?

5. Do you think, mankind and nature can subsist besides each other in harmony? If not, why? If yes, how?

2.5 Social engagement/group activities

Member of a women group: (*mwanakikundi*)	yes	no	name:
Targets*:			Notes:
time of meeting, where:			
position:	member since when?		membership fee:

Member of a mixed group:	yes	no	name:
Targets*:			Notes:
number and sex of members:			
time of meeting, where:			
position:	member since when?		membership fee:

Member of other groups:	yes	no	name(s)
Targets*:			Notes:
time of meeting, where:			
number and sex of members:			
position:	member since when?		membership fee:

targets*: Mary-go-round/neighbour-farming, gardening/horticulture, poultry, handicraft (e.g. basket-making, ugali-sticks, strings, making stoves, pots etc.), selling firewood, water, fruits, crops, brewing beer, etc...

Is someone else belonging to your household joining a group? Who? Kind of group?
Has the project contributed to (the success of) these group activities? How?
Social activities (visiting ill relatives etc.), which
Private activities (free time, relaxation), which
What do you understand by the term privacy?
In times of droughts, floods or other hazards, what happens with the poorer women? What kind of assistance do they receive? Do you offer help? To whom? What kind?

2.6 'Psychological' and empowerment related aspects

Do you get support (psychological, physical) concerning group- and resource management related activities from your husband resp. other male relatives?
What about restrictions?
What about the reactions (suspicion, jealousy, support, admiration etc.) of other women concerning your 'empowermental activities (relatives, friends, neighbours?
What do you think is your position within your community? Do you support knowledge transfer ?
Would you like to do more/support knowledge exchange? How could this be done?
Do women participate in public decision making processes (in village committees etc.)? Do they face any restrictions/problems? Which
How many children in your opinion are good to have? Why?
Notes:
What means friendship to you? Especially between women?
What are your dreams, wishes, aims and hopes for the future? Where do you go from here?

2.7 Family background

2.7.1 Woman-related questions

- born where
- since when living in the village
- parents (relation, occupation)
- grandmother, -father (relations, occupation)
- brothers and sisters (relations, occupation)

2.7.2 Husband-related questions

- social background and origin
- relation of power and dominance
- if the husband is not staying permanently on the farm, what are the consequences? (e.g. more freedom, more problems)

Notes:

3: ECONOMIC ASPECTS

3.1 Income

3.1.1 Income generating farm activities

Income generating farm activities	amount/price sold

What do you do with the revenues from selling your farm products? Can you keep all revenues for yourself? If not, how much do you have to give away? To whom?

3.1.2 Income generating off-farm activities **(beer, soap, handicraft, petty trade, firewood etc.)**

Income generating off-farm activities	amount/price sold

Member of a cooperative:	yes	no	name:
Targets:			Notes:
number and sex of members:			member since when:
time of meeting, where:			membership fee:

What is the contribution of such activities to your income? How much? Regularly?

What do you do with the revenues from selling your products?

Do you have them to your own disposal? If not, why and how much?

Who is doing off-farm activities of the household-members? What kind?

Is someone belonging to your household working in another place, off-country? Who, for how long, where? Contribution to the household?

Did you loose some sources of income through new inventions? If yes, which?

3.1.3 Others

Do you get financial support from your husband? If yes, how much?

Do you get support from someone not living with you? If yes, what do you receive?

Occupation of the grown-up sons/daughters?

3.1.4 Credit

What are the main sources of credit for you as a female smallholder to fund different activities concerning sustainable resource management?

Did you apply for a credit? If yes, amount, to what conditions, where, for what?

Did you have any problems? If yes, which?

What about the credit situation for male smallholders ?

Have there been any efforts by the project to mobilise especially female farmers to form savings and credits associations?

3.2 Expenditures

3.2.1 Inputs

Labourers (permanent/casual) for farm and/or household activities:

Tools used for land preparation (food crops) (hand-hoe, tractor, ox-plough):

Tools used for land preparation (cash crops) (hand-hoe, tractor, ox-plough):		
Tools used for tree management (axe, pruning scissors):		
Tools/animals hired/own: (tractor, ox-plough):		
Cutting machine for fodder grass	no	yes

Food crop seeds:	Bought every year? Which?	Previous seeds recycled? Which?
Cash crop seeds:	Bought every year? Which?	Previous seeds recycled? Which?

Animal treatment	no	yes	What kind:	Price

Mineral fertilisers	yes	no	which:	for which crops:
Organic fertilisers	yes	no	which:	for which crops:
Pesticides/herbicides	yes	no	Which:	for which crops:

Labour requirement	**cultivation**		**seeding**		**weeding**		**watering**		**harvesting**		**scms**
'Mary-go-round'											
family only - who?											
neighbours/friends											
church group											
clan group											
hired labour (*vibarua*)											
commercial group											
other:											

Notes:

3.2.2 Household food supply

Do you have food/fodder shortages? If yes, when? If no, why?
Do you store food/fodder? If yes, which? How? If no, why?

3.2.3 Others

Do you support someone not living with you? How much do you contribute? Regularly?

3.3 Marketing

What are the main market outlets for your crops and livestock products (local/national/ international/ middleman?
Do you sell your products to a middleman? Which, how much?
Are you satisfied with the situation? If not, what has to be changed?
How often do you bring your products to the market place?
Transport facilities in general; means of transport concerning the products:
Are the prices offered to your satisfactory?
In your opinion is the amount of land available to you for crops and livestock production adequate? If not, could you get more land? - If yes, what would you cultivate?
Did you ever sell any land? When? Why? How many acres?
If not, what are the limitations of expansion? What strategies would you evolve to maximise productivity?

3.4 Others

Which facilities are in the neighbourhood (school, dispensary, food store, hospital etc.)? How far away are the others?
Distance to the main road:
What about the roads during the rainy season?
Kind of house (roof - iron sheet, grass ...; wall - mud, mud/burned bricks, cement), number of rooms, electricity?
Notes:

4: Land tenure & project-related aspects

4.4 Land tenure

Which shamba is	inherited - size/loc.	borrowed/ caretaker - size/loc.	rented - size/loc.	bought - size/loc.	common - size/loc.	alloc. through government - size/loc.
Which shamba is	yours - size/loc.			your husband's - size/loc.		other family member - size/loc.

Is land in your area communally/privately owned or rented, and what are the implications in terms of soil conservation issues?
Have land tenure systems changed due to project interventions and how (acquisition of title deeds, land use patterns, extent of overgrazing, etc.)
Is there restriction of free-grazing?

4.5 Project related questions

1. Since when are you joining the project:
2. How was the approach?
3. Any kind of positive/negative critics?
4. What kind of training is conducted? (e.g. farmer field days, demonstrations, training)
5. Of what sex was/is/are the trainer/s?
6. Do you think that all/a lot/few men/women living in the project-area know about the project resp. share any positive aspects deriving from the project? Why? Why not?
7. Do you know about other institutions/NGO's operating in the programme area? What are their main activities?
8. Which of the activities you are carrying out are a direct result of the project intervention? Please specify the activities.

physical SCM	**biol. SCM**	**animal production**	**water harvesting**	**groups, credits**	**off-farm income generation**	**others** (health, birth control etc.)

9. Is the project linked to activities concerning health care (aids etc.), birth control, education? If yes, which?
10. On which subject(s) would you like to join a training course? Why?
11. In which field concerning resource management activities would you like to join a training course? Why?

Research-related aspects

1. Did you have contact with (white) researchers before? When? Who? What dide they do?

2. Can you characterise them and their work?

3. What did you feel about them?

4. In which way do you profit from them/their work?

5. How did you like my stay at your place? Do you have positive/negative critics?

Farm Sketch (with energy/nutrient flow diagrams): **scale:**

Appendix 2

Questionnaire

Anja Blume 9/'00

Date:

Organization/Institution and position held (optional):	
Name (optional):	
Sex (optional):	**Age (optional):**
Land (optional):	

Aims and objectives:

This questionnaire is part of an ongoing study carried out on inter-linkages between gender and the conservation and sustainable management of natural resources in Tanzania and Kenya since 1999.

Considering the decrease of natural resources through processes of degradation and destruction caused by humankind with at the same time a constantly increasing demand for food in the so-called 'Third-World-Countries' strategies have to be worked out and operationalised to solve this urgent problem. How far development projects, aiming at the conservation and sustainable management of natural resources and based upon participative concepts sensible to gender issues play an important role referring to this is being investigated by examining 18 successful, partly female headed small-scale farms in two project areas in Tanzania and one in Kenya, supplemented by discussions with women's (mixed) groups, farm visits and informal meetings with farmers and interviews with experts and project staff.

The different activities carried out by the successful (female) farmers and their influence on the ecological conditions as well as the influence of these practices on the quality of life of the selected families regarding socio-cultural and economic aspects are being assessed, analysed and illustrated. In this context, the influence of the female farmers on their social environment are of particular interest. Furthermore, project strategies are being analysed.

Interviews are being held from different organisations, universities, etc., not only from Tanzania respectively Kenya, but with experts from other countries, too. This renders the possibility of including opinions and estimations from decision-making persons on a local, national and global level into the final analysis and evaluation as a further criterion for rating.

Please note that all information will be handled confidential - no names will be mentioned!

Please don't change the structure of the questionnaire like deleting questions, etc. Just leave questions you can't/don't want to answer open!

Thank you very much for supporting this research!

1	**Linkages and knowledge/'interdisciplinary' exchange between projects and/or local, regional as well as international institutions**
1	What do you think about linkages resp. knowledge/'interdisciplinary' exchange in general between organisations/ institutions on different levels (local/national/ international)?
2	What are the weaknesses and strong points of the linkage mechanisms and what is the corresponding impact?
3	What are the main indicators of effective knowledge dissemination?
4	What, in your opinion, could be done to enhance knowledge dissemination?

2	**Impact of projects on various aspects of the people's/ women's lives**
2.1	**Education, health**
1	What could/should be done through project interventions to change women's live conditions with regard to education, health, etc.?
2.2	**Gender issues**
1	How do, on your opinion, gender aspects influence the success/failure of project interventions with regard to natural resource management?
2	What, on your opinion, is the best approach to address gender aspects?
3	Any kind of critics/notes concerning positive aspects of existing project approaches with regard to this aspect?
4	What do you think about women/mixed groups as an approach to address natural resource management?
5	Do you think rural women's workload has increased over the time ? If yes, why?
2.3	**Economic aspects**
1	How could projects improve the employment/income opportunities for the rural population (e.g. to reduce the extent of migration of young people to towns)?
2	What are the main sources of credit for female smallholders to fund different activities concerning sustainable resource management?
3	Do you know about any efforts by projects to mobilise especially female farmers to form savings and credits associations?
4	What are the main market outlets for (female) farmer crops and livestock products? Are the prices offered to farmer's satisfactory?
2.4	**Political aspects**
1	Do you think international/national politics resp. political changes/events have an impact on the success/failure of the implementation of natural resource management activities? Could you give an example?
2	What about the impact of land tenure systems on the encouragement of women in activities for a sustainable resource management?
3	What could be done to ease the situation for female smallholders with regard to this aspect?

2.5	**Empowerment aspects**
1	What kind of problems do female smallholders face?
2	What do you think are the reasons for a successful realisation of activities concerning natural resource management & - conservation through female smallholders?
3	What, on your opinion, should be done to help female (resource-poor) smallholders to come to a more successful realisation of activities concerning natural resources management &- conservation?
4	What is your opinion/are your own experiences concerning 'strong women'/'successful female farmers'? Would it be a challenge to support them to function as 'multiplicators for knowledge transfer' within (agricultural) extension?
5	What do you think are the characteristics of a 'successful (female) farmer'?
6	What is your opinion/experience concerning the interest and engagement of female farmers in activities for a sustainable management of natural resources (incl. field days, training seminars etc.) - Please specify!

3	**Measures in the field of natural resources management**
1	What do you think about the promotion of indigenous trees/shrubs? How could this be done?
2	What do you think about organic farming?

4	**Methodology - extension and research approach**
4.1	**Action research/participant observation**
1	What do you think is the best approach with regard to extension? Please specify potentials and weaknesses
2	Do you know about and/or have experience with action research/participating observation? If yes, what kind and how would you describe this method?
3	Any critics or notes on potentials?
4	Is, on your opinion, action research/participant observation in general a good method for to obtain information?
4.2	**Intercultural research**
1	Do you think research should be carried out through researchers from the so-called industrialised countries, too? If yes, why (what could be the potentials) and what kind? If not, why?
2	Do you think the sex of the researcher has an influence on the field work? If yes, why? If no, why not?
3	What, on your opinion, is the best approach/are the preconditions for researchers from the so-called industrialised countries concerning field research in general?

Any kind of critics/notes on the questionnaire as well as general additional notes is/are welcome!

Appendix 3: Measures implemented on the farms

Districts/Projects	**NSWCP**						**SCAPA**						**HASHI-ICRAF**					
Farmers	**1K-l***	**2K-l***	**3K-l***	**1K-m***	**2K-m***	**3K-m***	**1T-l***	**2T-l***	**3T-l**	**1T-h***	**2T-h**	**3T-h***	**4T-l**	**5T-l**	**6T-l**	**4T-m**	**5T-m**	**6T-m**
Physical measures																		
contour tillage (plough/hoe)	X	X	X	X	X	X	x	X		X	X	X						
contour furrows & ridges	X	X	X	X	X	X	X	X		X	X	X						
tied ridges				X		X					X		X		X	X	X	X
raised beds				X								x	X	x	X	X	X	X
holes / micro basins		X	X	X	X	X	X		X						X		X	X
circular bunds		X	X		X			X			X	X					X	
enclosure bunds					X			X	X							X	X	X
contour bunds							X	X		X	X	X						
(level) bench-terraces				X	X	X												
fanya-juu terraces	X	X	X	X	X													
infiltration / retention ditches	X	X	X	x	X	X	X	x	X	X	X	X			X	X	X	X
cut-off drains	X	X	X	X	X													
Biological measures																		
contour cultivation	X	X	X	X	X	X	X	X		X	X	X						
contour grass strips			X		X		X											
contour vegetation strips	X	X	X	x	X	X	X	X		X	x	X						
cultivation along / in waterlines	X	X	X	X	X	X		X			X	X						
cultivation on raised beds				X								X	X	X	X	X	X	X
trash lines												X						
mulching	X	X	X	X	X	X	x	X	x	x	x	x	x	x	X	X	X	X
green manuring								X		X	X							
composting	X	X	X	X	X	X		X	X	X	X	X				X	X	X
farm yard manuring	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
liquid manuring								X	X		X							
crop rotation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
mixed- / intercropping (crops)	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X
trees inter-cropped	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
trees on soil conservation structures	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X
trees on farm / field boundaries	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
hedgerow / alley cropping				X		X		X		X		X	X	X	X			
multistorey cropping	x	X	X	X	X	X	x	X	x	X	X	X	x	x	x	X	X	X
fallow	X				X	X												X
natural forest/woodlot	X	X	X	X	X	X	X											X
natural tree regeneration	X	X			X		X	X					X	X	X	X		X
Other measures																		
Zero-grazing / own grazing area			x	x	/	X	x	X	x	X	X	x	X	X	x	/	/	
fodder bank – grasses & herbs	X	X	X	X	/	X	X	X	X	X	X	X			X	/	/	
fodder bank – trees**					/		X	X		X	X	X	X	X	X	/	/	X
Energy-saving stoves (wood)		X	X	X	X	X	X	X					X		♦	♦		
Energy-saving stoves (charcoal)				X									X					
water harvesting (water tank)	X	X	X	X		X	X					X						
beekeeping	X						X	X		X		X						
Fish pond								X		X								

Legend:

K = Kenya; **T** = Tanzania; **l** = LPA; **m** = MPA; **h** = HPA; **X** = carried out on the farm; x = carried out partly/little on the farm; / = no livestock; * = inclination > 4 %; ** = *Leucaena ssp*., *Gliricidia s*., *Flemingia m*., etc.; ♦ = ordered; ☐ = not on the resp. farm; ▒ = not in the resp. zone/country

Appendix 4: Botanical, English and Swahili names of crops cultivated (grouped)* - indigenous = (i); exotic = (e); perennial) = (p)

Botanical names	English names	Swahili names
(Leafy) vegetables		
Abelmoschus esculentus (e)	okra	bamia
Allium cepa var. cepa (e)	onion	kitunguu
Amaranthus ssp. (i)	amaranthine	mchicha
Brassica oleracea L. var. acephala (e)	kale	sukuma wiki
Brassica oleracea var. capitata (e)	cabbage	mfigili
Brassica rapa L. ssp. Pekinensis (e)	Chinese cabbage	-
Capsicum annuum var. grossum (e)	red pepper	pilipili hoho
Citrullus lanatus ssp. vulgaris var. vulgaris (i)	water melon	mtikiti
Corchorus trilocularis (i)	-	mlenda
Cucurbita maxima (e)	squash	matango
Cucurbita pepo (e)	pumpkin	[m]boga
Cyamopsis tetragonoloba (i)	clusterbean	mgwaru
Cyphomandra betacea (p) (e)	tree tomato	ngogwe
Daucos carota ssp. sativus (e)	carrot	karoti
Lactuca sativa var. Capitata (e)	salad	saladi
Lycopersicon esculentum (e)	tomato	nyanya
Solanum melongena (e)	eggplant	mbilingania
Solanum nigrum (i)	black nightshade	mnaf(v)u
Spinacia oleracea (e)	spinach	spinazi
Protein rich vegetables (*Leguminosae*)		
Arachis hypogaea (e)	ground nut	njugu nyasa, karanga[176]
Cajanus cajan (p/a) (i)	pigeon pea, red gram	mbaazi, [njegere]
Dolichos lablab (i)	hyacinth/bonavist/lablab bean	mfiwi
Lens culinaris (e)	lentil	dengu, adesi
Phaseolus coccineus (e)	Scarlet runner bean	maharagwe
Phaseolus vulgaris L. var. vulgaris (e)	French bean	maharagwe
Vigna radiata (Phaseolus aureus) (e)	green gram, mung bean	cho(r)oko
Vigna subterranea (i - Timbuktu)	Bambarra/Madagaskar groundnut, earthnut, baffin pea	njugu mawe
Vigna unguiculata ssp. unguiculata (i)	cow pea	kunde
Herbs and spices		
Allium sativum (e)	garlic	kitunguu saumu
Allium schoenoprasum (e)	chives	-
Capsicum frutescens (p) (e)	chilli	pilipili
Cereals		
Eleusine coracana (i)	finger millet	(m)wimbi
Oryza sativa (?)	rice	mpunga
Pennisetum glaucum (i)	bulrush/pearl millet	U(m)wele, ulezi
Sesamum indicum (i)	sesame	simsim
Sorghum bicolor (i)	sorghum	mtama - ulezi
Zea mays (e)	maize	mhindi
Tubers		
Colocasia esculenta (e)	coco-yam, dasheen	
Ipomoea batatas (e)	sweet potato	kiazi
Manihot esculenta (p) (e)	cassava, manioc	mihogo
Solanum tuberosum (e)	potato	kiazi cha kizungu/viringo
Others		
Ananas comosus (e)	pineapple	[m]nanasi
Gossypium hirsutum (e)	cotton	pamba
Helianthus annuus (e)	sunflower	alizeti
Saccharum officinale (e)	sugar cane	miwa

* References: FRANKE 1997; MAUNDU et al. 1999; ITLC 1994, 1999

[176] Normally refers to roasted groundnuts

Appendix 5: Botanical, English and Swahili names of trees/shrubs*

Indigenous fruit trees/shrubs/climbers		
Botanical names	**English names**	**Swahili names**
Annona senegalensis	wild custard apple	mtopetope, mtomoko mwitu, mchekwa
Balanites aegyptiaca	desert date	njienjia
Borassus aethiopum	African fan/borassus palm	mvumo
Cordyla africana	wild mango	mgwata, mroma, mr(v)oo, mtigonzi, mumbwe
Manilkara discolor	forest milk berry	(mchedi)
Pappea capensis	pappea	mubamba ngoma
Parinari curatellifolia	Mobola plum	-
Psydrax livi	-	-
Rhus ssp.	-	mkumba, mt(l)ishangwe, mvunja/mrinja kondo, mkuna/ mkono chuma, mlama-mvitu
Sclerocarya birrea subsp. caffra	prunier	mng'ongo, mng'ong'o
Strychnos heterodoxa	-	-
Syzygium cordatum	water-berry tree	msambarau, mzuari, myamayu
Tamarindus indica	tamarind	mkwaju
Telfairia pedata	oyster nut tree	mkweme
Vangueria ssp.	wild medlar	mviru
Vitex keniensis	meru oak	mfu
Vitex mombassae	smelly berry vitex	mfudumaji, mtalali
Ximenia americana	wild plum	mpingi, mtundakula
Ximenia caffra	large sourplum	mpingi

Exotic fruit trees/shrubs/climbers		
Botanical names	**English names**	**Swahili names**
Annona muricata	soursop	mstafeli
Carica papaya	papaya	mpapai
Citrus aurantiifolia	lime	mdimu
Citrus limon	lemon	mlimao
Citrus x paradisi	grapefruit	mbalungi
Citrus reticulata	tangerine	mchenza
Citrus sinensis	orange	mchungwa
Cocos nucifera	coconut palm	mnazi
Coffea arabica	coffee	kahawa
Cyphomandra betacea	tree tomato	ngogwe
Dovyalis caffra	kei apple	-
Macademia tetraphylla	macademia nut	-
Mangifera indica	mango	embe
Morus alba	mulberry	mforsadi, mfurusadi
Musa ssp.	banana	mgomba
Opuntia ficus-indica	Indian fig, prickly pear	mpungate
Passiflora edulis	passionfruit, grenadille	-
Persea americana	avocado pear	parachichi, embe mafuta
Phoenix dactylifera	date palm	mtende
Phoenix dactylifera	date palm	mtende
Pithecellobium dulce	Madras thorn, Manila tamarind	mkwaju wa kihindi, maramata
Prunus persica	peach	mfyoksi
Psidium guajava	guava	mpera
Punica granatum	pomegranate	mkomamanga, mkudhumani
Syzygium cuminii /jambolanum	jambolan, java plum	Ki/m(th)sambalau

Indigenous non-fruit trees/shrubs		
Botanical names	**English names**	**Swahili names**
Acacia depranolobium	whistling thorn	-
Acacia mellifera	black/hook thorn	kikwata
Acacia nilotica	Egyptian thorn	mgunga
Acacia refrascia	-	-
Acacia senegal	three-thorned acacia, Sudan gum arabic	-
Acacia tortilis	umbrella thorn	mgunga, mugumba
Acacia xanthophloea	fever tree	mgunga
Afzelia quanzensis	lucky-bean tree, pod mahogany, mahogany bean	mbambakofi
Albizia amara	bitter albizia	mkenge
Albizia gummifera	peacock flower	mkenge
Albizia schimperiana	long-podded albizia	-
Arundinaria alpina	mountain bamboo	mianzi
Brachylaena huillensis	silver oak	muhuhu, mkal(r)ambati,
Burkea africana	burkea, wild syringa	-
Cassia abbreviata	long-pod cassia	-
Combretum constrictum	-	mbamba ng'oma
Combretum molle	velvet-leaved combretum, velvet bush willow	-
Combretum obovatum	-	-
Combretum schumannii	forest tree combretum	mgurure, mpera mwitu
Commiphora africana	poison-grub commiphora	mbambara, mkororo, mturituri
Cordia africana	East African cordia	mringamringa
Cordia monoica/ovalis	sandpaper cordia	mkamasi, nyamate, msasa
Croton megalocarpus	croton	-
Croton macrostachys	broad-leaved croton	-
Dodonea angustifolia	hopbush	mkengata
Dalbergia melanoxylon	African blackwood	mpingo
Dichrostachys cinerea	-	mkulagembe, msigino, mvunja shoka
Diospyros fischeri	African ebony	-
Dombea rotundifolia	white dombeva	-
Entada abyssinica	tree entada	-
Erythrina abyssinica	kaffir boom, red-hot-poker tree	mjafari
Euclea divinorum	diamond-leaved euclea	mdaa
Euphorbia tirucalli	finger euphorbia	mnyara, mwasi, utupa
Ficus sycomorus	sycamore fig	mkuyu
Ficus thonningii	strangler fig	mrumbapori
Gnidia latifolia	-	mwata
Hagenia abyssinica	hagenia	-
Kigelia africana	sausage tree	mwegea, mwicha, mvungwa
Lannea schimperi	-	-
Lannea schweinfurthii var. stuhlmannii	-	mtundu
Maerua angolensis	-	-
Maesopsis eminii	-	-
Manilkara mochisia	milk berry	msapa
Markhamia obtusifolia	golden bean tree	mtarawanda
Olea capensis subsp. welwitschii	Elgon olive	loliondo
Pericopsis angolensis	East African Afrormosia	mbanga, muvanga
Phoenix reclinata	wild date palm, Senegal palm	-
Piliostigma (Bauhinia) tomentosa	-	msaponi
Rauvolfia caffra	quinine tree	mwembemwitu, mkufi
Ricinus communis	castor oil plant	mbarika, mbono, nyonyo
Sclerocarya birrea subsp. caffra	-	mn'ongo, mng'ong'o
Securidaca longipedunculata	violet tree	-
Senna bicapsularis	-	-
Senna didymobotrya	candle bush, peanut-butter cassia	-
Senna singueana	-	-
Sesbania sesban	Sesbania, river bean	-
Solanum incanum	sodomapple	mthunguja
Synadenium compactum	-	-
Tamarindus indica	tamarind	mkwaju

Indigenous non-fruit trees/shrubs		
Botanical names	**English names**	**Swahili names**
Tarenna graveolens	-	-
Terminalia brownii	-	-
Terminalia orbicularis	-	-
Terminalia sericea	silver terminalia	-
Trichilea emetica	Cape mahogany	mkungwina, mtimai,
Turraea robusta	honeysuckle tree	-
Zanthoxylum/Fagara chalybeum	knobwood	mjafari
Zanthoxylum/Fagara merkeri	-	-

Exotic non-fruit trees/shrubs		
Botanical names	**English names**	**Swahili names**
Acacia angustissima	-	-
Acacia crassicarpa	-	-
Acacia mearnsii	black wattle	muwati
Agave sisalana	sisal	katani, mkonge
Albizia lebbeck	East Indian walnut, siris tree, woman's tongue	mkingu
Araucaria cunninghamiana	hoop pine, Moreton Bay pine	-
Araucaria heterophylla	Norfolk Island pine, star pine	-
Azadiracta indica	neem tree	mwarubaini kamili
Bougainvillea glabra	Bougainvillea	-
Caesalpina decapetala	Mauritius/mysore thorn	-
Calliandra calothyrsus	calliandra	-
Callistemon citrinus var. splendens	bottlebrush tree	-
Casuarina equisetifolia	horsetail tree, sea pine, swamp she oak, whistling pine	mvinje, moinga
Catharanthus roseus/Vinca rosea	-	-
Cupressus lusitanica	(Mexican) cypress	-
Delonix regia	flamboyant	mkakaya
Eucalyptus ssp.	Eucalyptus	mkaratusi
Euphorbia cotinifolia	Red Euphorbia	-
Flemingia macrophylla	-	-
Ficus benjamina	Java fig, weeping fig	-
Gliricidia sepium	Mexican lilac, mother of cocoa, quick stick, tree of iron	Gliricidia
Gmelina arborea	gmelina, white teak	majani wa pana?
Grevillea robusta	silver oak	mgrivea
Hibiscus rosa-sinensis	-	-
Ipomea arborescens	morning glory tree	-
Jacaranda mimosifolia	jacaranda, Brazilian rosewood	-
Lantana camara	Lantana, curse of India	-
Leucaena diversifolia	-	-
Leucaena leucocephala	wild tamarind, ipil ipil	(m)lusina
Leucaena palida	-	(m)lusina
Manihot glaziovii	tree cassava	mpira
Melia azedarach	bead tree, Chinaberry, Persian lilac	mmelia, mwarubaini nusu
Moringa oleifera	drumstick tree, horse-radish tree	mlonge
Nerium oleander	-	-
Piliostigma (Bauhinia) variegata	orchid tree	-
Rosa ssp.	rose	-
Schinus molle	pepper tree, Peruvian mastic	mpilipili
Senna/Cassia siamea	Iron wood, yellow cassia	mjohoro
Senna/Cassia spectabilis	cassia	mhoba
Terminalia catappa	bastard/Indian/tropical almond	mkungu
Terminalia mantaly	-	-
Tithonia diversifolia	wild sunflower	-
Thevetia peruviana/neriifolia/ thevetioides	yellow oleander, lucky nut	-

* References: KOKWARO 1993; BLUNDELL 1994; MBUYA et al. 1994; NOAD & BIRNIE 1994; FRANKE 1997; MAUNDU et al. 1999

Appendix 6: Botanical and English names of fodder grasses and -plants

Botanical names	English names
Grasses	
Brachiaria decumbens - Africa	Kongo signal grass
Brachiaria ruziziensis	Ruzi grass
Cenchrus ciliaris	Buffalo grass/African foxtail
Centroxma pubescens - Australia, South America	Cetro
Chloris gayana - Africa	Rhodes grass
Chloris roxburghiana	Horsetail, bottle brush grass
Cynodon plechtostachyum	Star grass
Eragrostis superba	Maasai love grass
Melinis minutiflora	Molasses grass
Panicum maximum	Guinea grass
Panicum trichocladum	Donkey grass
Pennisetum purpureum	Elephant/Napier grass
Pennisetum clandestinum	Kikuyugrass
Setaria sphacelata (anceps)	Nandi grass/Golden Timothy grass
Setaria splendata - England	Giant Setaria
Tripsacum laxum	Guatemala grass
Vetiveria zizanioides	Vetiver grass
Herbs	
Canna edulis	Edible Canna
Clitoria ternatea	Butterfly pea
Desmodium intortum - tropical America	Greenleaf desmodium
Desmodium uncinatum	Silberleaf desmodium
Dolichos lablab/Lablab purpureus	hyacinth/bonavist/lablab bean
Macroptillum atropurperium	-
Medicago sativa - Asia	Lucerne/Alfalfa
Symphytum peregrinum	Russian comphrey

* References: KOKWARO 1993; BLUNDELL 1994; MBUYA et al. 1994; NOAD & BIRNIE 1994; FRANKE 1997; MAUNDU et al. 1999

Appendix 7: Additional data about the women's groups

Farmers	Name	Started	Number of members	Meeting time	Fees in Ksh	Total income in Ksh/y	Account	Money saved	Active	Notes, Problems
1K-l	*Umiisyo* (Sw = Kutamalia mateso) women group (A);	1987	10	every wednesday, 9-12	20 ksh/m	**20/bucket = ~100.000**	**/**	/	**x**	In total there are 5 groups: **A**: **10**; cultivating, **B**: **15**; terraces, **C**: **20**; trees, **D**: **8** (only men); gabion, **E**: **8** (only men) clearing; Men are also members, but most of them work in town.
2K-l	*Wikwatyo wa Kitia* (our hope) women group	1997	20 (16 active)	every tuesday and friday	100 ksh/ w; 50 ksh for re-gistration/y	96.000	**x**	**7.260**	**x**	husband supports group; 187 497 165, Kenya Commercial Bank, Machakos; Want to start **poultry-keeping**. She wants to provide the place. A hired labour shall be paid to do the work; need 5.000 ksh (buying chicken and fodder: 2 sacks per months a 2.000 ksh). They need a **water tank**: have already stones - 3 lorries a 5.000 ksh (husband supported), all done by women. need 30.000 ksh for poultry and water tank - do harambee in february for to get 23.000 ksh) **Problems**: Drought, saltification
3K-l	*Ushirika wa-nawake* women business group	1982	18 (Kaithi village (each family one member)	every tuesday	1000 ksh/m	/	**x**	/	**x**	Support from a Canadian project
1K-m	*Ivutu* women group *	1981	68	first monday of each month, 10-1, at her place	10 ksh/m	/	**x**	/	**x**	Group has been build up by her **Problems:** water
2K-m	*Kauti* Women group	1978	19 active	every wednesday	120 ksh/y + 23 ksh/m	60.000	**x**	/	**x**	Group started in 1978, but fell apart in 1979. 5 women remained and re-organized the project; failed in 1989, now active since 1994 **Problems:** engagement
3K-m	*Kwambio* (charcoal) women group	1991	46	every tuesday	20 ksh/w	60.000	**x**	/	**x**	**Problems:** Need water tank (water comes from down the river), uniforms and material for sewing clothes, market for baskets. Big general problem: Men don't help
1T-l	Family group	Family group	5	Family group	/	/	**/**	/	**x**	
2T-l	/	Juli 1997	12	1 x week	/	/	**/**	/	**x**	engagement

3T-l	*Pendaneni* women group	1993	25	every tuesday	/	1 kg Lucerne = 900 ksh = **40-45.000**	**x**	/	**x**	The group exists since long: went on, stopped, went on...
1T-h	*Amani* (peace) women group (A+B)	1994	10 (5 per group)	every friday, during planting season 1 x per month	/	/	**x**	/	***x***	
2T-h	*Nkaseure* women group	1990	10	every friday	1.000 Tsh/m + 1.000 Tsh /y for registration	/	**/**	/	**x**	Selfishness – one mama left and does not care for te others
3T-h	*Pendeza* women group /*Kawawa* women group	May 1999	12	every monday + thursday from 3.00 pm	500 Tsh/w	/	**x**	/	**x**	The group is very important (*"group ni moto"*). **Problem** with clay: comes from Singida.
4T-l	*Nia njema* women group (**1**)	1994	15	2 x /m	500 Tsh/m; 10.000 Tsh one time	/	/	/	**x**	In total there are 6 groups: **2** *Jikwamue* (18/23 members): animal husbandry, crops + vegetables, handicraft; **4**: *Umoja ni nguvu* (13): animal husbandry, tree nursery **5** *Isesemya* (18/15): ~ new! **6** *Elimisha* (30/18): (soon animal husbandry, handicraft)
5T-l	*Nguvu mali* women group (**3**)	1998	18	2 x /m	3.000 Tsh one time	/	/	/	**x**	
6T-l	*Nia njema* women group (**1**)	1994	15	2 x /m	500 Tsh/m; 10.000 Tsh one time	/	/	/	**x**	Group has been build up by her
4T-m	*Msitu ni uhai* women group	1995?	7	every monday + friday	soon 1.000 Tsh /m	This year only 600 Ksh	/	/	**x**	**Group 2**: *Twende na wakati* (5 members: improved cooking stoves; **group 3**: *Kikundi cha mfinyanzi* (5 members): pottery, improved cooking stoves – both groups visited **Problems:** Trees dried up
5T-m	*Kagongwa* women group	1998?	5	each 15. + 30.	/	/	/	/	**-**	**Problem**: *bure*: members thought they get everything for free, not active in the moment
6T-m	*Upandaje ya miti* women group	1994	20	3 x /m	500 Tsh/m	/	/	/	**x**	

* See MAGETO (1998) for further information about *Ivutu Women's group* (1K-m).

/ = not resp. no data

Appendix 8: Botanical, English and Swahili names of wild growing and partly cultivated plants used as vegetable/spice/medicine*

Botanical names	English names	Swahili names
Commelina africana	-	kongwa
Commelina benghalensis	-	-
Commelina forskaolii	-	jaja, kongwe
Cucumis metuliferus	spiny/horned cucumber	-
Cucumis prophetarum	-	-
Sesamum angustifolium/calycinum	-	mfuta mwitu
Cymbopogon citratus	lemon gras	chai chai
Aloe ssp.	Aloe	kisimamleo

Appendix 9: Botanical, English and Swahili names of weeds (partly used as vegetable [v], fodder [f], nitrogen-fixing [n], against weeds [w] or for medicinal purposes [m])*

Botanical names	English names	Swahili names
Achyranthes aspera	-	-
Argemone mexicana	Mexican Poppy	-
Bidens pilosa	Black Jack	-
Craterostygma pumilum	-	-
Crotalaria ochroleuca (v, f, n, w)	-	marejea
Gutenbergia cordifolia	-	-
Heliocrysum ssp	Everlasting flower	-
Hibiscus pycnostemon	-	-
Leonotis mollissima	Lion's tongue	-
Leonotis nepetifolia	Lion's tongue	-
Priva curtisiae	-	-
Saliva coccinea	-	-
Solanum incanum (m)	Sodom apple	mtunguja
Striga ssp.	Striga	-
Tagetes minuta	Khaki weed	tururu

* References: KOKWARO 1993; BLUNDELL 1994; MBUYA et al. 1994; NOAD & BIRNIE 1994; FRANKE 1997; MAUNDU et al. 1999

Appendix 10: Quotations of the farmers with regard to nature

	What means nature? What role plays nature/~ conservation in personal life/~life of family, friends, neighbours?
1K-l	„Nature is beautiful - like birds and trees - and important - like trees, like national parks. Trees bring rain and fresh air, birds sing. Nature should be preserved like through national parks. National parks are absolutely necessary."
2K-l	"Trees are nice. We like trees because we need them. " "What about wild animals?" - "In the mango mountains you can see wild animals." "Do you like them?" - "No, we don't like them. They come and spoil our shambas. They are dangerous." - "What about national parks?" - "Yes, they are nice. It's good to have an area where you can bring them, where they are fenced and don't enter our shambas." (She does not really know what nature conservation means. Knows soil conservation).
3K-l	"Nature is important because if she gets lost the children don't know the animals, the nature and her animals. I like national parks a lot because if I read in a book about the meaning and relevance of the animals I understand very good when I see them. And trees are very important."
1K-m	„Nature is trees, birds. Me and my family think that national parks are important, esp. for the children. National parks are needed because here children can see nature and by seeing and loving them they learn that it is important to preserve nature."
2K-m	„Trees are beautiful, they give home to nice singing birds. You have to have a big variety of trees to enhance the environment. Useful trees are important. National parks are good for those trees who need long time to grow. National parks are important for children, they bring foreign currency."
3K-m	„Nature is nice, I like animals. E.g. forests function as catchment areas. National parks preserve Kenya's heritage."
1T-l	„God is nature, nature is god. We try to live with nature. It's important to save the trees. We like Serengeti. Wild animals nearby are dangerous like hyenas, lions, leopards, they come very seldom in march/april."
2T-l	„Nature is trees and animals. Very important, beautiful. Nature means nice place and climate; trees bring firewood and shade... Also the dangerous animals are nice, but should stay in fenced areas. Of course it's a problem to have big animals who destroy the crops, near the shambas. We like birds, antelopes. We observe birds, sometimes Edward [husband – note by the author] catches one for to show him to the children or neighbours. We don't like boys throwing stones at birds; we would like to keep some animals like antelope, birds in a fenced area. Many of our friends know that nature is important, but there are also others who don't know. We like national parks; it's problematic that the Maasai still walk inside the national parks and disturb, expel the animals."
3T-l	„Nature is important, every part of nature is important. Trees bring rain and shade. I like trees, all animals, too, but not too close. The animals should be kept in fenced/special areas, they are very important in national parks. It is important to know the animals, they are beautiful."
1T-h	„Very important, nature is life. We are very happy if we see birds or other animals. National parks are important. Not all friends see it like
2T-h	„I like nature a lot. Animals are very important, they are creatures of god. Knowing the animals, their names etc. is important for being able to conserve them. My last born son is guide in Tarangire National park. National parks are important."
3T-h	"Nature is important, brings a lot of money from foreign countries to Tanzania and furthermore, we just like nature. We need nature, e.g. nature gives animals, we can eat them. We need national parks."
4T-l	"I like nature a lot because nature is beautiful and important, it is the place for miti ya asili (indigenous trees). Foreigners like national
5T-l	"Nature is useful, we get e.g. medicine and firewood."
6T-l	"Where would we be without nature? Nature is everything around us. We have to care for nature, because we need her. So, national parks are a good thing to save nature."
4T-m	"Nature and reserves assist people to get food, groups have to travel, to see and understand."
5T-m	„I like nature a lot, and I am very happy when I see wild animals."
6T-m	„Nature is wealth. I like nature because it gives firewood, medicine, everything. Also strangers come here to watch animals. Also me I would be very happy if I could watch animals. Because of this national parks are very important."

Appendix 11: Project activities joined (inclusive other projects)

	Project activities joined (also from other organizations & institutions)
1K-l	2 training courses (a.o. improved cooking stoves in Nairobi); is a trainer, receives up-dates for 1-2 days, 1 week, up to 2 weeks; contact to people from Tanzania, Madagascar, etc.
2K-l	A.o. group seminar on trees and natural medicine. 2-days seminar on soil erosion, Organic farming (Min. of For.), tree nursery, farming, livestock
3K-l	Joined seminars from GTZ: 1-4 days on trees and agriculture in Nairobi, Thika, Machakos
1K-m	A lot, also other projects & institutions (a.o. about bananas, cooking, maize [hybrid], mats, marketing), first in the early 70s. First seminar joined was organised by church 1969.
2K-m	1 week in Thika about tree nursery management
3K-m	Horticulture, soil conservation, poultry/livestock keeping: 1-2 days for several months
1T-l	Construction of water tanks, fencing, tree management – 1 day seminars
2T-l	A.o. 10-days seminar (trees, soil conservation, construction of water tanks, livestock); other training (~ 3 days) in Singida, Tanga, Dar-es-Salaam, Morogoro, 1 day tours
3T-l	Farmers field day (Nambala on pasture grass (with 4 extensionists). **Group:** 4-days seminar 1996 in Njiro (a.o. pasture grass, horticulture, organic farming, tree management)
1T-h	A lot of study tours and seminars, e.g. 1 week in Babati (LAMP).
2T-h	Study tours, demonstrations, seminars (5 days to Njiro/Arusha in May 1999, different subjects). 1987 Tengeru (*Chama cha mifugo*) (2-weeks seminar on livestock keeping
3T-h	Seminar in Lushoto (1/7 1999) on indigenous trees (received seeds), horticulture, contours; seminar on livestock keeping in Tengeru (*Chama cha mifugo*). Day-tours to Nyresi, Oloitushula, Mushona, Sakila, etc.
4T-l	All traning in 1998: 2x HASHI on construction of improved cooking stoves. 6 days in Tengeru (HPI), went to Arusha, Babati. 2 weeks Maraa (HPI) for animal husbandry, natural medicine and gender. HASHI on water (4 seminars?). On pump construction (Caritas). 3 x one-day seminars with HASHI
5T-l	Several demonstrations, also HPI, 2x seminar (1x dairy, 1x tree management)
6T-l	Training (e.g. in Arusha - HPI), seminars, demonstrations, field days
4T-m	Participated the last days in a 14 days training on forest, water, livestock. Send chairlady instead, read her notes and taught the group; 1 day improved cooking stove
5T-m	Not yet, receives farm-to-farm visits on farmer field days through HASHI
6T-m	Many times training HASHI → came and she went too for several days (3) to seminar in Kahama → trees; more in bustani, livestock

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Hiermit versichere ich, dass ich diese Dissertation selbstständig verfasst und keine anderen als die gekennzeichneten Hilfsmittel benutzt habe.

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Anja Blume