

REPOA

P.O. Box 33223, Dar es Salaam, Tanzania 157 Mgombani Street, Regent Estate Tel: +255 (0) 22 2700083 / 2772556 Fax: +255 (0) 22 2775738 Email: repoa@repoa.or.tz

Website: www.repoa.or.tz

ISBN: 978-9987-483-21-1

REPOA, is an independent, non-profit organization concerned with poverty and related policy issues in Tanzania. REPOA undertakes and facilitates research, enables monitoring, and promotes capacity building, dialogue and knowledge sharing.

REPOA's research agenda is concerned with poverty and its alleviation. Our objectives are to:

- develop the research capacity in Tanzania;
- enhance stakeholders knowledge of poverty issues and empower them to act;
- contribute to policy dialogue;
- support the monitoring of the implementation of poverty related policy;
- strengthen national and international poverty research networks, and forge linkages between research(ers) and users.

It is our conviction that research provides the means for the acquisition of knowledge necessary for improving the quality of welfare in Tanzanian society.

REPOA's Research Reports contain the result of research financed by REPOA. Our Special Papers contain the findings of commissioned studies conducted under our programmes of research, training and capacity building. The authors of these research reports and special papers are entitled to use their material in other publications; with acknowledgement to REPOA.

REPOA has published the results from this research as part of our mandate to disseminate information. Any views expressed are those of the authors alone and should not be attributed to REPOA.

Integrating Traditional and Modern Knowledge Systems in Improving Agricultural Productivity in Upper -Kitete Village, Tanzania

Julita Nawe and Herbert Hambati



Research Report 14/3

Integrating Traditional and Modern Knowledge Systems in Improving Agricultural Productivity in Upper-Kitete Village, Tanzania

By Julita Nawe and Herbert Hambati

POLICY RESEARCH REPOA

Research Report 14/3

Published for: REPOA P.O. Box 33223, Dar es Salaam, Tanzania 157 Mgombani Street, Regent Estate Tel: +255 (0) 22 2700083 / 2772556 Fax: +255 (0) 22 2775738 Email: repoa@repoa.or.tz Website: www.repoa.or.tz

Design: FGD Tanzania Ltd

Suggested Citation:

Julita Nawe and Herbert Hambati 'Integrating Traditional and Modern Knowledge Systems in Improving Agricultural Productivity in Upper-Kitete Village, Tanzania'

Research Report 14/3, Dar es Salaam, REPOA

Suggested Keywords:

Traditional environmental knowledge systems (TEKS), Modern environmental knowledge systems (MEKS), Land conservation and Management, Agricultural productivity, and Pasture land.

©REPOA, 2014

ISBN: 978-9987-483-21-1

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means without the written permission of the copyright holder or the publisher.

Abstract

This study examined the integration of traditional environmental knowledge systems (TEKS) and modern environmental knowledge systems (MEKS) for improving the productivity of arable land and pastureland in Upper-Kitete Village, Karatu District, Tanzania. Structured interviews were conducted with 100 adults (50 males and 50 females) selected from areas of the village with different land uses. In-depth interviews were also conducted with 21 respondents, and five focus group discussions were held, each with seven participants. Participants were asked questions regarding their knowledge and use of traditional and modern farming and livestock keeping practices for improving productivity. Participatory Rural Appraisal (PRA) techniques were employed in collecting primary data. Data were also collected from secondary sources.

The findings of the study indicated that the community of Upper-Kitete Village live in a vulnerable ecosystem, characterised by varied landscapes and diverse wildlife and plants. As individuals and as a community, village residents use traditional and modern sources of knowledge in the classification of land and the uses to which it is put. Over time, specific land uses have been identified that are suited only to particular ecological conditions.

The use of both traditional and modern environmental knowledge by farmers in Upper-Kitete is indicative of the community's potential to evaluate and adopt new technologies. The study found that agricultural productivity varied depending on the system of knowledge applied (TEKS alone, MEKS alone, or the integration of TEKS and MEKS). Findings also indicated that efforts are required in accurately documenting TEKS because respondents relied on memories and did not use standard measures when they described traditional practices.

Based on the study's evidence, it is recommended that an information management system be developed (at policy level) for the conservation and sustainable management of land resources. The identification of knowledge would ideally proceed through three stages: i) identification of traditional environmental knowledge; ii) the setting of standards for its application; and iii) dissemination of information to the wider community. The integration of TEKS and MEKS also needs to follow a similar process.

Table of Contents

Abst	ract		iii
Tabl	e of C	ontents	iv
List	of Tab	les	v
List	of Fig	ures	vi
1.0	Intro	duction	1
	1.1	Background to the study	1
	1.2	Research problem and significance of the study	2
	1.3	Research objectives	3
2.0	Lite	rature Review and Theoretical Framework	4
	2.1	Conservation and management practices for land resources in Africa	4
	2.2	Integration of traditional and modern environmental knowledge in the conservation and management of land resources	6
	2.3	Conceptual framework	7
3.0	Res	earch Methodology	9
	3.1	Study area	9
	3.2	Sample size and sampling techniques	9
	3.3	Data collection procedures and instruments	10
	3.4	Data analysis and presentation	11
4.0	Find	ings and Discussion	12
	4.1	General characteristics of respondents	12
	4.2	Types of land use	15
	4.3	Identification and efficiency of TEKS and MEKS used in farming on arable land	16
	4.4	Identification and efficiency of TEKS and MEKS used on pastureland	21
	4.5	The integration of TEKS and MEKS related to the use and management of arable and pastureland in Upper-Kitete	25
5.0	Con	clusions and Recommendations	28
Refe	rence	S	29

List of Tables

Table 1:	Population statistics for Upper-Kitete Village	14
Table 2:	Farm size and knowledge applied	17
Table 3:	Respondents' use of modern farming equipment by ward	18
Table 4:	Farm yield per acre	21
Table 5:	Livestock statistics for Upper-Kitete, 2009	23
Table 6:	Milk yield per cow (litres)	25

List of Figures

Figure 1:	Levels of analysis of TEKS and MEKS	8
Figure 2:	Education of respondents, by level	12
Figure 3:	Land use/cover types in Upper-Kitete Village	15
Figure 4:	Integration of TEKS and MEKS in land tillage	17
Figure 5:	Elephant grass grown on contour lines between fields	19
Figure 6:	Beans grown in November/December	20
Figure 7:	Community grazing land	22
Figure 8:	Dairy cattle feeding in a shed	24
Figure 9:	Both dairy and traditional cattle feeding outside the homestead	24

Introduction

1.1 Background to the study

The twentieth century witnessed exciting initiatives in revitalizing technologies owned by local resource users in developing countries. For example, on 18 December 1990, the United Nations Resolution 45/164 declared 1993 the "International Year of the World's Indigenous People". The year aimed to strengthen international cooperation, in order to address the problems faced by indigenous communities, in such areas as human rights, the environment, development, education and health (World Commission on Environment and Development (WCED), 1987). According to the WCED, indigenous communities are repositories of accumulated traditional knowledge and experience – hereafter referred to as Traditional Environment Knowledge Systems (TEKS) – which wider society could learn from to manage complex ecological systems. TEKS are essentially land use systems that support various livelihoods.

The 1995 Commission on Development and Global Change issued the report, *For Earth's Sake*, which listed areas of research of the highest priority if solutions to national and international environmental problems were to be found. One such area concerned the application of TEKS in conservation measures and "approaches to rescuing and revaluing TEKS about natural resources and their management" (IDRC, 1997, p.123). As observed by Lane (1996), traditional knowledge is the sum of experience and knowledge within a given group, which forms the basis for decision making related to familiar and unfamiliar problems and challenges. Within this context, TEKS and resource management systems (RMS) are important areas of environmental research for sustaining land, land use systems and land users.

Of note, in the second half of the 1990s, TEKS entered the mainstream of activities and initiatives undertaken by developing countries and by the international donor community, UN agencies and the World Bank. TEKS were on the agenda of the first conference devoted to Global Knowledge for Development (GK 97), held in Toronto, Canada, and even more prominently on the agenda of the second conference (GK II), held in Kuala Lumpur, Malaysia, in 2000. The final action plan of the GK II Action Summit and Forum included a strong endorsement of the TEKS programme, and specifically called for the identification, development and dissemination of local knowledge in various forms including local languages. It also called for developing strategies for using TEKS in development.

Recently, there has been a growing interest and appreciation among scientists in traditional knowledge systems. The body of scientific publications has grown over the last two decades. For instance, the UNESCO World Conference on Science recommended that traditional knowledge be integrated into mainstream science (UNESCO, 1999). It is in this context that Agenda 21 seeks to address these initiatives by re-examining and applying TEKS techniques, as opposed to the wholesale importation of modern environmental knowledge systems (MEKS). The ultimate goal is to achieve the optimal combination of best practices from TEKS and MEKS that demonstrate the good use of indigenous knowledge and develop cost-effective and sustainable livelihood strategies for wealth creation and income generation.

In asserting control and direction over their lives in order to safeguard social structures, communities applying informal science have utilized knowledge, practices, skills and tools that have been developed over the course of centuries (Rugumamu, 2003). Nevertheless, formal knowledge, that is, knowledge generated in schools, universities, research institutes and industrial firms, dominates

development thinking. This system of knowledge has gradually spread over the developing world as the dominant system shaping politics, values and careers. It places great emphasis on the contribution of MEKS to development. In this context, TEKS were considered inferior and were denied a role in the development process. As a result, TEKS were classified as non-scientific compared to MEKS (Thompson, 1991).

Nonetheless, the situation is changing as decision makers in developing countries are seeing more and more examples of how TEKS can be put to good use. They are beginning to realise that TEKS is the largest and single most powerful asset that many developing countries possess but have not yet mobilized for sustainable development (Hambati & Rugumamu, 2005).

In the 1960s, Tanzania initiated various programmes on the integration of TEKS and MEKS. In order to facilitate the cost-effective provision of services, the *Ujamaa* villages approach was used. Upper-Kitete Village was one of the first villages selected for the *Ujamaa* Village Programme in Tanzania in 1963 (URT, 2000). The people were placed in the village and provided with basic social services to enable them to work as a team for their development through integration of traditional and modern farming systems. The project worked well when all provisions were met by the government but degenerated and finally collapsed when the village took over full responsibility for managing the programme.

The involvement of local people in planning and implementation are essential to the success of programmes seeking to integrate TEKS and MEKS. In other words, locally-driven solutions to complex issues on land resource conservation and management are very important for achieving desired outcomes in developing countries that lack capital investment but would like to benefit both from existing knowledge and from formal education.

The current research is also in line with the Millennium Development Goals (MDGs), in particular MDG 1 which addresses extreme poverty and hunger; and with the Tanzania National Strategy for Growth and Reduction of Poverty (NSGRP), through its focus on the efficient use of available and affordable resources to improve the livelihoods of rural communities in Tanzania.

1.2 Research problem and significance of the study

1.2.1 Research problem

The survival and well-being of communities in rural areas is predominantly dependent on utilizing land resources for their livelihoods. Effective utilization of resources is influenced by technical knowhow. Studies conducted by Toima (1997), Mapinduzi (2001), Borjeson (2002), and Hambati and Rugumamu (2005) noted that most of the modern technical solutions that have been implemented to address the conservation of land resources to increase productivity in rural areas have not worked well because they did not take into account the local culture, particularly community preferences, skills and knowledge.

The agro-pastoralists in Upper-Kitete integrate TEKS and MEKS in several processes at various levels in crop and livestock production from land preparation to storage and use of the outputs. The empirical evidence shows that arable land productivity improves significantly when TEKS and MEKS

are jointly employed. Interestingly, there is little incentive for the integration of the two knowledge systems given the high productivity experienced. Therefore, the study assesses why traditional and modern environmental knowledge related to the conservation and management of arable land resources have not been integrated to the desired level to enhance productivity.

1.3 Research objectives

1.3.1 General objective

The general objective of the study is to assess the integration of TEKS and MEKS in improving the productivity of arable and pastureland in Upper-Kitete Village.

1.3.2 Specific objectives

The specific objectives of this study are to:

- i. Identify the different farming practices used on arable land and pastureland in Upper-Kitete Village and categorize these practices as TEKS and MEKS;
- ii. Determine the efficiency of TEKS and MEKS in improving household agricultural productivity; and
- iii. Examine how TEKS and MEKS can be best integrated to achieve sustainable use of arable and pastureland so as to inform public and policy makers of the best means to integrate the two knowledge systems.

Literature Review and Theoretical Framework

2.1 Conservation and management practices for land resources in Africa

Traditional environmental knowledge (TEK) is defined as "a body of local environmental knowledge and beliefs that has been gathered by first-hand observations from living in close contact with nature, and transmitted through oral tradition" which includes "a system of classification, a set of empirical observations about the local environment, a system of self-management that governs the sustainable resource base, and an understanding of the relationships of living things and their environment" (CEMA, 2008). As Maganga (1995) observed, a consensus is gradually emerging that rural communities in Africa and other parts of the world have detailed knowledge of their environments. Local people through their traditional lifestyles, especially cultural practices, have contributed significantly to ensuring the survival of various land resources enjoyed today.

As observed by Nabhan (1985), farmers are aware of soil characteristics, while many rural people have detailed knowledge of plant species, their characteristics, and water requirements. Hambati and Rugumamu (2005) noted that TEKS, such as knowledge of different trees and their products, was used in Kainam (in Manyara region, Tanzania) to better exploit specific land resources. According to Schmidt (2000), it is possible to construct taxonomy of useful trees and grasses from TEKS, including which fruits are edible and which trees and grasses provide good materials for roofing. Furthermore, Kalland et al. (1996) noted that indigenous people know which plants have medicinal properties and which can provide handles for hoes, cutlasses and axes. Pastoralists have detailed knowledge of animal diseases and disease vectors as well as which plants are poisonous. Over the years, local communities have developed effective ways of ensuring that this knowledge is used to ensure sustainable utilization of land resources (Kalland, 1994). Large-scale "systems management knowledge" is embodied in sustainable resource utilization.

Warren (1991) observed that the traditional knowledge of shamans is very well recognised within South American communities and by global drug companies. Shaman are renowned for precisely identifying the physical, biological and chemical characteristics of various types of plants in the tropical rainforest. In relation to herbs and modern medicinal use of plants, shamans are regarded as unique traditional data banks. In their interactions with indigenous people, natural scientists have noted that they do not only grasp the biological facts but also the traditional aspects of the invisible world.

Problems encountered in many development programmes and conservation initiatives could be attributed to the failure in adapting MEKS to the indigenous ways of handling nature. Made (1995) in his study on *Land tenure and impacts of indigenous knowledge systems for Southern Africa* found that to restore TEKS without addressing the equitable allocation of land resources is not an easy task. The study by Mubonda et al. (1995) on the indigenous knowledge system (IKS) in Lozi, Zambia, found that the participation of local communities facilitated adaptation processes in the management of natural resources and that TEKS were easy for local people to adapt and inexpensive to run because they were part of them.

In developing countries like Tanzania, most TEKS are not covered in literature that deals with resource management. For example, Mbuta (2001) has shown that TEKS is not widely practiced in the Mang'ula village ecosystem in Kilombero Valley due to internal and external factors. That study

found that the cultural beliefs and values that moulded historical resource management and decision making were fading away as a result of modernization. Similarly, Simon (1997) observed that TEKS were overlooked in water furrow management along the southern slopes of Mount Kilimanjaro. This situation led to the gradual disappearance of numerous TEKS related to natural resource management. Excluding TEKS also means excluding the indigenous people from participating in managing their natural resources because indigenous systems are considered as conservative, speculative and inaccurate.

Contrary to the above, Mapinduzi's (2001) study on the pastoralist community in Monduli District of northern Tanzania revealed that the TEKS related to land resource management, especially pastureland, was effective in conserving biodiversity. He observed that the community possessed valuable knowledge for allocating different pastures to livestock over time to maintain biodiversity.

Borjeson's (2002) historical study of the indigenous knowledge system among farmers in the Mbulu Highlands of Tanzania between 1880 and 2000 showed that TEKS has been used in that area since the pre-colonial period (1880s), especially soil-water conservation in their agricultural systems. Loiske (1995) noted that the TEKS of Iraqw people was first interrupted by colonialists in 1906, when the Roman Catholic missionaries arrived. During the period of German colonisation the missionaries failed to convert the Iraqw to Christianity and had, after a hard struggle, to move out from Mbulu Highlands. The mission station was, after some years, moved to Tlawi outside Kainam. Furthermore, the same happened to colonial governments and MEKS. The Iraqw people were considered by the British colonialists as using "passive resistance" against the colonial government (Heartly, 1938).

Loiske (1995) noted that TEKS was becoming stronger and dominating land resource conservation in Mbulu Highlands, while completely disappearing in other areas populated by the Iraqw people, including Hanang, Karatu, Babati and other parts of Mbulu District. Borjeson (2002) noted that most people in those areas have used MEKS since the 1940s when they took up commercial agriculture (i.e. coffee, tobacco and wheat). In those areas, Borjeson observed severe land degradation as compared to the Mbulu Highland areas of Kainam.

Kikula and Mwalyosi (1994) noted that in Tanzania before colonialism, sound land conservation and management measures existed, which were built into effective indigenous agricultural practices. As observed by Toima (1997) in Monduli District, the practices were intended to improve land resources and agricultural production, and improve their quality of life in the long run.

Some of the most notable traditional management measures include the:

- Ngoro (Matengo pit) system in Mbinga;
- Ukara mixed farming system in Ukerewe;
- Iraqw intensive farming in Mbulu;
- Ufipa mound cultivation system in Rukwa; and
- Mixed farming and zero/stall grazing of the Chagga(Kerario, 1996; Kikula & Mwalyosi, 1994).

These systems were practised among crop cultivators and mixed farmers. Other practices include the "*Ngitiri*" system in Shinyanga, Mwanza and Tabora regions that involved traditional rotation of grazing, and the "*Ndobindo*" or "*Mbugha*" in Singida to avoid overgrazing.

2.2 Integration of traditional and modern environmental knowledge in the conservation and management of land resources

During this era of globalization, it is inevitable that MEKS are prominent in the discussion of environmental issues (Thompson, 1991). However, it is the task of Africans to adopt and adapt modern technologies that suit their local environments and are cost effective over time and space. The concerns of MEKS adaptation should reflect the needs and aspiration of the stakeholders as well as those of natural resource base that is demand driven. This goal of integrating TEKS and MEKS is achieved through democratic participatory design, implementation, monitoring, and evaluation of the policies, legislation, and conventions related to land resources so as to develop the best ways for harmonizing the two knowledge systems in land conservation and management practices. Research is vital to better understand past and present TEKS practices, to determine the potential for TEKS to manage and conserve land resources, as well as resolve conflicts over those resources, and to better adapt MEKS to local conditions through adaptive co-management.

Thompson's (1991) study on *Combining local knowledge and expert assistance in natural resource management in small-scale irrigation in Kenya* found that a project for water resource management was successful because the local people were involved throughout the project cycle (i.e., in planning, implementation, monitoring and evaluation) and their TEKS were integrated with expert knowledge. The local people felt that their knowledge was recognized, and they also recognized the expert knowledge. The same success was recorded in Tanzania, especially in community development projects funded by World Vision Tanzania (WVT), in which the communities were involved right from the beginning through Participatory Learning and Action (PLA) and Participatory Rural Appraisal (PRA) in adaptive co-management (Dirk, 2000).

There have been numerous situations where modernization projects did not involve the traditional knowledge of local people in the management of land resources. The projects initiated in that manner have proved to be a failure as they were against local people's perceptions and aspirations since their ideas were neither included nor valued. In many instances, people have rejected, abandoned or undermined programmes, which they regarded as being imposed on them (Chambers, 1983). For instance, in Latin America, a community pipe-borne water project was set up to deal with guinea worm infestation. It failed because the women preferred to get water from brooks, which traditionally served as social meeting places (Rogers, 1962).

Dirk (2000) observed a similar situation in Shinyanga, Tanzania, where a bore-hole water project was implemented to reduce the distance travelled and time consumed by household members in searching for water for domestic use. However, the project was abandoned because the local community preferred to get water from rivers and local wells, which were traditionally identified as good quality water (soft water) compared to the pumped bore-hole water, which was hard water.

The development in knowledge is said to be sustainable when it is self-perpetuating, self-regulating, and beneficial to coming generations (Alao, 1995). Among the factors, which are crucial to this process, are good resource management, an effective flow of information, and appropriate technology particularly in rural areas where over 70% of the population in the developing world lives (Chambers, 1989).

2.3 Conceptual framework

A key premise of the current study is that a complex relationship exists between and among individuals, local communities, land use systems and the environment in the process of earning livelihoods. Several interrelated concepts are used in the analysis of TEKS and MEKS. Given the linkages between them, none of the concepts can stand alone.

Traditional environmental knowledge systems are embedded in the places and lives of people. TEKS may be considered as an integral part of local knowledge, classification systems and social interaction with the environment. Social interactions provide the rules for relations and management systems. Unlike MEKS, which are universal, TEKS practices have more restrictive application, i.e., they tend to be specific to a given location, but may also be more broadly applicable, for example, to the conservation of particular types of land.

TEKS and MEKS are analyzed at the following four levels:

- 1) Knowledge of land resources, such as arable land, pastureland and/or water resources. This level includes the knowledge of plants, animals, soils, water and landscapes.
- 2) Conservation and management systems (adoption of practices) for land resources, which include users of environmental knowledge and an appropriate set of practices, tools and techniques. This is the level where local people seek to have a mutual and harmonious relationship with their environment. It is a stage that requires an understanding of ecological processes to sustain their daily livelihoods.
- 3) Social institutions which include a set of rules and code for social relationships that govern human behaviour.
- 4) Improved productivity of land resources, which shapes traditional perceptions and gives meanings to observations of the practices experienced. Subsequently, successful TEKS and MEKS are disseminated to the whole community to be practiced to improve the productivity of land and human resources over time and space.

The four levels of TEKS and MEKS analysis are summarized in Figure 1.





Source: Modified from Berkes (1999, p.3)

B Research Methodology

Both qualitative and quantitative research approaches were applied in this research. Multiple methods were used to collect data and information on how modern and traditional knowledge were integrated to improve household productivity.

3.1 Study area

3.1.1 Rationale for selection of the study area

The study was conducted in Upper-Kitete Village. The village was chosen purposively because it was one of the first four villages¹ selected for implementation of the Ujamaa and Rural Development Programme in 1963. This programme emphasized the use of MEKS in agricultural production so that the community could learn and adopt modern knowledge through diffusion. Upper-Kitete Village exhibits interesting features in the integration of traditional and modern knowledge to improve agricultural productivity.

3.1.2 Geographical location, size and population

Upper-Kitete Village is situated in Karatu District, one of the six districts of Arusha Region. It lies between latitudes 3°19'S and 4°15'S and longitudes 34°60'E and 35°50'E (see map 1). Karatu District covers an area of 24,536 km². According to the 2002 census, the district has a total population of 186,182 people: 95,755 males and 90,227 females (URT, 2002). The dominant ethnic groups are Iraqw and Barbaig. Other ethnic groups are Chagga, Pare, Arusha, Rangi and Maasai who migrated into the area for various activities, such as business and administration. Karatu District is among the fastest-growing districts in the region with a population growth rate of 2.8% per annum (Meindertsma & Kessler, 1997; URT, 2002). Upper Kitete Village is dominated by the Iraqw ethnic group.

3.2 Sample size and sampling techniques

Within the field of social science research, Nachmias and Nachmias (2000) observed that for a sample to be sufficiently representative of a given population, it should be not less than 10% of the total population. In the current research, the study unit was the household, and a sample of 100 households was selected. Given that Upper-Kitete village has 595 households (see Table 1), this sample represented 16.8% of households in the study area.

Satellite imagery covering the study area were downloaded from <u>http://glovis.usgs.gov</u> and interpreted to identify different land uses in Upper-Kitete Village, using GIS techniques (see Map 1). The map was used as a reference/guiding tool for inquiry on land use and land management issues in the study area. Major land uses in the village were settlement, farming/cultivation (arable land), grazing (pastureland), forest land and related uses like water sources, fuel and timber.

Stratified sampling was then undertaken based on the different land uses. Within each of the land use areas, interviewees were selected randomly. With the help of village leadership, sub-village leaders were identified. From each sub-village, a proportionate sample was drawn so as to include the different land users in the sample. Structured interviews were conducted with 100 adults: 50

¹ The other villages were Kerege in Bagamoyo District, Kabuku in Handeni District and Mlale in Songea District.

males and 50 females. Five focus group discussions were formed (with seven respondents each), coming from all the seven sub-village. For each of the different land uses, respondents were asked questions regarding the traditional and modern knowledge they applied for improving productivity.

3.3 Data collection procedures and instruments

The data were collected from both secondary and primary sources. Secondary data were obtained from published and unpublished sources such as papers, journals, books and proceedings of conferences and workshops. Primary data were collected using a range of participatory rural appraisal (PRA) techniques. The methods used included questionnaires, focus group discussions and field observations. Each of these methods is discussed below. Results from the different methods were triangulated to more strongly validate the findings and overcome the inherent weaknesses in each method when applied singly.

3.3.1 Questionnaires

Questionnaires were used for collecting socio-economic data (age, sex, household numbers etc) as well as information on resources available, such as human resources, forest, livestock, water, crops and infrastructure services. The household head (whether father or mother) or any member of the household who was above 18 years old (if the head of the household is not present) was asked questions from a structured questionnaire by the researcher who filled in the answers. The socio-economic data helped in understanding the influence of population increase on the utilization and management of land resources. This technique was used because it has the ability to gather data beyond the physical boundary of an observed space (Hay, 2005). Both open-ended and closed ended questionnaires were used.

3.3.2 Focus group discussions

Focus group discussions (FGDs) were held with five groups, each with seven participants. One group included village leaders who provided general information on land ownership and use in the study area, while a second group consisting of influential people in the community for example retired teachers and village leaders provided information on people's perceptions regarding TEKS and MEKS. A third group was a cross-section of land users recruited from different land uses. Both men and women were recruited based on the nature of the livelihood activities that they engaged in and type of management (ownership of and right of access to). The selection of participants for these groups was done purposively using a snowball approach. The FGDs with land users helped to validate the information collected through questionnaires and the information gathered from village leaders and influential people.

3.3.3 Field observation

Field observation was used to collect on-the-spot information about TEKS and MEKS in relation to socio-economic activities in the study area as well as policy implications and cultural perceptions towards land resources and land use patterns. Field observation also included taking photographs to provide pictorial evidence of land use in the study area. Field observation increased the reliability and validity of the data collected through questionnaires and focus group discussions.

3.4 Data analysis and presentation

3.4.1 Quantitative data analysis

Microsoft Excel was used to analyse the descriptive statistics on respondents' characteristics and socio-economic activities. SPSS was used to analyse quantitative data to derive tables of frequencies and cross-tabulations between independent variables (farm implements) and dependent variable (household yields).

3.4.2 Qualitative data analysis

Hay (2005) argued that qualitative data analysis is the "intellectual art of decision making in a logical sequences of ideas". It involves the organizing, compiling, interpreting and primary analysis of data with the community members to enable discussion and agree upon the existing situations of their land use and the respective responses. Content analysis was done by the researchers after the field visits to describe and explain the meaning attached to information given by the village leaders, influential people and household members.

Findings and Discussion

4.1 General characteristics of respondents

The majority (91%) of respondents were mainly engaged in farming or farm-related activities. The remainder were employees (4%), petty business persons (3%) or engaged in construction activities (2%).

Almost three-quarters (74%) of respondents had a minimum level of formal education, i.e., primary education or higher. As shown in Figure 2, most respondents (64%) had primary education, 6% had secondary education, 4% had education beyond secondary and 8% possessed adult education. Lastly, 18% of respondents reported having non-formal education. Most of the respondents in this final category belonged were aged above 50 years.

Education, whether formal or informal, is a basic source of modern knowledge. Although the extent of knowledge gaining is not necessarily determined by level of education, during the interview and focus group discussions it was noted that a person's level of education was one of the major factors that influence the rate of knowledge adoption in the community.

However, it is worth noting that traditional knowledge acquired from families and communities is neither standardized nor documented. Respondents relied on memories and estimations using non-standard measures. For instance, the use of ash for preservation of cereals and beans was cited. However, no exact proportions of ash to the quantity of crop preserved were able to be determined as respondents used tins, cups and bowls as units of measure. This indicated that beyond the identification of knowledge, it is important to set and document standard measures.



Figure 2: Education of respondents, by level

Source: Field Survey (2012)

Upper-Kitete village has a population of 4,045 people, of which 2,164 are men and 1,881 are women. By age, 43% of the village population were adults aged 18-60 years, 30% were in the age bracket 6-17 years and 20% were young children under five years of age. During the household interviews it was noted that old people who were 50 years and above were more conversant in explaining how TEKS works and those who were 40 years and below tended to use MEKS more than TEKS. Evidence from these findings indicated that TEKS and MEKS are integrated and the degree of integration was strongly influenced by level of education and age.

Table 1: Population statistics for Upper-Kitete Village

Total	Total		376	632	527	639	763	579	4,045
total	L	257	192	301	258	239	369	265	1,881
Subt	Σ	272	184	331	269	400	394	314	2,164
vil ants	Ľ	0	0	0	2	0	0	2	4
Ci Serv	Σ	4	0	2	c	0	2	7	23
beled	ш	-	2	0	c	0	9	2	14
Dise	Σ	2	-	4	0	-	12	4	24
s over /ears	ш	7	11	26	2	12	24	14	66
Adult 60 y	Σ	2	7	23	9	15	21	14	91
ults years	L	109	70	118	104	116	142	114	773
Adı 18-60	M	137	66	136	100	266	156	129	066
dren years	L	84	68	94	87	64	117	80	594
Child 6-17	¥	75	66	100	96	70	119	100	626
dren /ears	Ł	56	41	63	57	47	80	53	397
Chil 0-5 y	Μ	49	44	99	64	48	79	60	410
No. of	liousellolus	82	45	85	20	83	125	105	595
Sub-village		Tloma	Sabasaba	Antsi	Bonde la Faru	Juu	Qanqari	Kati	Total

Sources: Upper-Kitete Village records (2012)

4.2 Types of land use

Land use in Upper Kitete Village is highly diverse, reflecting the variety of soils, slopes and natural micro-environments as also noted by Rhode and Hilhorst (2001). The most common land uses are settlement, forest, woodland, bush land, grassland, and cultivated land as shown in Figure 3. The area has fertile volcanic soils and good rainfall, averaging more than 800 mm annually. This area is good for both cultivation and keeping livestock.



Figure 3: Land use/cover types in Upper-Kitete Village

Source: Interpreted from satellite images from http://glovis.usgs.gov (2012).

4.3 Identification and efficiency of TEKS and MEKS used in farming on arable land

4.3.1 Land management in Upper-Kitete Village

Upper-Kitete Village started with 100 households as a pilot study area for use of MEKS under the Ujamaa Village System. Each household was allocated six acres. They were taught new farming and livestock techniques and they were also provided with resources such as machinery and industrial fertilizers. Land was classified according to its best use based on the soils, terrain and vegetation.

In general, people's capacity to manage land resources is grounded in traditional knowledge and practices. According to Iraqw traditions, the first man to occupy a new piece of land and build a house is known as *kahamusmo* and becomes the owner of the land. He has the authority to allocate land to new occupants. According to focus group discussions, the landowners settle land disputes and punish those who are found guilty. Therefore, Iraqw security of tenure depended on the leadership qualities of the *kahamusmo*. There is a strict adherence to these procedures of land allocation and arbitration or fines in case of conflicts. However, in the study area, land allocation was now done through the village government which has authority over the system of land management.

Areas for agriculture within the study area were found in patches according to village land use guidelines. According to focus group discussions, the average farm size in the village between 1963 and 1980 was 3.5 acres per household (see Table 2). However, as the village population increased, land was further distributed to young married males. Thus, the six acres of land per household in 1963 decreased to 0.7 acres per household in 2012.

However, in some cases, households had more than six acres, resulting from the practice of renting land, whereby an individual can cultivate land belonging to another person or/and land owned by the village at a minimum fee of 30,000 Tanzanian shillings per acre per year. As noted during the focus group discussions, the village had set aside 75 acres for rent but an individual can only rent up to five acres of village land. The decrease of household farm size suggests the intensification of agricultural activities so as to improve the productivity per acre. The nature of farm size and farm inputs (implements) used by households is further evidence of TEKS and MEKS integration in the area.

		Farm Size in Acre			
Knowledge Applied	Period	Range	Average		
TEKS	Before 1963	0.3 – 0.5	0.4		
MEKS	1963-1980	1 – 6	3.5		
TEKS and MEKS	1981 - 2012	0.6 – 0.8	0.7		

Table 2: Farm size and knowledge applied

Source: Field survey (2012)

4.3.2 Farm implements

Traditional tools – such as wooden hand hoe and thick piece of wood known as *duqsay* for clearing bush – and modified traditional tools – for example, hand hoe, bush knife and ox-plough – are used in the preparation of land for farming in areas where modern machines cannot be effectively used, especially along the slopes and hilly rocks (see Figure 4). The Iraqw community manufactures farm tools to improve their production and productivity. All the interviewed respondents reported that they use traditional farm implements, such as hand tools in farm preparation (35%), planting (80%), weeding (98%) and harvesting (75%) because of the nature of the landscape.

Figure 4: Integration of TEKS and MEKS in land tillage



Source: Field survey (2009)

Modern implements and tools observed by the study included tractors, milling machines for processing, and lorries for transportation (see Table 3).

Sub-village	Tractor	Milling machines	Lorries
Tloma	-	-	-
Sabasaba	1	1	-
Antsi	9	2	3
Bonde la Faru	7	-	-
Juu	-	1	-
Qanqari	8	1	-
Kati	3	2	-
Total	28	7	3

Table 3: Respondents' use of modern farming equipment by sub-village

Source: Field survey (2012)

4.3.3 Seed selection

Traditionally, the Iraqw people relied on their own knowledge for selecting seeds to be planted in subsequent seasons. Maize, beans, wheat and pigeon peas are the main staple and cash crops, while millet and sorghum are used for making local brew and as back-up food crops in cases of drought. Seed selection is done mostly by the elders (mother, father or grandparents) soon after harvesting. They select the seeds that have performed well in the past season. Factors considered in seed selection include germination rates, productivity, and attributes such as taste, resistance to pests and tolerance to weather uncertainties.

The TEKS-MEKS interface was demonstrated by 28% of study interviewees who cultivated modern seeds supplied by Farm Africa, an NGO working with rural people in Karatu District via the village government. The improved seeds include maize, H 622/32 (Kilima), SEEDCO 403 or 513 and beans 85/90 (Lyamungu). These interviewees used traditional fertilizers and pesticides and also used hand hoes for cultivating land.

4.3.4 Crops grown and cropping practices

The study observed that TEKS and MEKS are integrated at different stages of crop production from land preparation to storage and use of harvested crops. Crops grown are maize, beans, wheat, pigeon peas, millet, finger millet, sorghum, pumpkins, sweet potatoes and barley. Traditionally, maize, beans, pigeon peas, pumpkins and bananas, are intercropped as a strategy for preserving soil fertility. In addition, intercropping is used as a survival strategy to minimize the effects of severe drought. In areas where drought is more likely to occur (lowland areas) it is common to find

intercropping of maize, beans, pigeon peas, sunflower and pumpkins. Sunflower and pigeon peas are drought-resistant crops.

Traditionally, people used contours planted with sweet potatoes or covered with maize stalks to control soil erosion. According to focus group discussions, the introduction of modern technology led to planting of fodder grasses on ridges to replace contours planted with sweet potatoes and use of maize stalks to make contours to control soil erosion as shown in Figure 5.

Figure 5: Elephant grass grown on contour lines between fields



Source: Field survey (2009)

Apart from controlling soil erosion, villagers also practice intercropping of crops to sustain soil fertility. Normally leguminous and non-leguminous plants are intercropped (mostly beans and maize). Other crops intercropped include pigeon peas, bananas, sugar cane, pumpkins and sorghum. However, beans grown in November/December are normally not intercropped because the same farms are used for growing barley and wheat in February/March (see Figure 6).

Figure 6: Beans grown in November/December



Source: Field survey (2009)

4.3.5 Storage methods

The harvested crops especially maize and beans are stored for future use because they are less perishable and can be preserved by using local technologies. According to focus group discussions, these crops are stored in two ways: on cobs or when shelled. For instance, cobs of maize are stored outside on trees or inside on wooden scaffolds suspended from the ceiling over the cooking fire. The smoke and heat from the fire repels weevils. The shelled grains are normally kept in clean locally-made containers through use of cow dung known as *kunti*. For storage in *kunti*, the shelled grain is mixed with sand, burned animal dung and ashes, which all contribute to reducing insect damage. For example, sand occupies air spaces between grains, excludes air and suffocates grain weevils. It also scratches their skins, causing dehydration and eventual death, especially if the grain is very dry. This system has been used for many years and has proved effective in preserving crops. Insects are killed and rodents excluded without using any other chemical substances. However, farmers are increasingly using bags instead of *kunti* to store grains and beans for convenience in transportation, and insecticides for convenience of use by the farmers who can afford to buy them.

4.3.6 Crop yields

According to agricultural plan document for Karatu district by Meindertsma and Kessler (1997), a target for maize yields is 900 kg per acre, while the outputs by using TEKS, MEKS and integrating TEKS and MEKS were 700 kg/acre, 1,250 kg/acre, and 800 kg/acre respectively. This implies that the application of MEKS results in higher farm yields than the integration of TEKS and MEKS. Even lower yields were produced when only TEKS is applied. This pattern also applies to beans and wheat (see Table 4).

Integration of TEKS and MEKS was noted among the majority of study respondents. This implies that the integration of the two systems, if well done, could help in reducing household poverty. While

yields from the integration of TEKS and MEKS are lower than those from the application of MEKS alone, they are closer to the district's optimal yield per acre. It is also worth noting that apart from the cost factor, the application of MEKS is constrained in some areas by the size of the farm (owned or rented) and the terrain. The use of modern farming implements is uneconomical on small plots and not feasible on steep slopes.

Knowledge Applied	Maize (kg/acre)		Beans (k	g/acre)	Wheat (kg/acre)		
Knowledge Applied	Range	Mean	Range	Mean	Range	Mean	
TEKS	600-800	700	200-300	250	700-800	750	
MEKS	1,000- 1,500	1,250	500-600	550	800-1,000	900	
Both TEKS and MEKS	700-900	800	300-400	350	800-900	850	
District's optimal yield per acre	800-1,000	900	400-500	450	900-1,100	1,000	

Table 4: Farm yield per acre

Source: Field survey 2012

4.4 Identification and efficiency of TEKS and MEKS used on pastureland

According to respondents in focus group discussions, pastureland is identified according to location and topography (for example, interfluves, mid-slopes and valley bottoms), soils, and vegetation types. The work of identifying pastureland is traditionally done by the group of old wise men known as *barisersagaloen* aged between 46-64 years who have been trained since their youth by the former *barisersagaloen*. According to focus group discussions with the *barisersagaloen*, there are four types of grazing lands: hill grazing land traditionally known as *tlomma*. This is pastureland for distant grazing during the afternoon and it is communally owned. The dominant tree species on the hills are traditionally known as *narrey* or shrubs, especially *solanum* species and *brackens* (*Pteridium acquilibrium*) (see Figure 7).

Figure 7: Community grazing land



Source: Field survey (2012)

Interfluve grazing land, traditionally known as *dindirmo*, is the area near homesteads. Each household owns an area less than 0.5 hectares of this land. Grazing near homesteads, which is traditionally known as *hindiwi*, is normally done during the morning. This is also grazing land for weak and lactating animals. Mid-slopes grazing land, traditionally known as *geay*, is, left uncultivated for grazing purposes and is communally owned. This land is generally characterised by gentle inclination, i.e., a slope angle ranging from 4 to 8 degrees. Valley-bottom grazing land, traditionally known as *khatsa*, is where livestock get water. After watering, livestock typically spend a few hours resting. The *khatsa* is sub-divided into three parts: the area where cattle rest after drinking water; protected wetlands for collecting grasses for livestock and thatching houses, and fields for dry season cultivation.

The study found that 70% of respondents practiced rotational grazing to allow for the regeneration of plants and grasses. Pastures in some areas are also fenced for purposes of quarantine to control diseases and ticks, and recently for village income generation. For example, people in need of livestock feed are able to cut grass from the protected area at an agreed upon price.

The most common grass species include *heteropogon* (traditionally known as *harri*), which regenerates naturally from seeds. Traditional livestock extension officers known as *deemusersagaloen* determine and estimate the carrying capacity of pasturelands according to the seasonal use of the different pastures, rainfall, the availability of important tree and shrub fodder, as well as the availability of water in the area. Crop residues are not included in the estimates of carrying capacity as they are used as supplementary feed to weak animals and lactating or pregnant cows. The carrying capacity of a grazing area is a measure of the land's potential to support livestock.

As for arable land, the study found an interaction of TEKS and MEKS in conservation and management of pastureland resources in Upper-Kitete. For example, new species of fodder, dairy cows and caring practices for livestock and pastures have all been introduced. Leaves and stems from the banana plant were reported to be the most important new source of fodder. Banana plants are now grown on contour lines between fields along with other plants, for example, elephant grass (*Pennisetum purpreum*) and Guatemala grass (*Tripsacum laxum*), which both provide fodder for cattle. The elephant and Guatemala grasses were introduced by the British, but growing grasses on contour lines was an established practice.

People from all seven sub-villages in Upper-Kitete village keep livestock. This was noted from village records, responses from the survey participants and field observation. Table 5 details the livestock kept as per village records from 2009.

Sub-villages	Dairy cattle	Non-Dairy Cattle	Traditional Goats	Sheep	Donkeys	Pigs	Dogs	Cats	Chicken	Ducks
Tloma	6	201	222	88	9	0	30	33	285	0
Sabasaba	0	247	528	95	44	0	32	28	321	0
Antsi	10	160	141	30	13	4	28	28	221	8
Bonde la Faru	8	191	240	27	20	0	44	28	275	0
Juu	0	205	382	57	21	0	31	26	312	0
Qanqari	8	182	342	79	12	0	56	35	299	0
Kati	6	160	317	65	0	0	31	15	505	12
Total	38	1,346	2,172	441	119	4	252	193	2,218	20

Table 5: Livestock statistics for Upper-Kitete, 2009

Source: Upper-Kitete village records (2009)

The breakdown of livestock types in Table 5 indicates that Upper-Kitete Village practices both traditional and modern livestock keeping, with more inclination to traditional practices (1,346 nondairy cattle livestock compared to 38 dairy cattle). Of note, the presence of ticks and tse-tse fly in the area hampers keeping of dairy cattle. Raising dairy cattle is very costly, thus not affordable to most households. In addition, poor infrastructure constrains the sale of products outside the village. Most villagers have livestock for domestic use, thus the internal market is constrained.

Dairy cattle are fed on fodder collected and stored at the homestead, especially during the dry season (see Figure 8). The introduction of crossbred and exotic cattle in the village is a means of intensifying animal production, controlling animal numbers, and their mobility, and consequently improving the environment (see Figure 9).



Figure 8: Dairy cattle feeding in a shed

Source: Field survey (2009).



Figure 9: Both dairy and traditional cattle feeding outside the homestead

Source: Field survey (2009).

According to participants in the focus group discussions, the community depends significantly on their livestock for getting money to meet their daily expenses and also for food (milk and meat). Livestock are also treated as a traditional form of capital for most economic transactions, including

the purchase of food, clothing, medicine and schooling, as insurance/security against drought and plant diseases, and for significant cultural events such as rituals and marriage.

According to the household interviews, 80% of respondents depend on livestock for food, manure and income, while 20% for food, manure, income, dowries and prestige. The study found that 63% of respondents who apply TEKS get, on average, less than two litres of milk per day per cow. Around 30% of respondents integrated TEKS and MEKS in livestock keeping. These households produced 1.5 to 6 litres of milk per day per cow. However, the yield of milk per cow is far below the district's optimal yield (see Table 6). As in the case of agricultural output, integration of TEKS and MEKS was noted among the majority of respondents. This implies that integration of the two systems, if well done, could help to reduce household poverty because in addition to milk, households get manure to use on their farms.

Knowledge applied	Zebu (tra	aditional)	Cross	-bred	Exotic Cattle		
Knowledge applied	Range	Mean	Range	Mean	Range	Mean	
TEKS	0.5-1	0.75	1-2	1.5	3-4	3.5	
MEKS	1-2	1.5	2-4	3	4-6	5	
Both TEKS and MEKS	1-2	1.5	1-3	2	5-7	6	
District's optimal yield	2-4	3	4-6	5	10-20	15	

Table 6: Milk yield per cow (litres)

Source: Field survey (2012)

4.5 The integration of TEKS and MEKS related to the use and management of arable and pastureland in Upper-Kitete

In their efforts to assert control and direction over their lives and to safeguard their social structures, Africa's rural people have traditionally utilized the knowledge, skills, and tools that their societies have developed over the course of centuries. TEKS is an important aspect of a society's culture.

Practices and policies in any community greatly influence the use and conservation of land resources. The management of land resources in rural areas is the concern of many sectoral policies. Officially, land in Tanzania is owned by the state, but in a practical sense it is privately owned (Ellis, 1988). Customary laws of land tenure are still propagated in most parts of Tanzania (Shivji, 1998). Rugumamu (2003) observed that land conservation and management practices within local communities are aimed at preserving natural resources for future production of goods and services. As such, they are essential for survival of certain groups of people over a given time and space. In Upper-Kitete, the community has traditional ways of classifying land use depending on the nature of the landscape in terms of slope angle, aspect and location. As noted by Sikina (1994), in the northern province of Zambia, farmers have their own ways of identifying local soil and land types for agricultural uses. The main criteria used by farmers to classify soils were the colour of the top

soil layer, texture, consistency, and organic matter content. The same criteria were also observed in Upper Kitete. For example, black soils are considered to be soils that are rich in organic matter. These soils are often found in the bottoms of valleys. Here, farmers normally plant maize and beans, the staple food crops.

Traditional ways of conserving the fertility and productivity of soil practised by the Upper-Kitete community include the application of manure, which is collected and processed in different ways. As noted by Tengo and Andersson (2000), to maintain soil productivity on permanent fields, it is necessary to compensate for the loss of nutrients gained by the crop and lost through leaching via a constant input. The importance of livestock as manure producers is well recognized by the farmers of Upper-Kitete Village and this is said to be one of the main reasons for keeping cattle. Also, after harvesting, weeds and maize stalks are cut and spread as mulch or buried in the soil to prepare the ground for the next planting season. This traditional practice returns nutrients to the soil. In the current study, 80% of respondents who were agro-pastoralists reported using manure. However, it was noted that those who had more than three acres also used artificial fertilizers to augment manure.

In their study on soil fertility in Sub-Saharan Africa, Smalling and Braun (1996), noted that beans rotated with cereals out-yield inter-cropping practices. Nitrogen fixation by beans provides nutrient soil input. Nitrogen fixation is an important process that restores nitrogen to arable land during fallow periods and to pastureland. This is also supported by the results in Upper-Kitete, where beans are used as the most common nitrogen-fixing crop. Through the use of beans in local inter-cropping and crop rotation systems, nitrogen is effectively added to the soil. As noted by Tengo (1999), wild nitrogen-fixing plants, such as *Fabaceae*, are found on fallow and in grazing areas.

FAO (1983) notes that management practices on different areas within one land utilization type are not necessarily the same. For example, land utilization type may consist of mixed farming with part of the land under arable use and part allocated to grazing. Such differences may arise from variation in the land, requirements in land use type, from requirements of the management system or all of them. This concept was supported by the results in this study where fields were prepared and organized differently in accordance with the cropping patterns in different land units with different traditional land management systems.

As observed by Rugumamu (2003) in semi-arid areas of Tanzania and Hambati and Rugumamu (2005) in northern Tanzania, traditional pastoralism depends heavily on rotational grazing between different areas to take advantage of fluctuations in the availability and quality of forage and water. This is also supported by the results in this study which shows that the traditional rotational grazing system among livestock keepers in Upper Kitete was done both for tick control and to leave certain areas fallow so that leaves and twigs were able to decompose and fertilize the land. These findings are echoed by Tengo and Andersson (2000) in Hanang.

The present study also found that Upper Kitete Village had no reliable veterinary services; hence there was greater dependence on traditional veterinary attendants. This implies that traditional healthcare for livestock is the dominant system in the village. Traditional livestock practices underpin the capacity of the ecosystem in Upper Kitete to sustain the present population of livestock within the village's pastureland resource base. As Ellies and Swift (1988) observed, pastoralists have

detailed knowledge of animals, their characteristics, diseases and vectors for disease. Tengo and Andersson (2000) noted that the Iraqw community has developed effective ways of ensuring that this knowledge is used for sustainable utilization of environmental resources. The same situation has been observed by Loiske (1995) in Gitting Village in Hanang District and Rugumamu (2003) in Busongo and Makomero villages in Shinyanga region.

TEKS practices as observed by Rugumamu (2003) have conserved and managed several forest species. Upper Kitete Village community for years has been observing the dynamics of forest growth and regeneration using TEKS. As observed by Mark et al. (1992), in Indian rural communities, the community protects the forest through their beliefs that the forest is the source of rainfall and water in the villages. Mbuta (2001) also observed a similar case in Mangula Village. This is also supported by the results in the present study which indicate that there is a strong belief that trees should remain as natural as possible as a place where gods rest and give blessings.

Conclusions and Recommendations

The findings of this study show that rural communities possess extensive knowledge of their land resources. The Upper-Kitete Village community has traditional systems of land classification and a good understanding of the effects of land use on agro-biodiversity. These results indicate that involving local people in the development of inventories of arable and pastureland resources is critical for conservation of those resources. The community in Upper-Kitete has culturally in-built knowledge of the environment, which has been accumulated over long periods of time and usage. This traditional know-how is vital for the survival and sustainable use of land resources in the village.

Generally, the local community has not adopted modern technologies for farming and livestock keeping because they are too capital intensive, thus not affordable to most households. For respondents who owned or worked a reasonable area of land, MEKS was used for cultivation and harvesting. But, in areas that were either too small or on slopes, MEKS practices were not feasible for cultivating land. TEKS and MEKS were integrated in other processes at various levels.

The interaction of traditional and modern farming methods in this era of globalization is inevitable. The successful and sustainable development of land resources is more likely to be achieved when local communities are directly involved in the planning and implementation of projects and programmes. The needs and aspirations of all stakeholders as well as the limitations of land resources must be reflected in development initiatives. Land uses in most rural areas can be complementary but they can also be competitive and conflicting. Therefore, an inventory of locally-driven solutions to complex issues on land resource conservation and management is very important in achieving desired outcomes in developing countries that lack capital investment.

The use of both traditional and modern technologies by farmers in Upper-Kitete community is indicative of the community's potential to evaluate and adopt new technologies. The study found that agricultural productivity varied depending on the system of knowledge applied (TEKS alone, MEKS alone, or the integration of TEKS and MEKS). However, land size, landscape and cost factors also have a significant impact on the efficiency and effectiveness of the system applied.

Findings of the study indicate that more efforts are required to document traditional knowledge so as to facilitate the identification of compatible strategies for integrating traditional and modern farming methods. It is recommended that an information management system be developed (at policy level) for the conservation and sustainable management of land resources. The documentation of knowledge would ideally proceed through three levels: i) identification of TEKS; ii) setting standards for its application; and iii) dissemination of information to a wider community. The integration of TEKS and MEKS also needs to follow a similar process.

References

Amanor, K.S. (1991). Managing the fallow: Weeding technology and environmental knowledge in Krobe District of Ghana. *Agriculture and Human Values*, 8, 5-13. at <u>http://www.nuffic.nl/ciran/ikdm/2-2/articles/titilola.html</u> (Accessed 13.1.2009).

Alao, J.A. (1995). Indigenous and scientific knowledge: Some critical comments. In O.D. Kolawole (Ed.) *Local knowledge utilization and sustainable rural development in the 21st century;* <u>http://www.nuffic.nl/ciran/ikdm/9-3/kolawole.html</u> (Accessed 15.1.2009).

Berkes, F. (1999). Sacred ecology - Traditional ecological knowledge and resource management. Philadelphia: Taylor & Francis.

Borjeson, L. (2002). *Kilimo cha Asili cha Wairaqw*. Paper No. 15, EDSU, Stockholm University, Sweden and IRA, University of Dar es Salaam, Tanzania.

CEMA. (2008). Traditional environmental knowledge bibliography. <u>http://www.nationtalk.ca/modules/</u> <u>news/article.php?storyid=13191</u> (Accessed 13.1.2011).

Chambers, R. (1983). *Rural development: Putting the last first*. New York: Longman.

Dewes, W. (1993). Introduction: Traditional knowledge and sustainable development. In S.H. Davis and K. Ebbe (Eds.), *Environmentally sustainable development proceedings.* Series No.4. Proceedings of a conference held at the World Bank, Washington D.C., 27-28 September 1993.

Dirk, B. (2000). *World Vision Tanzania Annual Report*. Presented at annual meeting 25-30 September 2000 in Arusha, Tanzania. Unpublished.

Ellis, F. (1988). *Peasant economy farm households and agrarian development*. Cambridge: Cambridge University.

FAO. (1983). Guidelines: Land evaluation for rain fed agriculture. *Soil bulletin*, 53

Farrington, J. and Martin, A. (1988). Farmer participation in agricultural research: A review of concepts and practices. London: Overseas Development Institute. <u>http://www.nuffic.nl/ciran/ikdm/2-2/articles/titilola.html</u> (Accessed 13.1.2009).

Gilbert, A. (1995). *Small voice against the wind: Local knowledge and social transformation*. Paper presented at Fourth International Symposium on the Contribution of Psychology to Peace, University of Cape Town, South Africa.

Hambati, H. and Rugumamu, W. (2005). Traditional environmental knowledge systems and management of vulnerable areas in Northern Tanzania, *UTAFITI Journal*, 6(1), 1-21.

Hay, I. (2005), Qualitative research methods in human geography, 2nd edition, Oxford university Press.

Heartly, B.J. (1938). An indigenous system of soil protection, *The East African Agricultural Journal*, 4, 63-66 referenced in Loiske, V.M. (1995). *The village that vanished: The roots of erosion in a Tanzanian village, Meddelanden Series* B94, Doctoral Dissertation, Department of Human Geography, Stockholm University, Sweden.

IDRC. (1997). *Recognizing traditional environmental knowledge report*. Vol. 21, No.1 <u>http://www.idrc.ca/books/reports/V211/trad.html</u> (Accessed 13.1.2009).

Kalland, A. (1994). Indigenous knowledge – Local knowledge: Prospects and limitation. <u>http://www.idrc.ca/books/reports/V211/trad.html</u>, (Accessed 13.1.2009).

Kalland, A., Orlov, B. and Brush, S. (1996). Anthropology and the conservation of biodiversity. *Annual reviews of Anthropology, 25*, 329-52.

Kerario, E.J.C. 1996. The environmental component. In *Proceedings of the workshop on development of land use planning and land tenure system in Tanzania*. SUA, Morogoro, 12-14 March 1996.

Kikula, I. S. and Mwalyosi, R. B. (1994). Environmental management in Tanzania: Challenges of the 21st century. In L.A. Msambichaka, H. B. P. Moshi and F. P Mtafikolo (Eds.) *Development challenges and strategies for Tanzania: An agenda for the 21st c*). Environmental management in Tanzania: Challenges of the 21st century. Dar es Salaam: DUP.

Kipuri, N. (1995). Contribution and experiences of the pastoral Maasai of East Africa. In J. Larson (Ed.) (1998), *Perspectives on indigenous knowledge systems in Southern Africa* (Discussion paper No. 3, pp. 17-18). Washington D.C.: World Bank.

Lane, C. (1996). *Pasture lost; Barbaig economy, resource tenure, and the alienation of their land in Tanzania.* Nairobi: Initiative Publishers.

Loiske, V-M. (1995). The village that vanished: *The roots of erosion in a Tanzanian village*. Meddlelanden series B 94. Doctoral Dissertation, Department of Human Geography, Stockholm University, Sweden.

Made, J. (1995). Land tenure and impacts of indigenous knowledge systems for Southern Africa. In J. Larson (Ed.) (1998) *Perspectives on indigenous knowledge systems in Southern Africa* (Discussion paper No. 3). Washington D.C.: World Bank.

Maganga, F.P. (1995). Local institutions and sustainable resource management: The case of Babati District, Tanzania. Ph.D. Dissertation, International Development Studies Roskilde University, Denmark.

Mapinduzi, A.L. (2001). Indigenous knowledge of the Maasai pastoralists for biodiversity conservation in Mt. Komoloniki (Monduli) ecosystems, Northern Tanzania. MSc. Thesis, Noragric University, Norway.

Mark, P., Betsy, M. and Gadgil, M. (1992). *Supporting traditional forest management systems. Field methods manual.* New Delhi: Society for Promotion of Wastelands Development.

Mbuta, C.F. (2001). Assessment of traditional environmental knowledge systems in natural resource management in Tanzania: A case study of Mang'ula Village ecosystem in the Kilombero Valley. MA Dissertation, University of Dar es Salaam (Unpublished).

Meindertsma, J.D and Kessler, J. J.(1997), *Towards a better use of environmental resources*. A planning document of Mbulu and Karatu districts, Tanzania. Mbulu district council.

Mubonda, N., Mumbuna, M. and Wamulwange, L. (1995). Indigenous knowledge systems in the Barotse Flood Plains of the Western Province, Zambia. In J. Larson (Ed.) (1998) *Perspectives on indigenous knowledge systems in Southern Africa* (Discussion paper No. 3, pp. 11-12). Washington D.C.: World Bank.

Nabhan, G. (1985). *Gathering the desert*. Tucson: University of Arizona Press.

NSGRP. (2006). Growing out of poverty: A plain language guide to Tanzania's National Strategy for Growth and Reduction of Poverty. Dar es Salaam: DSA-TWG.

NSGRP. (2006). Status Report 2006: Progress towards the goals for growth, social well-being and governance in Tanzania. Dar es Salaam: Creative Eye Ltd.

Oba, G. (1994). The role of indigenous range management knowledge for desertification control in Northern Kenya. Research Report No. 4, EPOS, Uppsala University.

Rhode, R. and Hilhorst, T. (2001). A profile of environmental change in the Lake Manyara Basin, *Tanzania*. London: IIED.

Rogers, E. M. (1983). Diffusion of innovations (3rd Ed.). New York: Free Press.

Rugumamu, W. (2003). *Towards a balanced village ecosystem: An environmentally sound participatory development strategy for semi-arid Tanzania*. Report funded by SIDA- SAREC and submitted to the Faculty of Arts and Social Sciences, Research and Publications Committee, University of Dar es Salaam.

Schmidt, M. (2000). Pastoral system in Shiga/ Baltistan: Communal herding management and pasture range rights. In E. Ehlers and H. Kreutzman (Eds.) *High mountain pastoralism in Northern Pakistan*. Stuttgart: Fraz Steiner Verlag.

Shivji, I.G. (1998). Not yet democracy: Reforming land tenure in Tanzania. Dar es Salaam: IIED/Haki Ardhi.

Sikana, P. (1994). Indigenous soil characterization in Northern Zambia. In I. Scoones, J. Thompson, and R. Chambers (Eds.) *Beyond farmers first. Rural people's knowledge, agricultural research and extension practice.* London: International Technology Publications Ltd.

Simon, P. (1997). Environmental conservation in Tanzania: A case study of the role of indigenous knowledge systems in the management of traditional water –furrow system on the southern slope of Mount Kilimanjaro. University of Dar es Salaam. Unpublished M.A, Dissertation. Smalling, E. M. A. and Braun, A.R. (1996). *Soil fertility* research in Sub-Saharan Africa: New dimensions, new challenges. London: MacMillan.

Tengo, M. (1999). Integrated nutrient management and farming practices in agro-ecological system of Mama Issara. Honour's project in natural resources management, Department of Systems Ecology, Stockholm University.

Tengo, M. and Anderson, A. (2000). *The persistent agricultural system of Mama Issara: An ecological study, Tanzania*. Uppsala University. Unpublished PhD thesis.

Tichenor, P. (1980). *Community conflict and the press*. London: Sage.

Thompson, J. (1991). Combining local knowledge and expert assistance in natural resource management: Small-scale irrigation in Kenya. USA: Centre for International Development and Environment

Toima, K.P. (1997). *Indigenous knowledge: Roles and status with reference to woodland management in Maasai Steppe*. M.A. Dissertation, University of Dar es Salaam, Tanzania (Unpublished).

UNESCO. (1999). *World Conference on Science*. Budapest: UNESCO.

URT. (2000). *National Human Settlement Development Policy*, Dar es Salaam: Government Printer.

Vlaerenderen, V.H. (2000). Local knowledge: What is it, and why and how do we capture it? In E. Kauzeni (Ed.) *Local knowledge for food security: Selected papers on experience from Tanzania.* Institute of Resource Assessment, University of Dar es Salaam, Links report No.3. Dar es Salaam: FAO.

Warren, D.M., and Cashman, K. (1988). *Indigenous knowledge for sustainable agriculture and rural development*. London: IIED.

Warren, D.M. (1991). *Using indigenous knowledge in agricultural development*. World Bank Discussion Papers. Washington, D.C.: World Bank.

World Commission on Environment and Development (WCED). (1987). *Our Common Future*. Oxford: Oxford University Press.

Wickma, J. M. and Mwihomeke, S. T. (2006). *The* role of indigenous knowledge in combating soil infertility and poverty in the Usambara Mountains, *Tanzania.* REPOA research report No. 06.2, Dar es Salaam: REPOA.

Publications by REPOA

Books

"Researching Poverty in Tanzania: problems, policies and perspectives" Edited by Idris Kikula, Jonas Kipokola, Issa Shivji, Joseph Semboja and Ben Tarimo

"Local Perspectives on Globalisation: The African Case"

Edited by Joseph Semboja, Juma Mwapachu and Eduard Jansen

"Poverty Alleviation in Tanzania: Recent Research Issues" Edited by M.S.D. Bagachwa

Research Reports

- 14/3 Integrating Traditional and Modern Knowledge Systems in Improving Agricultural Productivity in Upper-Kitete Village, Tanzania Julita Nawe and Herbert Hambati
- 14/2 Structural Barriers, Constraints, and Urban Youth Employment: The Case of Ilala Municipality, Dar-es-Salaam Christopher S. Awinia
- 14/1 Socio-Economic Factors Limiting Smallholder Groundnut Production in Tabora Region
 Mangasini A. Katundu, Mwanahawa L.
 Mhina, Arbogast G. Mbeiyererwa and Neema P. Kumburu
- 13/1 Factors Influencing the Adoption of Conservation Agriculture by Smallholders Farmersin Karatu and Kongwa District of Tanzania Simon Lugandu
- 12/4 Factors Affecting Participation in a Civil Society Network (Nangonet) in Ngara District Raphael N.L. Mome
- 12/3 "The Instrumental versus the Symbolic: Investigating Members' Participation in Civil Society Networks in Tanzania" Kenny Manara
- 12/2 "The Effect of Boards on the Performance of Microfinance Institutions: Evidence from Tanzania and Kenya" By Neema Mori and Donath Olomi

- 12/1 'The Growth of Micro and Small, Cluster Based Furniture Manufacturing Firms and their Implications for Poverty Reduction in Tanzania' Edwin Paul Maede
- 11/2 'Affordability and Expenditure Patterns for Electricity and Kerosene in Urban Households in Tanzania' Emmanuel Maliti and Raymond Mnenwa
- 11/1 "Creating Space for Child Participation in Local Governmence in Tanzania: Save the Children and Children's Councils Meda Couzens and Koshuma Mtengeti
- 10/5 "Widowhood and Vulnerability to HIV and AIDS-related Shocks: Exploring Resilience Avenues"
 Flora Kessy, Iddy Mayumana and Yoswe Msongwe
- 10/4 "Determinants of Rural Income in Tanzania: An Empirical Approach" Jehovaness Aikaeli
- 10/3 "Poverty and the Rights of Children at Household Level: Findings from Same and Kisarawe Districts, Tanzania" Ophelia Mascarenhas and Huruma Sigalla
- 10/2 "Children's Involvement in Small Business: Does if Build youth Entrepreneurship?" Raymond Mnenwa and Emmanuel Maliti
- 10/1 "Coping Strategies Used by Street Children in the Event of Illness" Zena Amury and Aneth Komba
- 08.6 "Assessing the Institutional Framework for Promoting the Growth of MSEs in Tanzania; The Case of Dar es Salaam" Raymond Mnenwa and Emmanuel Maliti
- 08.5 "Negotiating Safe Sex among Young Women: the Fight against HIV/AIDS in Tanzania" John R.M. Philemon and Severine S.A. Kessy
- 08.4 *"Establishing Indicators for Urban Poverty-Environment Interaction in Tanzania: The Case of Bonde la Mpunga, Kinondoni, Dar es Salaam"* Matern A.M. Victor, Albinus M.P. Makalle and Neema Ngware

- 08.3 *"Bamboo Trade and Poverty Alleviation in Ileje District, Tanzania"* Milline Jethro Mbonile
- 08.2 "The Role of Small Businesses in Poverty Alleviation: The Case of Dar es Salaam, Tanzania" Baymond Mnenwa and Emmanuel Maliti
- 08.1 *"Improving the Quality of Human Resources for Growth and Poverty Reduction: The Case of Primary Education in Tanzania"* Amon V.Y. Mbelle
- 07.2 "Financing Public Heath Care: Insurance, User Fees or Taxes? Welfare Comparisons in Tanzania" Deograsias P. Mushi
- 07.1 "Rice Production in the Maswa District, Tanzania and its Contribution to Poverty Alleviation" Jerry A. Ngailo, Abiud L. Kaswamila and Catherine J. Senkoro
- 06.3 "The Contribution of Microfinance Institutions to Poverty Reduction in Tanzania" Severine S.A. Kessy and Fratern M Urio Publications by REPOA
- 06.2 "The Role of Indigenous Knowledge in Combating Soil Infertility and Poverty in the Usambara Mountains, Tanzania" Juma M. Wickama and Stephen T. Mwihomeke
- 06.1 "Assessing Market Distortions Affecting Poverty Reduction Efforts on Smallholder Tobacco Production in Tanzania" Dennis Rweyemamu and Monica Kimaro
- 05.1 "Changes in the Upland Irrigation System and Implications for Rural Poverty Alleviation. A Case of the Ndiwa Irrigation System, Wes Usambara Mountains, Tanzania" Cosmas H. Sokoni and Tamilwai C. Shechambo
- 04.3 "The Role of Traditional Irrigation Systems in Poverty Alleviation in Semi-Arid Areas: The Case of Chamazi in Lushoto District, Tanzania" Abiud L. Kaswamila and Baker M. Masuruli

- 04.2 "Assessing the Relative Poverty of Clients and Non-clients of Non-bank Micro-finance Institutions. The case of the Dar es Salaam and Coast Regions" Hugh K. Fraser and Vivian Kazi
- 04.1 "The Use of Sustainable Irrigation for Poverty Alleviation in Tanzania. The Case of Smallholder Irrigation Schemes in Igurusi, Mbarali District" Shadrack Mwakalila and Christine Noe
- 03.7 "Poverty and Environment: Impact analysis of Sustainable Dar es Salaam Project on "Sustainable Livelihoods" of Urban Poor" M.A.M. Victor and A.M.P. Makalle
- 03.6 "Access to Formal and Quasi-Formal Credit by Smallholder Farmers and Artisanal Fishermen: A Case of Zanzibar" Khalid Mohamed
- 03.5 "Poverty and Changing Livelihoods of Migrant Maasai Pastoralists in Morogoro and Kilosa Districts"
 C. Mung'ong'o and D. Mwamfupe
- 03.4 *"The Role of Tourism in Poverty Alleviation in Tanzania"* Nathanael Luvanga and Joseph Shitundu
- 03.3 "Natural Resources Use Patterns and Poverty Alleviation Strategies in the Highlands and Lowlands of Karatu and Monduli Districts – A Study on Linkages and Environmental Implications" Pius Zebbe Yanda and Ndalahwa Faustin Madulu
- 03.2 "Shortcomings of Linkages Between Environmental Conservation and Poverty Alleviation in Tanzania"
 Idris S. Kikula, E.Z. Mnzava and Claude Mung'ong'o
- 03.1 "School Enrolment, Performance, Gender and Poverty (Access to Education) in Mainland Tanzania"
 A.V.Y. Mbelle and J. Katabaro
- 02.3 *"Poverty and Deforestation around the Gazetted Forests of the Coastal Belt of Tanzania"* Godius Kahyarara, Wilfred Mbowe and Omari Kimweri

- 02.2 "The Role of Privatisation in Providing the Urban Poor Access to Social Services: the Case of Solid Waste Collection Services in Dar es Salaam" Suma Kaare
- 02.1 *"Economic Policy and Rural Poverty in Tanzania: A Survey of Three Regions"* Longinus Rutasitara
- 01.5 *"Demographic Factors, Household Composition, Employment and Household Welfare"* S.T. Mwisomba and B.H.R. Kiilu
- 01.4 *"Assessment of Village Level Sugar Processing Technology in Tanzania"* A.S. Chungu, C.Z.M. Kimambo and T.A.L. Bali
- 01.3 *"Poverty and Family Size Patterns: Comparison Across African Countries"* C. Lwechungura Kamuzora
- 01.2 "The Role of Traditional Irrigation Systems (Vinyungu) in Alleviating Poverty in Iringa Rural District" Tenge Mkavidanda and Abiud Kaswamila
- 01.1 *"Improving Farm Management Skills for Poverty Alleviation: The Case of Njombe District"* Aida Isinika and Ntengua Mdoe
- 00.5 "Conservation and Poverty: The Case of Amani Nature Reserve" George Jambiya and Hussein Sosovele
- 00.4 *"Poverty and Family Size in Tanzania: Multiple Responses to Population Pressure?"* C.L. Kamuzora and W. Mkanta
- 00.3 "Survival and Accumulation Strategies at the Rural-Urban Interface: A Study of Ifakara Town, Tanzania" Anthony Chamwali
- 00.2 "Poverty, Environment and Livelihood along the Gradients of the Usambaras on Tanzania" Adolfo Mascarenhas
- 00.1 *"Foreign Aid, Grassroots Participation and Poverty Alleviation in Tanzania:* The HESAWA Fiasco" S. Rugumamu

- 99.1 "Credit Schemes and Women's Empowerment for Poverty Alleviation: The Case of Tanga Region, Tanzania" I.A.M. Makombe, E.I. Temba and A.R.M. Kihombo
- 98.5 "Youth Migration and Poverty Alleviation: A Case Study of Petty Traders (Wamachinga) in Dar es Salaam"
 A.J. Liviga and R.D.K Mekacha
- 98.4 "Labour Constraints, Population Dynamics and the AIDS Epidemic: The Case of Rural Bukoba District, Tanzania"
 C.L. Kamuzora and S. Gwalema
- 98.3 "The Use of Labour-Intensive Irrigation Technologies in Alleviating Poverty in Majengo, Mbeya Rural District"
 J. Shitundu and N. Luvanga
- 98.2 "Poverty and Diffusion of Technological Innovations to Rural Women: The Role of Entrepreneurship"
 B.D. Diyamett, R.S. Mabala and R. Mandara
- 98.1 "The Role of Informal and Semi-Formal Finance in Poverty Alleviation in Tanzania: Results of a Field Study in Two Regions" A.K. Kashuliza, J.P. Hella, F.T. Magayane and Z.S.K. Mvena
- 97.3 "Educational Background, Training and Their Influence on Female-Operated Informal Sector Enterprises"
 J. O'Riordan. F. Swai and A. Rugumyamheto
- 97.2 "The Impact of Technology on Poverty Alleviation: The Case of Artisanal Mining in Tanzania"B W. Mutagwaba, R. Mwaipopo Ako and A. Mlaki
- 97.1 "Poverty and the Environment: The Case of Informal Sandmining, Quarrying and Lime-Making Activities in Dar es Salaam, Tanzania" George Jambiya, Kassim Kulindwa and Hussein Sosovele

Working Papers

- 14/2 Silent Killer, Silent Health Care: A Case Study of the Need for Nurse-led Hypertension Management Celestina Fivawo
- 14/1 The Invisibility of Wage Employment in Statistics on the Informal Economy in Africa: Causes and Consequences Matteo Rizzo and Marc Wuyts
- 13/4 Payments and Quality of Ante-Natal Care in Two Rural Districts of Tanzania Paper 4 from the Ethics, Payments and Maternal Survival project.
 Paula Tibandebage, Maureen Mackintosh, Tausi Kida, Joyce Ikingura and Cornel Jahari
- 13/3 Payments for Maternal Care and Women's Experiences of Giving Birth: Evidence from Four Districts in Tanzania Paper 3 from the Ethics, Payments and Maternal Survival project. Maureen Mackintosh, Tausi Kida, Paula Tibandebage, Joyce Ikingura and Cornel Jahari
- 13/2 Understandings of Ethics in Maternal Health Care: an Exploration of Evidence From Four Districts in Tanzania
 Paper 2 from the Ethics, Payments, and Maternal Survival project
 Paula Tibandebage, Tausi Kida, Maureen Mackintosh and Joyce Ikingura
- 13/1 Empowering Nurses to Improve Maternal Health Outcomes Paper 1 from the Ethics, Payments, and Maternal Survival project Paula Tibandebage, Tausi Kida, Maureen Mackintosh and Joyce Ikingura

Special Papers

- 13/1 Understanding the Process of Economic Change: Technology and Opportunity in Rural Tanzania Maia Green
- 13/2 Rewards for High Public Offices and the Quality of Governance in Sub-Saharan Africa Theodore R. Valentine

- 12/4 Growth with Equity High Economic Growth and Rapid Poverty Reduction: The Case of Vietnam Do Duc Dinh
- 12/3 "Why Poverty remains high in Tanzania: And what to do about it?" Lars Osberg and Amarakoon Bandara1
- 12/2 The Instrumental versus the Symbolic: Investigating Members' Participation in Civil Society Networks in Tanzania By Kenny Manara
- 12/1 The Governance of the Capitation Grant in Primary Education in Tanzania: Why Civic Engagement and School Autonomy Matter By Kenny Manara and Stephen Mwombela
- 11/1 "Tracer Study on two Repoa Training Courses: Budget Analysis and Public Expenditure Tracking System" Ophelia Mascarenhas
- 10/5 "Social Protection of the Elderly in Tanzania: Current Status and Future Possibilities" Thadeus Mboghoina and Lars Osberg
- 10/4 *"A Comparative Analysis of Poverty Incidence in Farming Systems of Tanzania"* Raymond Mnenwa and Emmanuel Maliti
- 10/3 "The Tanzania Energy Sector: The Potential for Job Creation and Productivity Gains Through Expanded Electrification" Arthur Mwakapugi, Waheeda Samji and Sean Smith
- 10/2 "Local Government Finances and Financial Management in Tanzania: Empirical Evidence of Trends 2000 - 2007' Reforms in Tanzania"
 Odd-Helge Fjeldstad, Lucas Katera, Jamai sami and Erasto Ngalewa
- 10/1 *"The Impact of Local Government Reforms in Tanzania"* Per Tidemand and Jamal Msami
- 09.32 *"Energy Sector: Supply and Demand for Labour in Mtwara Region"* Waheeda Samji, K.Nsa-Kaisi and Alana Albee

- 09.31 *"Institutional Analysis of Nutrition in Tanzania"* Valerie Leach and Blandina Kilama
- 09.30 *"Influencing Policy for Children in Tanzania:* Lessons from Education, Legislation and Social Protection" Masuma Mamdani, Rakesh Rajani and Valerie Leach with Zubeida Tumbo-Masabo and Francis Omondi
- 09.29 "Maybe We Should Pay Tax After All? Citizens' Views of Taxation in Tanzania" Odd-Helge Fjeldstad, Lucas Katera and Erasto Ngalewa
- 09.28 "Outsourcing Revenue Collection to Private Agents: Experiences from Local Authorities in Tanzania" Odd-Helge Fjeldstad, Lucas Katera and Erasto Ngalewa
- 08.27 "The Growth Poverty Nexus in Tanzania: From a Developmental Perspective" Marc Wuyts
- 08.26 "Local Autonomy and Citizen Participation In Tanzania - From a Local Government Reform Perspective." Amon Chaligha
- 07.25 *"Children and Vulnerability In Tanzania: A Brief Synthesis"* Valerie Leach
- 07.24 "Common Mistakes and Problems in Research Proposal Writing: An Assessment of Proposals for Research Grants Submitted to Research on Poverty Alleviation REPOA (Tanzania)." Idris S. Kikula and Martha A. S. Qorro
- 07.23 "Guidelines on Preparing Concept Notes and Proposals for Research on Pro-Poor Growth and Poverty in Tanzania"
- 07.22 "Local Governance in Tanzania: Observations From Six Councils 2002-2003" Amon Chaligha, Florida Henjewele, Ambrose Kessy and Geoffrey Mwambe
- 07.21 "Tanzanian Non-Governmental Organisations – Their Perceptions of Their Relationship with the Government

of Tanzania and Donors, and Their Role and Impact on Poverty Reduction and Development"

- 06.20 "Service Delivery in Tanzania: Findings from Six Councils 2002-2003" Einar Braathen and Geoffrey Mwambe
- 06.19 "Developing Social Protection in Tanzania Within a Context of Generalised Insecurity" Marc Wuyts
- 06.18 *"To Pay or Not to Pay? Citizens' Views on Taxation by Local Authorities in Tanzania"* Odd-Helge Fjeldstad
- 17 "When Bottom-Up Meets Top-Down: The Limits of Local Participation in Local Government Planning in Tanzania" Brian Cooksey and Idris Kikula
- "Local Government Finances and Financial Management in Tanzania: Observations from Six Councils 2002 – 2003"
 Odd-Helge Fjeldstad, Florida Henjewele, Geoffrey Mwambe, Erasto Ngalewa and Knut Nygaard
- 15 "Poverty Research in Tanzania: Guidelines for Preparing Research Proposals" Brian Cooksey and Servacius Likwelile
- 14 "Guidelines for Monitoring and Evaluation of REPOA Activities"A. Chungu and S. Muller-Maige
- 13 *"Capacity Building for Research"* M.S.D. Bagachwa
- 12 "Some Practical Research Guidelines" Brian Cooksey and Alfred Lokuji
- 11 *"A Bibliography on Poverty in Tanzania"* B. Mutagwaba
- "An Inventory of Potential Researchers and Institutions of Relevance to Research on Poverty in Tanzania"
 A.F. Lwaitama
- "Guidelines for Preparing and Assessing REPOA Research Proposals"
 REPOA Secretariat and Brian Cooksey
- Social and Cultural Factors Influencing Poverty in Tanzania"
 C.K. Omari

- 7 "Gender and Poverty Alleviation in Tanzania: Issues from and for Research" Patricia Mbughuni
- 6 "The Use of Technology in Alleviating Poverty in Tanzania"A.S. Chungu and G.R.R. Mandara
- 5 *"Environmental Issues and Poverty Alleviation in Tanzania"* Adolfo Mascarenhas
- 4 "Implications of Public Policies on Poverty and Poverty Alleviation: The Case of Tanzania" Fidelis Mtatifikolo
- 3 *"Who's Poor in Tanzania? A Review of Recent Poverty Research"* Brian Cooksey
- Poverty Assessment in Tanzania: Theoretical, Conceptual and Methodological Issues"
 J. Semboja
- "Changing Perceptions of Poverty and the Emerging Research Issues"
 M.S.D. Bagachwa

Project Briefs

- Brief 40 National Agriculture Input Voucher Scheme(NAIVS 2009 - 2012), Tanzania:Opportunities for Improvement Kriti Malhotra
- Brief 39 Examining the Institutional Framework for Investment in Tanzania: A perspective from the Executive Opinion Survey, 2012-13 Johansein Rutaihwa
- Brief 38 *"Achieving High Economic Growth with* Rapid Poverty Reduction: The Case of Vietnam" Do Duc Dinh
- Brief 37 "Social-Economic Transformation for Poverty Reduction: Eight Key Messages for Unlocking Tanzania's Potential" Philip Mpango
- Brief 36 *"Tracer Study for Research Users: The case of TGN Media Training"* Ophelia Mascarenhas

- Brief 35 Understanding Rural Transformation in Tanzania
- Brief 34 Affordability and Expenditure Patterns for Electricity and Kerosene in Urban Households in Tanzania
- Brief 33 Biofuel Investment in Tanzania: Awareness and Participation of the Local Communities
- Brief 32 Supporting Tanzania's Cocoa Farmers
- Brief 31 The Instrumental versus the Symbolic: Investigating Members' Participation in Civil Society Networks in Tanzania
- Brief 30 Competitiveness of Tanzanian Coffee Growers amid Bifurcated Coffee Markets
- Brief 29 Using Annual Performance Reports to Manage Public Resources in Tanzania
- Brief 28 Growth of Micro and Small, Cluster-Based Furniture-Manufacturing Firms and their Implications for Poverty Reduction in Tanzania
- Brief 27 Creating Space for Child Participation in Local Governance in Tanzania: Save the Children and Children's Councils
- Brief 26 Tracer Study on REPOA Training Courses for Research Users: Budget Analysis and Public Expenditure Tracking System
- Brief 25 Transparency in Local Finances in Tanzania. 2003-2009
- Brief 24 Social Protection of the Elderly in Tanzania: Current Status and Future Possibilities
- Brief 23 Children's Involvement in Small Business: Does it Build Youth Entrepreneurship?
- Brief 22 Challenges in data collection, consolidation and reporting for local government authorities in Tanzania
- Brief 21 Children's Involvement in Small Business: Does it Build Youth Entrepreneurship?

- Brief 20 Widowhood and Vulnerability to HIV and AIDS Related Shocks: Exploring Resilience Avenues
- Brief 19 Energy, Jobs and Skills: A Rapid Assessment in Mtwara, Tanzania
- Brief 18 Planning in Local Government Authorities in Tanzania: Bottom-up Meets Top-down
- Brief 17 The Investment Climate in Tanzania: Views of Business Executives
- Brief 16 Assessing the Institutional Framework for Promoting the Growth of Micro and Small Enterprises (MSEs) in Tanzania: The Case of Dar es Salaam
- Brief 15 Preventing Malnutrition in Tanzania: A Focused Strategy to Improve Nutrition in Young Children
- Brief 14 Influencing Policy for Children in Tanzania: Lessons from Education, Legislation and Social Protection
- Brief 13 Disparities Exist in Citizens' Perceptions of Service Delivery by Local Government Authorities in Tanzania
- Brief 12 Changes in Citizens' Perceptions of the Local Taxation System in Tanzania
- Brief 11 Citizens Demand Tougher Action on Corruption in Tanzania
- Brief 10 Outsourcing Revenue Collection: Experiences from Local Government Authorities in Tanzania
- Brief 9 Children and Vulnerability in Tanzania: A Brief Overview
- Brief 8 Mawazo ya AZISE za Tanzania Kuhusu Uhusiano Wao na Wafadhili
- Brief 7 Mawazo ya AZISE za Tanzania Kuhusu Uhusiano Wao na Serikali
- Brief 6 Local Government Reform in Tanzania 2002 - 2005: Summary of Research Findings on Governance, Finance and Service Delivery
- Brief 5 Children Participating in Research
- Brief 4 Changes in Household Non-Income Welfare Indicators - Can poverty mapping be used to predict a change in per capita consumption over time?

- Brief 3 Participatory Approaches to Local Government Planning in Tanzania, the Limits to Local Participation
- Brief 2 Improving Transparency of Financial Affairs at the Local Government Level in Tanzania
- Brief 1 Governance Indicators on the Tanzania Governance Noticeboard Website TGN1 What is the Tanzania Governance Noticeboard?
- LGR 12 Trust in Public Finance: Citizens' Views on taxation by Local Authorities in Tanzania
- LGR 11 Domestic Water Supply: The Need for a Big Push
- LGR10 Is the community health fund better than user fees for financing public health care?
- LGR 9 Are fees the major barrier to accessing public health care?
- LGR 8 Primary education since the introduction of the Primary Education Development Plan
- LGR 7 Citizens' access to information on local government finances
- LGR 6 Low awareness amongst citizens of local government reforms
- LGR 5 Fees at the dispensary level: Is universal access being compromised?
- LGR 4 TASAF a support or an obstacle to local government reform
- LGR 3 Councillors and community leaders partnership or conflict of interest? Lessons from the Sustainable Mwanza Project
- LGR 2 New challenges for local government revenue enhancement
- LGR 1 About the Local Government Reform Project