Gender, Biodiversity and Local Knowledge Systems (LinKS) to Strengthen Agricultural and Rural Development (GCP/RAF/338/NOR)

# Selected Papers from the First National Workshop held in Morogoro, 22-23 June, 1999

Edited by Prof. A.S. Kauzeni
Institute of Resource Assessment
University of Dar es Salaam

LinKS Report No. 3

*February 2000*

# TABLE OF CONTENTS



# ANNEXES

# Preface

This is a selection of papers presented at the First National Workshop to the LinKS project (GCP/RAF/338/NOR), which took place at Tanesco Training Centre in Morogoro, 22-23 June 1999. The papers have been edited by Professor A.S. Kauzeni at the Institute of Resource Assessment, University of Dar es Salaam. The collection covers a range of topics under the common theme of the workshop, "Local Knowledge for Food Security".

The LinKS project is an outcome of the FAO regional efforts to develop mechanisms for implementation of gender sensitive policies, programmes and participatory technology development for the in-situ conservation, sustainable use and management of agrobiodiversity for food security. The mechanisms are directed to build on the local knowledge and skills of both men and women food providers.

The collection presents experiences from the field illustrating the use, value and importance of local knowledge in Tanzania, highlighting linkages between gender, biodiversity, local knowledge and household food security.

**H.M. Missano**
National Coordinator, LinKS Tanzania

# Local Knowledge: What is it, and why and how do we capture it?

*Hilde Van Vlaenderen*
*Department of Psychology, Rhodes University, Grahamstown, South Africa*

## 1 INTRODUCTION

In recent years the notion of local knowledge has gained popularity. An important impetus for this has been problems and failures encountered in development endeavours in developing countries. Development agencies, theorists and academics have come to realise that development efforts that are based on conceptualisations, methods and values of the Euro-American World often fail to bring about appropriate and sustainable development in the communities which they target. In analysing these failures it has become obvious that local people's needs, values, knowledge and capacities form an essential basis for effective development programmes. However, as a result of years of development interventions, steeped in a Modernisation approach, as well as a general process of globalisation, certain aspects of people's local and traditional knowledge are disappearing. The current interest in local knowledge is thus motivated by an appreciation of its importance as well as its perceived loss. I believe that the workshop today, which focuses on local knowledge, gender and biodiversity, can be placed within this context.

The aim of this paper is to help define the concept of local knowledge, to elaborate briefly on its role in development and to look at some methods and techniques, appropriate to access and record such local knowledge. Congruent with the interest of the workshop in gender, emphasis will be laid on methods which allow a gender analysis.

## 2 WHAT IS LOCAL KNOWLEDGE?

Although the interest in local knowledge is relatively recent a number of different definitions have emerged, which are often used interchangeably. In the following section I will attempt to provide some clarity in this new discourse and propose some working definitions for the concepts Local Knowledge, Indigenous Knowledge, Indigenous Technical Knowledge (ITK), Traditional Knowledge and Indigenous Knowledge Systems (IKS).

Local knowledge can be regarded as the umbrella term for the other terms. Local knowledge is the integrative framework of people in a particular setting use to make sense of their lives. It is a collection of ideas and assumptions that are used to guide, control and explain actions within a specific setting, based on a particular value system (religions and mythical beliefs) and epistemology (Gilbert, 1995). Indigenous and local knowledge are often used interchangeably. However, the term local focuses on the locality in which the knowledge is used and embraces exogenous knowledge that has entered the local community over time. Indigenous knowledge tends to emphasise the knowledge based on experiences internal to a particular setting. However, as a result of debates about the impossibility of a purely internally based knowledge it has been accepted that the terms indigenous knowledge and local knowledge and local knowledge are largely synonymous.

Traditional knowledge comprises of proven ancient, original and distinctive customs, conventions and routines and embodies a static view of culture. It refers to ideas and knowledge that have their origin in ancient history and have been carried over unchanged over several generations. It operates on a practical level of repeated actions based on opinions and beliefs (Brouwer, 1998). Traditional knowledge is a part of local since it is part of people's inheritance on which they have build their local knowledge. However, whereas traditional knowledge is static in nature, local knowledge is dynamic in nature, it is continually changed, re-interpreted and moulded by current everyday experiences and activities.

Indigenous Technical Knowledge (ITK) can also be regarded as an aspect of local or indigenous knowledge and is practical in nature. It is concerned with operationalised local thinking (indigenous technologies and procedures) in such fields as agriculture, fisheries, health and forestry (Brouwers, 1998).

An Indigenous Knowledge System (IKS) refers to local knowledge that has been captured by its carriers in a systematised way. IKS delineates a cognitive structure in which theories and perceptions of nature and culture are conceptualised. Thus it includes definitions, classifications and concepts of the physical, natural, social economic and ideational environments.

ITK and IKS are related in the sense that in order to fully understand ITK one needs to have a knowledge and an understanding of the concepts and cognitive structure on which they were based.

In order to get a better grasp of the concept of local knowledge, it is useful to juxtapose local with scientific knowledge. Whereas scientific knowledge is acquired through a formal process of learning in specially designated institutions, local knowledge is derived from participation with others in everyday activities in a local 'real life' setting. This characteristic has several implications:

Local knowledge, although common to a particular community is not equally distributed amongst people in the same setting. People's facility with local knowledge depends on the centrality of their participation in an activity. The more expansive and frequent participation in an activity the deeper the local knowledge. People with specific roles such as medicinal healers, midwives and foresters will develop specialised local knowledge in their areas of expertise.

If local knowledge originates from everyday activity in a particular setting, then its is also tied to that activity. In other words local knowledge is contextualized knowledge. All the aspects of local knowledge (people's knowledge of erosion, reforestation, farming, religion, death, etc.) are contained within a local cultural totality. As a structure this cultural totality reacts as a whole. If one of its parts is affected, an automatic reflex occurs on the others (Freire, 1976). This is in contrast with formally learned knowledge which is de-contextualised. It is formalised and abstracted so as to include general laws and principles, which can be transferred from one situation to another.

Local knowledge is dynamic. As they interact with their environment, local people continually adjust to that environment or try to change it to meet their needs. This follows a process of experimentation, adoption and propagation of new ideas about the environment and its management.

Local knowledge contains knowledge in all the different spheres of life such economics, environment, medicine climate etc. In each of these fields people have developed knowledge encompassing factual data concepts, taxonomies, theoretical models and values. This knowledge is captured in local linguistic symbols and systems. Besides knowledge of "what exists", local knowledge also includes knowledge on "how to do things" (methods, technologies etc.).

Local knowledge, because it has been acquired organically through everyday experience rather than through a predetermined educational process, is often tacit. It is not normally consciously reflected upon.

## 3 THE IMPORTANCES OF LOCAL KNOWLEDGE FOR DEVELOPMENT

Many studies have shown that rural people in developing countries have intimate knowledge of their natural environment (including plant and animal life a well as climate, soils etc.) and of environmental processes. They make rational resource management decisions based on that knowledge. Communities have well-established systems and carefully developed techniques which, over many years, allowed them to survive in harsh conditions (Van Vlaenderen & Nkwinti, 1993). Building on that local knowledge and resources reduces the likelihood that a development intervention de-skills the local people and increases their dependency on external experts (Korten, 1980). On the contrary, taking local knowledge as the basis for development it empowers local people by increasing their self-reliance, their confidence and their capacity to utilise and manage their local resources. This however does not mean that local

knowledge is superior to scientific knowledge. That local knowledge has its shortcomings is clear from the existence of debilitating diseases, natural resources degradation etc. in many developing settings. The plea that is made here is for a combination of local scientific knowledge in development in which the local knowledge (including methods, concepts, classifications) is used as a starting point for a process in which local and scientific knowledge can merge into an effective development strategy which is controlled by the local people rather than the development agent.

## 4 HOW TO ACCESS LOCAL KNOWLEDGE

Having identified the importance and the characteristics of local knowledge the question arises as to how to gain access to local knowledge. The lack of interest in local knowledge in the past has hampered the development of a methodology to capture local knowledge. Most social science data gathering methods are predominantly geared at collecting data within the framework of a theoretical research question determined by a researcher (mostly with a Western background or Western based education). These methods involve surveys, interviews, structured observations and experiments and employ the researcher's concepts, categories and classifications. Only the anthropological tradition, with its focus on long term participant observation and unstructured interviews, has a long term experience in capturing local values and concepts, Recently, some methodological innovations have emerged, mainly from within the rural and agricultural development field, that are geared at accessing local knowledge. These methods have the following characteristics:

- They allow people to provide information and ideas using local symbols and materials.
- They encourage local people to provide information using local concepts and classifications.
- They capture data in a holistic way (data embedded in its local cultural value framework) amongst the different role players in a community.
- They enhance the confidence of the local people and as such encourage them to share their local knowledge.
- They assist the local people in making their tacit local knowledge explicit.
- They are based on collective data gathering.

Methods used to capture local knowledge as part of a participator y development process have the following additional characteristics:

- They facilitate the link between data collection, analysis and planning for action
- They enhance group data analysis and reaching consensus

### 4.1 Data collection: Recording what People say

The more traditional way of accessing local knowledge is through unstructured or semi-structured interviews. Asking people about their knowledge is the most obvious way of finding out about peoples' ideas, concepts and local ways of doing things. The unstructured interview has the advantage of allowing the participant to partially decide the direction in which the interview proceeds. It also allows the researcher to ask for further details and clarifications throughout the data collection process, enhancing insight to the data that is provided. However, due to the often tacit nature of local knowledge, this method is sometimes inadequate. Answering questions which probe at issues that have not been consciously reflected upon may be a difficult task for the informant and often leads to answers that are influenced by the informant's desire for social acceptability rather than by the person's local knowledge.

Another anthropological method for accessing local knowledge is the analysis of local songs, riddles, proverbs and stories. These culturally informed texts, which employ local concepts and categories, provide important insights into local values and procedures. However, the analysis of such written materials relies heavily on the perspectives and skills of the analyst and often these interpretations are not ratified by the local people from whom they are elicited.

## 4.2 Data collection: Recording what People show and say

The visualisation techniques used in the RRA and PRA approach are a relatively new approach to accessing local knowledge. Instead of exclusively relying on the interview technique, they involve the drawing of diagrams as a means to elicit and analyse data. Before turning to the use of Rapid Rural Appraisal (RRA) and participatory Rural Appraisal (PRA) techniques, I will briefly elaborate on the history of these research approaches.

The methods of RRA/PRA began to emerge in the 1970's as a result of various influences (Mc Cracken et al., 1988):

- The increasing complexity of the interactions between ecological and socio-economic processes which required a multi-disciplinary approach.
- A disillusion with conventional methods in rural development, which were: too time consuming, expensive, formal and fixed, lacking integration, top down in direction and had a low level of participation from the local people.
- A growing recognition that rural people were themselves knowledgeable about many subjects that touched their lives.

RRA was seen as a collection of techniques for conducting action oriented research in developing countries aimed at:

- Assessing development needs of a community
- Identifying priorities for research and development interventions
- Assessing the feasibility (social and technical) of planned interventions
- Implementing development action
- Monitoring development action

From the RRA approach emerged the PRA approach. Both approaches are similar in that they employ the same data collection techniques. However PRA has adapted the use of these techniques to a participatory approach. In PRA the attitudes and behaviour of and the roles played by respectively the researcher and the local people differ from the RRA approach. Whereas in RRA the focus is on the researcher tapping people's local knowledge so that the development agency can develop a suitable intervention, in PRA documenting local knowledge is a process that is controlled by the local people and is linked to action by those people. In PRA, much more than in RRA the local people are in charge of the research process, decide on the methods for data collection, execute them analyse them and use the data for development planning in their community. It is a stated aim of PRA that at the end of the research process local people should be empowered with research skills so that they can continue doing research on their own issues in the future. In PRA the researcher is a catalyst or facilitator of a process as well as somebody who builds the local people's capacity to do research in their own localities, rather than a person in control of research process (Van Vlaenderen, 1995).

In the PRA/PRA approach a variety of techniques is used ranging from observation to workshops, analysis of documents and drawing of diagrams. I will confine myself to an elaboration of the last technique.

The RRA/PRA diagrams are simple schematic devises which present information in visual form. The construction of such diagrams involves a data generation as well as an analytical process. The enfolding diagram is a reflection of the knowledge of the people who draw it and simultaneously provides an anchor for the explication of further knowledge. The participants in RRA exercise draw the diagram based on their knowledge, but as the diagram enfolds the visual nature, it helps the participants to further access and analyse aspects of their knowledge that are more tacit.

The RRA and PRA diagrams are usually produced in groups, allowing participants to assist each other in the explication of their local knowledge and to combine the knowledge of the different participants.

The enfolding diagram enables individual participant's thinking and memory and stimulates them to add to what others have already provided.

The production of the diagrams facilitates discussions and an integral part of the RRA/PRA exercises is to capture the discussion that goes on during the production process as well as to ask questions and clarification from the group. After completion, the diagram itself (through its creators)can be interviewed.

The types of diagrams used in RRA/PRA include mapping, transects, seasonal calendars, Venn diagrams, historical profiles, ranking matrices, time trends and flow diagrams. However, the scope of this paper does not allow elaboration on each of these. In order to further clarify the nature of RRA/PRA diagrams and to highlight their suitability for accessing local knowledge some examples of mapping and matrices are provided.

### *4.2.1 Mapping*

Mapping involves the drawing of a rudimentary map of their area by local people themselves. This may be a social map depicting the village (providing population and socio-economic data) or a resource map depicting the natural resources (crops, soils, physical features, animal and plant biodiversity) surrounding the village, or it may include both aspects.

*Example 1: Maps of Tanzania*
This example refers to an exercise that was done as part of an ethnobotany course held in Arusha in April 1999 in which the participants were divided into 3 subgroups, according to the area they came from, and were requested to draw a map of Tanzania indicating the major forested areas and the areas of high population density. The discussion in the groups that accompanied the exercise concerned location of forest. ecological composition of the forest and importance of the forest. It also included discussions on the location of high population areas and the reasons behind this. Although the mapping was done as an exercise and not part of a real life intervention, its results provide useful insights into the use of PRA techniques for accessing local knowledge. A few of these are mentioned.

- The maps show the differences in perceptions, knowledge and interest amongst the different types of participants. For instance the coastal people emphasised Zanzibar and Pemba and depicted considerable areas of forest, whereas people from the lakes area emphasised the lakes and were very precise about the location of the forests in that area.
- The discussion held in the different groups explicated a lot of the participants local knowledge on forests and emphasised these differences in knowledge amongst them.
- The maps show that each group had chosen its own symbols to depict the features on the map

*Example 2: Medicinal plants in Engalaone*
This example refers to a map drawing that was done as part of a small ethnobotanical study on the use of wild plants as cough remedies. The study was done in the Maasai Village of Engalaone near Arusha in April 1999. In the village a men and a women group were asked to draw a map of their village and to show us where the medicinal plants that they had identified as cures for cough could be found. Comparison of the two maps reveal certain gender differences in the knowledge of the medicinal plants as well as in perceptions and interests in the natural environment hat surround their village. A few of these are mentioned below.

The maps show that:
- The male group identified the boundaries of the village while the women group the road was that main anchoring point for the construction of the map. This implies a gender difference in the perception of the concept village.
- In the male group a considerable amount of the plants are located in the forested area and the discussion that accompanied the identification of the medicinal plant species in the forest led to an in-depth discussion on the past and present water provision in the village, based on changes in the natural environment. This discussion provided valuable local knowledge about the perceived reasons

for conservation problems in the area as well as of the threat to medicinal plants and the change in health practices in the village. From the map made by the women one can deduce that the majority of medicinal plants known and used by the women are located near the bomas and in the cultivated areas. The discussion during the map drawing focused more on what the plants were exactly used for and how they were prepared than on where they could be found. This points to a possible gender difference in collecting medicinal plants and preparing them. Where the men would gather the plants it would be the task of the women to prepare them. However this last interpretation should be seen as a hypothesis to be checked through additional data collection.

*Example 3. Natural resource management: Past, present and future knowledge*
This mapping was done as part of a participatory research project on resource management in a Village in the Eastern Cape Province of South Africa during 1996. The Village was working together with a master student to develop coping strategies for the severe degradation of their immediate natural environment. As part of this programme a map drawing exercise was done including 3 maps. The maps were drawn by a small group of villagers including young and old people, women and men. One map was depicting the village in the past. One was a reflection of the village today and another was the villagers' vision for the future.

The three maps and the discussions during the map drawing provided several insights. Some of those were:

- There is much more in-depth knowledge of the present than of the past
- It was mainly the old men who provided the data on the past.
- There is more incongruence amongst the people about their perceptions of the past than that of the present.
- The women focused on the social aspects of the map and the men focused on the demarcations of the different maps (grazing areas).
- There were different perceptions with regards to the present and the past. Some participants (mainly young men) preferred the past situation, but some preferred the present situation motivations for both positions provided important local knowledge about people's priorities and insights in their environment.
- In drawing the third map, representing the vision for the future, differences between the participants became most obvious. For instance women focused on water taps in the vicinity of their houses while young men focused on changes in land management.

The maps were left with the village so that they could be used for their resource management programme.

### *4.2.2 Maps and Local Knowledge*

The three mapping exercises were useful for accessing local knowledge for the following reasons:

- They provided a framework for eliciting local knowledge without imposing the researcher's predetermined categories. They allowed the participants to use their own categories and symbols (circles, trees etc.).
- The construction of the maps did not only provide information about what people perceived in their environment but also about what people knew about the things they perceived (Fuglesang,1982). In example 2 information provided by the women did not only concern the distribution of the medicinal plant species but also on their uses and preparation.
- The collective drawing of the maps stimulated discussion and analysis in the groups. This discussion was initiated and controlled by the participants and revolved around the map rather than on the researchers.
- The mapping provided participants with a lower level of literacy, with the confidence to participate fully in the data gathering.

- The map drawing enabled analysis of differences between participants. It provided insights into differences in perceptions due to gender, age and location. In example 2 differences between men and women concerning medicinal plants were elucidated. In example 3 differences in perceptions and preferences with respect of natural resources were elucidated between men and women, elders and youngsters.
- The map provided participants with a lower level of leteracy, with the confidence to participate fully in the data gathering.
- The map drawing enabled analysis of differences between participants. It provided insights into differences in perceptions on gender, age and location. In example 2, differences between men and women concerning medicinal plants ere elucidated. In example 3, differences in perceptions and preferences with respect to natural resources were elucidated between men and women, elders and youngsters.
- The map drawing allowed the capturing of data in a holistic way. Although the focus may have been medicinal plants or natural resources, the map drawing allowed people to discuss these issues within the broader complex context, indicating their interrelations with other aspects of their lives. In example 2 information was provided about the hydrological issues in the village and the impact of these on different aspects of village life (health, conservation, etc.).
- The last example showed how data collection can be organically linked with reaching consensus and planning for action in a participatory process. The data gathering in the map of the present and the past assisted the process of envisaging and planning for the future.

### *4.2.3 Matrix ranking*

Matrix ranking involves the identification of a list of criteria for certain objects, issues or resources, followed by an indication by people about their preferences (ranking) and/or uses of resources. A matrix framework is used in this process.

*Example 1: Remedies for Coughs in Imbibia Village*
In example 1 the use of matrix exercise was part of a small ethnobotanical study in Imbibia Village (Arusha region) in April 1999. the aim of the matrix exercise was to identify which medicinal plant species were used/preferred for which types of cough. The process involved first identifying different kinds of coughs and second, indicating which species are used/preferred for each type of cough. this data was represented on a matrix. The process was accompanied by a discussion on the characteristics certain coughs.

*Example 2: Uses of Tree Species*
In example 2 the matrix exercise formed part of an ethnobotany course held in Arusha in April 1999. The aim of matrix exercise was to identify uses of the most common tree species in Tanzania. the process involved first identifying different tree species and second, identifying different uses of tree species and third, indicating the different uses for the different species. This data was indicated on matrix. The process was accompanied by a discussion on the characteristics of the tree species an why they had particular uses.

*Example 3: Use of Wild Plants around the Fish River Reserve*
In example 3 the ranking exercise formed part of a study on natural resources management in villages surrounding the Fish River Nature reserve in the Eastern Cape region of South Africa. The aim of the ranking/sorting was to find out which wild plant species were of most importance to the villagers. The process involved first, identifying wild plants used by the villagers and second placing them in three squares of different size according to their importance. This exercise was accompanied by a discussion on why the plants were more or less important, and what they signified in people's life.

### *4.2.4 Matrices and Local Knowledge*

The advantages of matrix exercise for capturing local knowledge are similar to those of mapping. Particular advantages of ranking and matrices are listed bellow:

- The ranking and matrix exercises provided a framework for eliciting local categories and local symbols. In example 1 for instance the participants identified a local taxonomy of coughs.
- The construction of the matrices stimulated discussion about various aspects of the indigenous categories. In example2 for instance the particular uses for wood species stimulated discussion on properties of tree species and the properties required for different uses. In example 1 the symptoms and causes of different types of coughs were discussed.
- The need for a consensus in the group to fill in the matrix or to do the scoring stimulated motivations for different options in the group. This argumentation process produced a lot of local knowledge and linked the ranking and scoring to other aspects of the lives of the participants.

#### *4.2.5 Video Production*

The use of Video as a method for data collection involves a process in which a community produces a Video of aspects of its own village life. This involves devising a scenario, shooting the Video and viewing the Video for discussion.

*Example 1: A Video of our Village Life*
This example relates to community development project that took place in the village of Rwantsana in the Eastern Cape Region of South Africa. The researcher was conducting a needs analysis in the village when the community elders decided that the questionnaire survey and interviews were not providing the researcher with an adequate picture of their community and that they wanted to produce a video that would show the 'real' situation in their village. The village committee wrote a scenario and with the help of a cameraman, a video was produced depicting the various aspect of community life, ranging from primary health issues to gardening projects and water collection. Once the video was ready it was watched by the community, discussed and used in planning for development projects.

The advantages of the video production method for capturing local knowledge are similar to those identified for the other methods described above. The production of a scenario by the villagers themselves allowed for local concepts, categories and forms of communication to be used. It presented an image of village life as perceived by the villagers. The fact that the team that made the scenario involved women ensured that gender issues were catered for. The use of images enabled the communication of certain local procedures, which may not easily have been described by words. The fact that they chose the medium of communication enhanced their confidence to share their local knowledge. The viewing of the completed video created a lot of discussion, which was rich in local knowledge.

### 4.3 Data collection: Recording what People do and say

Sometimes the tacit nature of local knowledge requires the researcher to employ data collection methods that do not rely on spoken or written word or symbol (diagrams). This often applies to people's local knowledge of technologies, methods and procedures. Technologies and procedures are generally acquired through observation and experience in everyday activities often without the use of verbal instructions. As such they are not easily captured in words. In order to capture these aspects of local knowledge it is necessary to rely on observations of people’s activities rather than on their descriptions.

#### *4.3.1 Observing Activities*

Observing activities implies that the researcher is present during one or more everyday activities of the local people, observes and documents them and asks questions about them.

*Example 1: Preparing Aloe Juice for Pharmaceutical Purposes*
This example refers to community development project that took place in Rwantsana, a village in the Eastern Cape Province of South Africa during 1993. As part of a process to enhance small business enterprises in the village, a survey was done to identify skills and facilities available in the village which could form a basis for a programme to develop small business. During the survey it became clear that some people wee involved in harvesting juice from aloe plants which they sold to a businessman who came to collect the juice from the village. They received a very small fee for the raw juice and they were told that if they could process the juice into a more refined product (called aloe cake) they would be able

to make a much grater profit. After further discussions in the community, two villagers volunteered that they used to process aloe juice before they came to the village and that they could explain how to make the aloe cake. However, the description of how to boil and prepare the juice (temperature, duration and monitoring of the process) was of such a nature that the other villagers were not able to copy the process accurately enough to obtain a satisfactory end result and the development worker could not provide a precise description of the process. Eventually it was decided that the two 'village experts' would demonstrate the process to the villagers and the development worker. This process clarified the precise nature of the procedure. The required temperature, duration of boiling and further processing were established. Moreover insight was obtained by the development workers into people's local concepts and criteria for assessing temperature, timing and other parameters

The activity had the following benefits with regards to capturing local knowledge:

- The demonstration provided the two villagers with a means to present their local knowledge, which they could not fully capture in words.
- It enabled the two villagers to show their own criteria for judging concepts such as temperature timing etc. contextualised within the process of making aloe cake in that particular setting.
- It provided the villagers with the confidence to share their local knowledge, because they could employ a method of communicating that they felt comfortable with.
- The concrete nature of the demonstration assisted the other villagers and the development worker in making enquiries about specific aspects of the procedure.

### *4.3.2 Popular Theatre*

Popular theatre involves local people making sketches of their own life situation. These sketches are then presented to the village and the content discussed with the audience afterwards. Some types of popular theatre involve the audience in the performance of the play and at crucial points in the play, the actors turn to the audience for advice or inputs.

*Example 1: Involving Farmers' Wives*
This example refers to work done by Dr Gilbert as part of an agricultural development project in the Natal Province of South Africa. Part of his work was to strengthen local agricultural organisations. These organisations were run by committees which were elected annually and which consisted exclusively of men. One year the women of the villages that were part of the programme decided that would be heard and attended to. This was however a sensitive issue and with the help of the development programme staff it was decided that the women would stage a play in which they would enact the role they fulfilled in promoting their husbands for election in the committees, but at the same time bring in arguments of why it would be beneficial to the community to have women involved in the communities and what their needs and perspectives were. The play was staged during the annual meeting and was received with lots of laughter and stimulated a lot of discussion. As a result a woman were elected in the committees.

Although the play had not been staged with the aim of eliciting local knowledge, a lot of local knowledge could be extracted from the play for the following reasons:

- The women provided an analysis of the men-women relationships with regards to agricultural field in their community. All the actors were women, although some of them played male roles. This enabled them to express their perceptions about the men in the community.
- The play provided a safe avenue to express issues which are sensitive in nature and which may not easily be accessible through more traditional data collection techniques such as interviews.
- The women were able to express their local knowledge, concepts and ideas in the form that they had chosen (they made the scenario, selected the actors, made the props and staged the play).
- The play may have enabled the expression of certain local attitudes and values which are difficult to describe in words.
- The play enacted everyday life scenes, as such the local knowledge about agricultural practices was portrayed holistically within the village life.
- The play leads to action, namely the election of a woman in the committee.

## 5 CONSIDERATIONS IN COLLECTING LOCAL KNOWLEDGE

In the section above different data collection techniques were discussed and their potential for eliciting local knowledge emphasised. However, those methods are employed by researchers and their successful use largely depends on the way they are executed. Several considerations needs to be taken into account in order to bring out the potential of those methods and techniques. These are listed below:

- The techniques should not be applied mechanistically, but should fit into an overall research design and each specific technique should be selected when felt appropriate to the research process and the prevailing community dynamics.
- The style of facilitator is an important determinant of the results of the data gathering. Most of the techniques discussed above are facilitated by a researcher who asks questions, makes suggestions and provides advice. A directive facilitator may limit the emerging of local categories and knowledge, a creative facilitator may be able to elicit more knowledge than a more formal facilitator.
- The researcher needs to be aware that knowledge is power and that people in the village are not always prepared to share their knowledge. For instance the experts in producing aloe coke, or the experts in medicinal plants may loose their monopoly over their knowledge and skills which may have repercussions for their livelihood. It is therefore important that the data collection is embedded in a process which is transparent to the informants. They need to be able to assess if the research or development process is potentially beneficial or worthwhile enough to them to volunteer their local knowledge.
- When using PRA techniques one needs to consider the context in which the data collection exercises took place e.g. a map cannot simply be read as a fact. What people think the purpose of a particular PRA exercise is, who takes part in it, what people think the likely outcome of the particular PRA exercise is, all this influence what they represent. Taken out of context, diagrams can be interpreted in different ways and can potentially lead to misleading conclusions.
- Since local knowledge involves a complicated network of concepts based on an integrative epistemological framework it can not easily be captured by means of a single data collection process based on the use of a single method. In local knowledge research there is a need for triangulation (using different methods to access the same kind of information) and a reaching of increasingly better interpretations through a process of devising and testing hypotheses based on different phases of data collection. This implies that collecting valuable local knowledge requires a fairly long term involvement with the research participants.
- Although the PRA techniques potential to illicit indigenous categories from local people, they still impose a certain structure which may limit the emergence of local categories. The matrix for instance imposes categorisation which may not correspond with local perceptions.

## 6 CONSIDERATIONS IN DOCUMENTING LOCAL KNOWLEDGE

Recording the data collected by means of the methods described above is not an easy task because the data collection process is largely determined by the participants and is therefore difficult to structure by the researcher and because the data collection procedure usually generates a lot of data through the group discussions.

- The researcher needs to remember that the conversations that take place during PRA exercises, demonstrations, rehearsals of plays etc. are as important as the end results (diagrams, play etc.). Very often these conversations are not adequately recorded which results in considerable loss of data and which makes the end products of the data gathering less rich.
- In documenting local knowledge it is preferable and often imperative to use vernacular. Concepts and taxonomies used are often not synonym or parallel to scientific language (often English) and translation can provide an inaccurate interpretation.
- Another important requirement in documenting local knowledge is the need to contextualise the local knowledge within the whole value system of the community from which the local knowledge is obtained. Van der Ploeg found that the words dura/suavecita (hard/soft) also communicate another important meaning i.e. the degree to which a particular plot has been cared for and therefore the

degree to which the plot may be considered grateful. These concepts cannot be exactly quantified they cannot be described in nomological models of applied science. However, they allow the local farmers to establish fairly exactly the overall condition of specific plots. The concepts only make sense when contextualised within the local epistemology.

## 7 CONCLUSION

In this paper I have tried to provide some clarity on the concept local knowledge and discussed some of the methods that focus on eliciting local knowledge. I would like to emphasise however that those methods per se only provide a tool to access local knowledge. It is the skilful application of these tools by the researcher that will determine the depth and breadth of local knowledge that is capture by those tools.

## 8 REFERENCES


**Brouwer, J.,** (1998). IK, IKS and ITK. *Indigenous Knowledge and Development Monitor*, 6 (3), 13.

**Cornwall, A & Fleming, S.,** (1995) Context and Complexity: Anthropologhical Reflections on PRA, PLA Notes, 24 London: HED.

**Freire, P.,** (1976). *Education: The practice of Freedom*. London: Writers and Readers Publishing Cooperative.

**Fugelsang, A.,** (1982). *About understanding: Ideas and observations on Crosscultural Communication*. Dag Hammarskjold Foundation, Uppsala, Sweden.

**Gilbert, A.,** (1995). *Small Voices against the Wind: Local Knowledge and Social Transformation* paper presented at the Fourth international Symposium on the contributions of Psychology to Peace, University of Cape Town. 25-30 Une.

**Mavrocordatos, A & Martin. P,** (1995). Theatre for Development listening to the Community: INN Nelson & S. Wright *Power and participatory development. Theory and practice. London. ITP.*

**Mc Cracken, J.A., Pretty, J. & Conway, G.R.,** (1988). *An Introduction to Rapid Rural Appraisal for Agricultural Developmen*t. London: Institute for Environment and Development.

**Scoones, I & Thompson, J.,** (1993). *Challenging the Populist Perspective: Rural people's Knowledge, Agricultural Research and Extension Practice*, London: IDS HED.

**Van Vlaenderen, H.,** (1995). *Participatory research for Rural Development*. Paper presented at the Agricultural Research Council Workshop. ARDRI. Fort Hare University, March.

**Van Vlaenderen, H. & Nkwinti, G.,** (1993). Participatory Research as a tool for Community Development. *Development Southern Africa*, 10(2), 211-228

# Indigenous Technical Knowledge as Reflected in the Management of Natural Resources in Tanzania

*George C. Kajembe, Eliakim Zahabu and Mwajuma Mwenduwa,*
*Department of Forest Mensuration and Management*
*Sokoine University of Agriculture, Morogoro*

## 1 INTRODUCTION

In the broad sense, natural resource management can be defined as taking a firm decision about future of any area of resources, applying it and monitoring the application (Rietbergen 1993). It is widely accepted that natural resources should be managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations. Much of these benefits should be geared towards the local communities. Local communities surrounding natural resources should be the first hand beneficiaries to know the resource better than outsiders, and should have, therefore a great role to play in resources management.

Within natural resource management systems, Indigenous Technical Knowledge (ITK) embraces people's knowledge of tools and techniques for the assessment, acquisition, transformation, and utilisation of resources which are specific to the particular location. ITK can encompass:

- Vernacular: Technical knowledge held by all or most individuals in a specific locality e.g. knowledge of crop rotation, pests and weed control;
- Specialised: The technical knowledge of certain skilled "resource persons." e.g. medicine, charcoal making, blacksmithery and varietal testing;
- Controlled: Knowledge held by dominant groups in the society such as a specialised knowledge held by dominant groups in the society such as a specialised knowledge referred to above, or skills in animal breeding, hunting or water diving;
- Social: Knowledge belonging to a group (clan or tribe) or community e.g. grazing rights, fishing control and tenure regulations.

The categories often overlap but in all cases ITK is the main resource which is controlled at least by part of rural people (Kajembe, 1994), whilst, natural resources and labour had normally been appropriated by outside powers. Even under those schools of thought that benefit some people may harm others. As a result natural resources management has not only involved expert operations, but also political negotiations and social considerations in order to reconcile divergent interests. The responsibility should be to establish natural resource management regimes that yield optimal results to society as a whole while respecting individual resource use rights and duties as much as possible. Some innovative management approaches have therefore to emerge from both sides of the management partners i.e. local people and professionals.

## 2 PERSPECTIVES ON HOW LOCAL KNOWLEDGE CAN BE UTILLIZED FOR SUSTAINABLE NATURAL RESOURCE MANAGEMENT

There are three Indigenous Technical Knowledge perspectives namely: Instrumental perceptive; Interpretative or Farmers-First perspective; and Actor-oriented or Beyond Farmer-First Perspective.

### 2.1 The Instrumental Perspective

The Instrumental perspective is mainly based on ecological or technical point of views, in which the use of indigenous knowledge can be seen as contributing to a better assessment, management and conservation of natural resources and to forming a basis for new (ecological) scientific knowledge (Inglis, 1993). This perspective is called "instrumental" because the knowledge and skills of local people are used as an instrument in externally designed and top-down implemented development or

conservation projects. In many transfer of technology mode of projects in Tanzania for example, local people participate only in the implementation not in decision making and evaluation activities.

In this perspective, indigenous or traditional knowledge is viewed as a static body or stock of skills and experiences resulting from a long tradition of direct interaction between local people and their natural environment, from which useful information can be "harvested" by outsiders.

### 2.2 Interpretative or "Farmer First" Perspective

As a reaction to the instrumental perspective, the interpretative approach perspective emerged, mainly advocated by Chambers, et al., (1989). This perspective is based on previous farming systems analysis of the complex, diverse and risk-prone situation in resource-poor agriculture and on the recognition of the importance of local knowledge in these farming systems. This perspective calls for a reversal in the farmers who should formulate research agendas and experiment and innovate, based on their own specific situation and external experts should act just as facilitators.

This reversal of power, places farmers' knowledge at the centre. Farmers' knowledge, problems, analysis and priorities should be the starting point of any development efforts. Many case-studies show the capacity of farmers to experiment and innovate (see for example Richards, 1985 and Kajembe, 1994.) This capacity is comparable to scientific experimentation and innovating. Any integration of (western) science and local knowledge should be based on this assumption. The role of the external actor (scientist and extensionist) is not to impose solutions from the laboratory in a top-down model, but to facilitate local initiatives by offering a "basket" of choices (like new varieties, technologies etc) from which the farmer can choose the most appropriate in his/her particular situation. Richards (1985) states that "intellectuals, development agencies and governments have all pursued environmental management problems at too high a level of abstraction and generalization". Many environmental problems are, infant, localised and specific, and require local, ecological particular responses.

From this perspective it follows that research should not be directed on further sophistication of scientific knowledge and on the transfer of this knowledge to the ground as in a "Transfer of Technology" model, but on a better understanding of indigenous management systems and technology. Then, from this understanding, research can seek for ways to build upon and strengthen local initiatives. Put simply, the role of external animator will be to find out what people are doing and help them to do it better.

### 2.3 An Actor-Oriented or Beyond "Farmer First" Perspective

The third perspective moves beyond the Farmer First perspective, not only by rejecting its basic goals, namely: active participation of all actors, empowerment of the local people and poverty relief, but by deepening the concepts of knowledge and power in the analysis of natural resources management and by adopting a more actor-oriented approach. An actor-oriented approach, allows for the recognition of development history (Kajembe,1994). From an actor-oriented perspective, institutionalisation only become real when introduced and translated by specific actors (including here not only the farmers but also others such as scientists, extensionists and politicians).

This implies that these "basic" trends do not eliminate power within the local situation, nor do they eliminate an active role for the farmers involved. What they do result in is a shift in the basis of power relations, and also a shift in various definitions of farmers' role. At the same time, increasing institutionalisation often results in the emergence of new structural discontinuities and hence in the creation of new points of leverage and space of manoeuvre which may become crucial in the interaction with various intervening agencies (Kajembe, 1994).

Actor-oriented perspective criticises the populist "Farmer First" perspective for its simplistic assumption of the need for a power reversal. Comparable to the advocates of a transfer of technology, "Farmer First" suggests a transfer of power from external experts to local people. This still suggests a pattern of powerless insiders, and neglects the complex and dynamic process of knowledge categorisation and generation.

The "Actor-oriented" or "Beyond Farmer First" perspective argues that both scientific and indigenous knowledge are fragmentary, partial and temporal. Knowledge is constantly being generated and constructed as a product of the dynamic process of interaction between various actors, each with different cultural backgrounds and understandings. In this, the advocates of "Beyond Farmer First" or "actor-oriented" perspective recognise the fact that multiple actors do exist in natural resource management and rural development at large. Knowledge is not just a commodity which can be transferred form one actor to another, but the outcome of a process which is result of negotiation on the "interface" between these multiple actors (Long Villareal, 1994)

In this framework, local actors (individuals or groups) should be seen as "situated agents". Within limits of existing information, uncertainty and other constraints(e.g. physical, normative and politico--economic), local actors are knowledgeable and capable (Chambers et al., 1989). They attempt to solve problems, learn how to intervene in the flow of social events around them and monitor continuously their own contingent circumstances.

Giddens (1987), points out that "agency" refers not to the intentions people have in doing things-social life is full of different kinds of unintended consequences with varying ramifications-but, to their capability of doing those things in the first place. Action depends upon the capability of the individual to "make difference" to pre-existing state of affairs (Kajembe, 1994). As a matter of fact, all actors exercise some kind of "power" even those in highly subordinated positions. As Giddens, (1987) puts it "all forms of dependence offer some resources whereby those who are subordinated can influence the activities of the superiors. And in this way they actively engage in the construction of their own social situation although the circumstances they encounter are not merely of their own choosing.

Considering the relation between social actor and structure, Giddens (1987) argues persuasively that the constitution of social structures, which has both a constraining and enabling effect on social behaviour, cannot be comprehended without allowing for human agency. He writes "In following the routines of my day-to day life, I help to reproduce social institutions that I played no part in bringing into being". They are more than merely the environment of my actions since they enter constitutively into what I do as an agent. Similarly, my actions constitute and reconstitute the institutional conditions of actions of others, just as their actions do to mine. My activities are thus embedded within, are constitutive elements of structured properties of institutions stretching well beyond myself in time and space (Giddens, 1987:11).

Human agency, or the capacity to devise ways of coping with life, plays a role in the way actors create new possibilities for development by influencing others, or in other words, create room for manoeuvre.

## 3 RECORDING OF ITK IN TANZANIA

Besides of all the evidence available, most professional Natural Resource Managers are still sceptical about farmers knowledge and experimentation, partly because farmers seldom record their accomplishments in writing, rarely write papers in their discoveries and do not attach their names and patents to their inventions. As a result, in most cases the history of natural resources development is written without reference to main innovators who are the farmers (Kajembe and Wiersum, 1998). However, in British Tanganyika, there was a tradition dating from 1930s that colonial district officers collected information as part of indirect rule (McCall, 1996). Much of this information was used to record customary patterns of land tenure and crop and livestock ownership.

In 1980, contemporary interest was revived first by the Brokensha's work. Initially the work started in Kakamege, Kenya under the Forestry, Tree and People Programme (FTPP). Later, the work was continued in Singida, Tanzania under the funding of the International Centre for Research in Agroforestry (ICRAF) (McCall, 1996). The work by Kajembe in 1994 carried out in Dodoma Urban and Lushoto District, Tanzania showed that local people knowledge and skills can be effective means to increase extension agents sensitivity to local needs, and stimulate meaningful dialogue between all actors in community based forestry management.

According to FAO (1993), natural resource management has been much more concerned with conserving the resource without local communities. Protection of natural resources has at times seen as necessitating disruption of the traditional ways of life of local communities. Effort has therefore to be done to incorporate social values into natural resource management systems and this incorporation has to be effective. It is through this incorporation where ITK has a chance to be recognised and valued.

Work done by Edje and Semoka (1990) on traditional systems of soil fertility maintenance with special reference to bean production concluded that traditional forms of soil fertility maintenance will contribute to the present interest by involving both natural and social scientists in the documentation and adaptation of indigenous bodies of unwritten knowledge for enhancing soil fertility and productivity. Kihwele, (1994) stated that over 99% of Tanzanian beekeeping Industry (Apiculture) is carried out by forest-based small-scale beekeepers who use indigenous technical knowledge to harness the stinging honey bees. He further emphasised that local beekeepers have a lot of knowledge in keeping, which is being transferred locally from one generation to another.

Furthermore Makali (1998) in the study carried out in Dodoma rural concluded that "customs, and traditions which in some ways help to conserve forests and which are effective tend to suit the conservation purpose at low cost". However, most of these local institutions, seem to have taken a decreasing trend with regard to their authority in forest management activities due to some prevailing socio-economic factors.

## 4 DYNAMICS OF INDIGENOUS KNOWLEDGE SYSTEMS

In adapting to changes in their environments, local people in the tropics not only vary products that they use, but also the practices they employ, the amount of labour they expend, as well as other socio-economic factors. The sources of the change that affect them are not invariably "outside" pressures or influences alone but also changes engendered by the local people's own subsistence activities and experimentation. It is undoubtedly true that many important changes have resulted from the impact of outside forces, and that increasingly the independent decision making of local people has been undermined. It is, we believe, theoretically unsatisfactory however, to base one's analysis entirely on the notion of external determinism.

Perhaps the least recognised aspect of ITK is its experimental nature. In fact the use of the word "Indigenous knowledge" itself may create an impression of knowledge that is static, after it has proved to be useful through countless generations. However, in reality this knowledge is constantly evolving and being updated with new information. Rhodes and Bebbington (1988) identified three kinds of local people's experiments: curiosity, problem solving and adaptation experiments.

- *Curiosity experiments:* with regards to curiosity experiments they gave an example of a Peruvian Farmer who simply out of curiosity did an experiment to test whether epical dominance would affect the number and size of potato tubers.
- *Problem solving experiments:* farmers usually carry out experiments to solve their problems. Kajembe and Kessy (1999) in the study carried out in Mwanza and Tabora Regions found that farmers are experimenting with a number of techniques to solve the problem of termite attack to young tree seedlings.
- *Adaptation Experiments:* In adaptation experiments, farmers can either test unknown technology in a known environment or test known technology in a new environment.

Studying experiments as undertaken by rural people give understanding of their "sense making" activities (Brouwers, 1993). Scientists tend to regard an experiment as an enquiry during which all the variables are highly controlled except the variables under the study. Local people differ from the scientists, way of experimenting in, the sense that the experiment has to be included in daily circumstances (Kajembe, 1994).

Richards (1988) concludes that in recent Literature the experimenting, innovative, adaptive peasant farmer is now accepted as a norm not the exception. His own pioneering work has made a substantial contribution to this change of attitude. He has given numerous examples from West Africa, including labour organisation and rice cultivation in swamps (Richards, 1985).

From Actor-oriented perspective, both scientific and indigenous knowledge are fragmentary, partial and temporal. Both scientific and indigenous knowledge are constantly being generated and constantly being generated and constructed as products of dynamic processes of interaction between various actors with different cultural backgrounds and understandings (Katani, 1999). Advocates of actor-oriented perspective recognise the fact that multiple actors do exist in natural resource management and rural development at large. Knowledge is not just a commodity which can be transferred from one actor to another but the outcome of a process which is a result of negotiation on the "social interface" between multiple actors (Long and Villareal, 1994).

In this perspective, local actors, (individuals or groups) should be seen as situated agents (Kajembe, 1997). Within limits of existing information, uncertainty and other constraints (e.g. physical, social and Politico-economic), local actors are knowledgeable and capable (Chambers et. al. 1989). They attempt to solve problems, learn how to intervene in the flow of social events around them, and monitor continuously their own actions, observing how others relate to their behaviour and taking note of various contingent circumstances. Human agency, or the capacity to devise ways of coping with life, plays a role in the way actors create new possibilities.

## 5 AREAS OF FURTHER RESEARCH WITH REGARD TO ITK AND NATURAL RESOURCES MANAGEMENT

In contrast to medicinal plants and agroforestry tree species, there has been little methodological scientific analysis in Tanzania on the implementation of ITK in other fields of natural resource management such as in soil fertility and conservation. However it is a known fact that as far back as 1970s some work was being done in agronomic and economic rationale of ridging, shifting cultivation, and multicropping (McCall, 1996). There are also gaps in the research in pest management and disease control.

Traditional beer-brewing, a major economic activity of rural women in Tanzania has been totally ignored. Furthermore, very little attention has been given to the impact of AIDS to the productivity capacity of indigenous farming systems, and to the coping strategies that have unfolded. Technical Indigenous knowledge can easily be lost; thus lunar influences on crop and livestock growth and traditional weather forecasting are seen as folklore (McCall, 1996).

## 6 CONCLUSION

Promising methodological directions for representing ITK and formal modelling of its concepts and structure have yet to be taken seriously in Tanzania. For instance the scope for representing spatial indigenous knowledge by means of Geographical Information System (GIS) has yet been explored. Some categories of ITK such as soil classes, erosion hazards and the utilisation of woodlands and rangelands can easily be transformed in GIS formats. Other types are less amenable because of their scale, their complex constructs or the problem of distinguishing between categories, for example, land tenure rules and common property management regimes. ITK can be instrumental in empowering local people. Whatever the legitimacy or legality of ownership, we cannot disregard the potentials of ITK for promotion some degree of empowerment. At the very least, using ITK can prevent the mistakes which have resulted from incompetent management of natural resources. At its best, the marriage of outsider and insider knowledge systems can be truly synergistic, creating technological improvement in such areas as agroforestry, varietal selection, and soil moisture conservation.

## 7 REFERENCES


**Brouwers, J.H.A.M.,** 1993. Rural People's Response to Soil Fertility Decline. The Adja case (Benin). PhD dissertation. Wageningen Agricultural University papers 93 - 4, Wageningen, The Netherlands.

**Chambers, R.A. Pacey and L.A. Thrupp,** (1989). Farmer First: Farmer Innovation and Agricultural Research. Intermediate Technology Publications, London, UK. 218 p.

**Edje, O.T. and Semoka, J.M.R.,** (1990). Traditonal systems of Soil Fertility maintenance with special reference to Bean: In Proceedings of the 9th SUA/CRSP and second SADCC/CIAT Bean Research Workshop Serioes No. 12 held at Sokoine University of Agriculture, Morogoro, Tanzania 17-22 September, 1990. Bean Research Vol. 5.

**FAO, (**1993). Challenge of Sustainable Forest Management. FAO. Rome 128pp.

**Giddens, A.,** (1987). Social Theory and modern Sociology. Polity Press in Association with Basil Blackwell, Oxford, U.K.

**Inglis, J.T.,** (ed), (1993). "Traditional Ecological Knowledge: Concepts and Cases". International Program on Traditional Ecological Knowledge and International Research Centre, Ottawa, Canada.

**Kajembe, G.C**., (1994). Indigenous Management Systems as a basis for Community Forestry in Tanzania: A case study of Dodoma Urban and Lushoto Districts. Tropical Resource Management Paper No. 6. Wageningen Agricultural University, The Netherlands. 194p.

**Kajembe, G.C.,** (1997). Perspectives on "How Local Knowledge can be utilized for Sustainable Natural Resource Management". Proceedings of the Regional Refresher course for the Alumini of the International Course on the Design of Community Forestry (ICDCF) from Africa held in Nairobi Kenya, February 17 - 28 1997. International Agricultural Centre, Wageningen The Netherlands pp 18-22.

**Kajembe, G.C.,** and **K.F. Wiersum,** (1998). Bridging the gap between Indigenous initiative and externally sponsored forest interventions: In Chamshama, S.A.O (ed). Special Issue, Proceedings of the 1st Annual Forestry Research Workshop. Record No. 67. Faculty of Forestry, Sokoine University of Agriculture Morogoro, Tanzania pp 95 - 105.

**Kajembe, G.C., and J.F. Kessy,** (1999). Evaluation of Forestry Extension Services in Mwanza and Tabora Regions, Tanzania. Consultancy report submitted to the Ministry of natural Resource and Tourism. Forculsult, Faculty of Forestry and Nature Conservation, Sokoine University of Agriculture Morogoro, Tanzania (unpublished).

**Katani, J.Z.,** (1999). Coping Strategies Against Deforestation: Impact of socio-economic Factors with special attention to Gender-Based Indigenous Knowledge: A case study of Mwanza District. A dissertation submitted in partial fulfilment for the degree of Master of Science in Forestry of the Sokoine University of Agriculture, Morogoro, Tanzania.

**Kihwele, D.V.N.,** (1994): Beekeeping and Sustainable Management of Natural Forest Resources. A case study of Tanzania. Paper presented in the workshop on information acquisition for sustainable Natural forest resources of Eastern, Central and Southern Africa. Arusha 31/10 - 04/11/1994. pp 240 - 241.

**Long, N.** and **M. Villareal,** (1994), "The Interweaving of Knowledge and Power in Development Interfaces". In: Scoones, I. and J. Thompson (eds). "Beyond Farmer First". Intermediate technology publications. London, UK.

**Makali, S.,** (1998). Community Based Forest Management: A case study of Dodoma Rural District. A special project report submitted in Partial fulfilment of the Bachelor of science degree in forestry of Sokoine University of Agriculture Morogoro, Tanzania.

**McCall, M.K.,** (1996). ITK in East African Farming Systems: In Indigenous Knowledge and Development monitor Vol. 4 issues.

**Rhoades, R.** and **A. Bebbngton,** (1998). Farmers who experiment: An untapped Resource for Agricultural Research and Development? International Potato Centre (CIP), Lima, Peru.

**Richards, P.,** (1985). Indigenous Agricultural Revolution. Hutchinson and Co, London, UK.

**Richards, P.,** (1988). Experimenting Farmers and Agricultural Research. Paper prepared for ILEIA Workshop on Participatory Technology Development, ILEIA, Rietbergen, S. (ed) 1993.

# Gender Roles, Local Knowledge, Food Security and Biodiversity in Different Livestock Production Systems in Tanzania

*A.D. Maeda-Machang'u, S. Mutayoba, G.H. Laswai,*
*D. Mwaseba, E. Kimambo,and E. Lazaro*
*Sokoine University of Agriculture, Morogoro*

## 1 INTRODUCTION

Tanzania has a large livestock population of about 13 million cattle; 3.7 million sheep; 6.4 million goats; 275,00 pigs and over 22 million chickens (1984 Census). The ruminant population is mainly concentrated in Northern zone (Arusha), Central Zone (Dodoma and Singida); Western zone (Shinyanga and Tabora) and Lake zone (Mwanza and Mara). This distribution has an important implication in terms of production, marketing and resource use pattern (particularly land resource). Livestock production in Tanzania is organised under two main sectors; the commercial and the traditional sectors. The commercial sector was once dominated by a few para-statal dairy farms and beef ranches which have recently been privatised. This sector also include a thriving urban and peri-urban private commercial poultry and small-scale dairy farms and accounts for about 15% of the total livestock population in the country. The traditional sector accounts for about 99% of the country's cattle herd and 85% of the chicken. Under this sector animals kept are mainly indigenous breeds like Tanzania shorthorn zebu (TSZ) (98%) while pure beef and dairy breeds constitute 0.8% and 1% respectively (Shayo and Mlay 1986).

The livestock industry is part of the agricultural systems of Tanzania where agriculture is the backbone of its economy and plays an important role in food security of its people. Its importance is great and multipurpose. This industry provides men and women not only with food (milk, meat, blood) but also draught power, employment and fertilisers for their crops (Lamosai & Crees 1992). In some situations they serve as a means of capital accumulation (banking system & insurance) apart from supplying manure, providing hides, skins, wool hair and numerous other products (Shayo and Turuka, 1987).

The traditional sector of this industry is divided into several indistinct production systems. (Mtenga et al. 1992). These production systems have arisen from the socio-cultural importance given to livestock in the society, the ecological zone of the area, the ethnic groups, animal ecotypes and the farming systems practised by the community. The three main livestock production systems identified are pastoralism, agro-pastoralism and small-scale intensive specialised system.

**Pastoralism** is a form of livestock production system which is migratory and does not involve permanent settlement. The pastoral societies derive most of their sustenance and livelihood directly from livestock and thus livestock plays an important role in the economy, food security, social and cultural lives of these societies. In Tanzania, these pastoral groups operate with mixed herd owning about 20% of all the cattle, sheep and goats in the country. The chief management objective in this system is to avoid risk of any kind, both to the subsistence and to the ruminant capital. Their cultural and social heritage is bound in livestock with utmost importance attached to ownership; large numbers attesting to wealth and a high social standing. The tendency of the pastoralists in building up numbers during favourable seasons to ensure the survival of their herds during drought or disease outbreaks has often led to overgrazing, environmental degradation and lack of commercial inclination (Mtenga et. al., 1992).

**Agro-pastoralism** is a farming system where crop and animal production is combined. It is the most common mixed farming system in Tanzania. This can be extensive or intensive depending on the land availability. The agro-pastoralists keep about 50% of the cattle, sheep and goats in this country and some poultry. They grow maize, sorghum and millet as food crops and coffee and cotton as cash crops. This system is predominantly found in Shinyanga, Rukwa, Mwanza, Tabora, Dodoma, Mbeya, Mara, Iringa and some areas of Kagera. In this system subsistence and food security is gained from crops. Livestock are maintained as a mobile reserve of wealth providing insurance against crop failure and as a source of

cash when needed. The stock consumes crop residues and fertilises the fallow fields. Some agro-pastoralists use these animals for power- as draught animals for ploughing and transport. Livestock off take tends to slump due to the disease outbreaks and drought risks. to minimise risks, some farmers keep their animals in different places and also have a tendency of keeping large numbers which often leads to environmental hazards (Mtenda et. al. 1992).

The **Small-scale intensive and specialised production system** is mainly a crop based production system in which animal component plays a complementary and essential role. In the densely populated areas cattle and goats are kept by small holders mainly for milk and supply of manure for the crops. These animals are prevented from damaging crops by stall feeding. There is a recent trend of specialisation in dairy production in which the farmers have been encouraged to form co-operatives, which collect and market their milk. The system is mainly practised in some areas of Kilimanjaro, Arusha (Arumeru) and Mbeya regions.

Although the traditional livestock sector accounts for about 99% of cattle sheep, goats and poultry, the economic potential contribution has not been fully exploited due to a number of constraints, which account for the current sector's poor performance. Problems hampering this sector of livestock range from nutritional, health, breed, markets, policies, gender blindness and capital resource shortage (Mackenzie, 1973). For example, although there seems to be some promising achievements in some disease control (such as rinderpest), frequent disease outbreaks and the ever prevalence of tick-borne and tsetse-borne diseases, the development of vector-chemical resistance and the resurgent of CBPP in many parts of the country are still major threats to the livestock sector.

Despite the numerous technologies available and a good number of trained personnel with diploma or degree, their impact on the traditional livestock production systems seems to be negligible and gender blind. In this country, 51% of the human population is women and contribute about 75% of the labour force in agriculture with varying degree of involvement in livestock keeping; crop production and wage earners on top of their other roles as mothers and unpaid household managers. ILO estimates that about 98% of rural women classified as economically active are engaged in agriculture at commercial and subsistence levels including livestock and fishing, as casual labourers and unpaid family workers (FAO facts sheet, 1994). Although, the nature of these activities varies from culture to culture, the reproductive and productive roles are common and central to women's identify and often their main source of status within the family and community. The workload for women in general in all rural areas is higher than that of men.

Modern technologies have been introduced over a number of years in trying to increase the output from the farm animals with minimal success. The probable cause for such outcomes might be due to the techniques used which in most cases disregard the farmers' experiences and local knowledge. Odhiambo (1990) stated that the knowledge, skills and survival strategies of farmers operating with low inputs have been ignored and eroded by outsiders promoting modern technology which are often costly or require a lot of inputs. Traditional livestock keepers have means of handling adverse situations and managing resources at their disposal efficiently. They minimise risks and seldom take chances that may lead to hunger, or starvation or loss of crops or their livestock. But we researchers and policymakers have not made enough effort to record or understand the variability in their cultures according to gender, age, class or occupational role. Identification and modification of the existing knowledge, which has persisted for several years in the society, can assist in the adoption of innovations. Dickman (1994) noted that innovation was accepted by farmers when its development involved step by step integration with existing farming system and local knowledge.

Several studies have been conducted by the authors aiming at analysing the gender roles and local knowledge, skills, practices and beliefs pertaining to animal health and production techniques in different livestock production systems. Data gathered from the studies is crucial and useful for increasing beneficial exchange among local community, animal health care providers, the formal animal health and production practitioners and the national policy makers and international agencies active in this field. It will be useful also for the authorities involved in the country's food security.

## 2 RESEARCH METHODOLOGY

### 2.1 The Study Area

The studies were conducted in seven regions namely Kilimanjaro, Mara, Mwanza, Morogoro, Iringa, Tanga and Mbeya. These regions were selected because of their contrasting livestock keeping systems. In Kilimanjaro, the intensive livestock keeping system is dominant whereas in Mwanza and Mara, livestock are largely kept under extensive agro-pastoral system, while in Tanga and Morogoro there are semi-nomadic pastoral production system and in Mbeya and Iringa, the intensive agro-pastoral system. In some of the regions both crop and livestock production are practised while for the pastoralists of Handeni and Morogoro crop farming is minimal.

### 2.2 Data Collection

The main methods of data collection used included:

a) Group interviews
b) Individual or face to face interviews
c) Observations
d) Intensive discussion
e) Collection and identification of local herbs used for medicinal purposes.

Group interviews were conducted in order to get an overview and opinion of the communities in general. Aspects such as gender division of labour in the household, indigenous knowledge in livestock pests and diseases, control and treatment of livestock diseases were covered during interviews. Checklist was used to guide discussions during the interviews. Based on the results of the preliminary survey individual interviews were designed for the purpose of quantifying and clarifying important aspects in the respective systems. Data was collected from fact to face interviews using a structured questionnaire. The unit of investigation in this research was the household. Throughout the study, physical observations, the identification of local herbs used by farmers for various purposes in livestock production was done. Samples of identified herbs were collected and dried for further taxonomy using experts in the Department of Forest Biology. The observations and discussions were also recorded through photography, video and flip charts.

### 2.3 Sampling Procedure

The selection of villages in identified regions was based on the representativeness of the dominant livestock keeping system in the area. The choice was based on preliminary findings. A sample of key informants was selected from each village to participate in group interviews. Two groups, one of women only and the other for both men and women of 5-10 people were interviewed in each village. The farmers were selected based on their experience and knowledge in livestock keeping. For the individual or face to face interviews, a random sample of 30 households was selected with the assistance of the extension officers and village leaders in that particular village. In selecting the households, purposive sampling was used to select the households that kept livestock.

## 3 RESULTS AND DISCUSSION

### 3.1 Study Areas and Demographic Information

The study locations differ greatly in terms of topography, traditional groups, land tenure, rainfall pattern, minimum and maximum temperatures, vegetation and soils. These factors have contributed to the evolvement of different production systems. Tribes found in these areas also differ and include the Maasai, Hehe, Kurya, Luo, Songo, Malila and Sukuma. For these, pastoral system and agro-pastoral systems dominate, while the Chagga, found in Kilimanjaro, use the intensive production system. Different tribes in Tanzania have different cultures and customs. This is usually reflected mainly by the type of staple food, farming practices, livestock production system and roles performed by men and women.

The majority of the respondents in Iringa, Mwanza, Kilimanjaro and Mara have had primary education and are therefore able to read and write, unlike pastoralists in Morogoro and Tanga, where about 83% did not have any formal education. Most men are married and polygamy is a common feature, particularly among the pastoralists and the agro-pastoralists in Iringa. A large number of children (about 8/family) are also a common feature to all the pastoral and agro-pastoral systems. In the intensive systems where monogamy is common, there are about four members per family.

Residence period in the area for the respondents is variable. The agro-pastoralists of Mwanza, Mbeya, Iringa, and Mara have stayed in the area for more than 30 years that is 35.25±21.3 and 37.75±20.0 years respectively while the pastoral groups in Morogoro and Tanga have only lived in the areas for 10.3±10.6 years.

## 3.2 Livestock Species, Breed and Numbers

Cattle are the dominant and most important livestock species in all production systems studies. Cattle are acquired through purchase, inheritance, present and dowry. The main reasons for keeping cattle are prestige or sign of wealth, income, social security, dowry, draught power, milk, meat and manure. However, there is a variation in animal numbers, large herds of cattle up to 200 are found in the pastoral system while only an average of about 7 - 15 in the agro-pastoral system in Iringa, Mara and Mwanza and an average of 4 dairy cows in the intensive system. This is in agreement with the general feature of pastoralists whereby large numbers of cattle are kept. The breeds kept by the pastoralists are the local indigenous dual purpose cattle mainly Tanzania short horn zebu (TSZ). During the present study, the respondents have revealed that there is a progressive decline in the number of calves resulting from tick-borne diseases probably due to a halt in vector control. Other species kept apart from cattle are sheep, goats, poultry, pigs, donkeys, cats and dogs.

In the intensive system the economy is based on the cash crop coffee, while animals play the important role of supplying manure and milk. Animals kept are a few (2-4) improved dairy breeds, milk goats and few chickens. Currently due to a fall in the coffee production, milk is increasingly becoming an important source of household income.

## 3.3 Livestock Health, Husbandry and Management

### *3.3.1 Local Knowledge*

The management techniques and practices have been developed traditionally and passed on from generation to generation. Livestock are kept extensively in the pastoral and agro-pastoral systems studied. The pastoralists have a migratory type of husbandry because they stay in the semi-arid areas where rainfall is unreliable, although it can reach 400-600 mm. These people have very good knowledge of the various vegetation types where they graze their animals - i.e. all fodder plants are known in local names. They have also an efficient flow of information about new areas for the grazing. They are capable and skilful in tending their animals. Pastoralists operate with mixed herd (cattle, sheep and goats) making intensive used of these animals and taking advantage of their different reproduction rates and feeding habits. Thus production of the animal protein per hectare is twice as high as the ranches. In addition, pastoralists interact with wetter areas where they can purchase grain to supplement their milk diet; where the crop residues after harvesting are used for grazing their animals; where they can find water for their animals and family use, and where they can find employment for cash payment during lean years so that they can rebuild their herds and sustain their families. Despite some few squabbles many places have seen a symbiotic relationship develop between the arable farmers and the pastoralists. No sensible pastoralists destroy grazing resources, so rarely do they start fires to burn pastures.

During the study, it was apparent that the majority of the respondents had substantial knowledge of diseases and health problems of their animals. Ill-health as a result of diseases transmitted by ticks, tsetse-flies and worms was high in all the areas studied. Diseases seemed to be the main constraint in livestock industry due to lack of drugs, increasing prices of veterinary drugs and services, non-functioning dips and lack of adequate extension services. They study revealed that pastoralists, agro-

pastoralists and intensive farmers use all options they have including local herbs and modern veterinary drugs to tackle health problems that confront their livestock. However, where the animal is valuable the farmer sought veterinary help immediately. A list of local herbs used has been compiled **(Table 1).** We hope, in the near future, funds permitting, these herbs will be analysed chemically.

**Table 1. Maasai Herbs, Scientific Names and their Uses**

| | VERNACULAR NAME | SCIENTIFIC NAME | USES |
|---|---|---|---|
| 1. | Ol sugukututi | Cissus quadrangularis | Kukohoa |
| 2. | Lbukoi | Monordica spinosa | Kuharisha tumbo |
| 3. | Olsuki | Faraga chalybea | Vidonda kusafishia kibuyu (Magome) mkaa wake kuhifadhi maziwa. |
| 4. | ol girigiri | Acacia pennata | Worms, |
| 5. | eluai | Acacia brevispica | babesiosis |
| 6. | ol mukutan | Acacia drepanolobiu | bark-mastitis, diarhoea, worms |
| 7. | ol suguroi | Albizia anthelmintica | retained placenta, wounds |
| 8. | ol beresonjugi | Aloe volkensii | non-infectious diseases |
| 9. | ol sagarami | Andropogan ischaemum | eye |
| 10. | ol amuriake | Bauhimia thonningii | worms, |
| 11. | ol senetoi | Carissa edulis | leaf, constipation, diarrhoe |
| 12. | ol matasia | Clausena anisata | leaf-worms |
| 13. | ekirikiri | Erythrina abyssinica | flower-eye infection |
| 14. | ol pongoni | Euphorbia candelabrum | Wounds, sores, ulces |
| 15. | olo engerianthus | Galium aparinoides | fruit-thoat cancer |
| 16. | ol orien | P;ea afrocama | leaf-eye, babesiosis |
| 17. | ol dule, ol onyonyong'I | Ricinus communis | mites mange, diarhoea, retained placenta |
| 18. | ol ojongalami | Serbania aegypriaca | diarrhoea |
| 19. | ndulele | Solanum incanum | fruit-constipation root-worms |
| 20. | ganyamda | Balenites eagyptiaca | mites, mange, worms, |
| 21. | ol ama | Ximenia americana | root-diarrhoea, wounds |
| 22. | ol kiperelekina | | retained placenta |
| 23. | igumu | Tephrosia vogelii | minyoo, mites, mange, ticks |
| 24. | ole kyasa | | malaria |
| 25. | ol kolobobiti | | ECF-UTOMVU |
| 26. | olkunonoi | | otitis |

### *3.3.2 Housing*

In the pastoral and agro-pastoral systems, the animals are housed during the night in enclosures which are not roofed. These enclosures are known as kraals or bomas built within the homestead from materials readily available from the locality such as thorny bushes or bamboo trees (Iringa). The young calves are normally kept in special houses constructed out of wooden poles and thatched with grasses or stay in the same house with family (Maasai). Sheep and goats in some areas are kept in small kraals or houses. The knowledge of how to build animal enclosures is learnt from the elders. In the intensive system, most of the farmers are elite having had an education or training on how to keep dairy animals and thus build modern houses of concrete and mortar, roofed with iron sheets. Small biogas units have also been built by some of these farmers using the animal dung.

### *3.3.3 Feeding and Nutrition*

Animals in the pastoral and agro-pastoral systems are grazed in open areas for 6-11 hours everyday. The grazing areas are selected depending on the availability of pasture and water, thus the distance from home to the field varies depending on the season. Supplementation is rarely done except after crop harvesting when the animals are left to feed on crop residues in the fields. Agro-pastoralists have shortest time (6 hours) coinciding with the peak of agricultural work when they have to work in the crop fields first before herding the animals. The pastoralists' pattern of herding a combination of the ruminant species with different foraging habits and reproductive rates indicates an overall optimisation of

resources. Both systems of production have evolved several skills, which enable them to feed their livestock during the dry and wet season and also allows the animals to survive in the face of high challenge of diseases such as tick-borne diseases. Forage is plenty during the wet season and animals gain weight and milk-yield is high. However, during the dry season the grass is dry, scarce and of low nutritive value, thus the animals tend to be unproductive. Animals are watered in natural rivers or water holes or dams. No supplementation if the animal diet is given although some farmers give their animals minerals either naturally occurring or bought. In the intensive system, animals are stall-fed, whereby the owners have transport and collect hay from fields far from home. Some preserve crop residues such as maize straw or rice straw for dry season feeding. The farmers also grow fodder grasses such as elephant grass and siratro on the slopes and borders to use as feed. In addition, the animals are given supplements such as cereal bran, mineral licks and molasses.

### *3.3.4 Reproduction and Breeding*

The pastoralists have controlled breeding whereby they select the best bull, breed with the best cow for size, shape, colour and milk-yield. However, some of the agro-pastoralists mate their animal randomly with the aim of getting more bull calves so that they can use them for power. The growth rate being slow, the age of first mating vary between 3 to 5 years and calving interval is 1.5-2 years. The dairy farmers either use artificial insemination (AI) or borrow graded bulls from neighbours for breeding.

### *3.3.5 Milking and Milk Processing*

Milking is normally done in the mornings and in the evenings every day for all systems but only once a day (in the evenings) for the poor milkers. Instruments used for milking are gourds or wooden cups (nunda) or plastic containers. Milk is consumed fresh in most of the households and some made into yoghurt. Excess milk is sold either fresh or as yoghurt. Ghee and butter is prepared locally and used for home consumption and excess is sold.

### *3.3.6 Slaughtering and Meat Processing*

Animals are rarely slaughtered unless they are too old and unproductive or there is a special occasion. Often the Islamic rites are observed during slaughter since the meat might be sold to both Christians and Muslims. In many cases, just small amount of meat is taken for the family and the rest is sold for cash or bartered for grains.

### *3.3.7 Other Animal Products*

Animals dung is used as manure for fertilising crops in the field. In some households it is dried for fuel or building. Few households in Iringa did not use the manure as fertiliser because they believed it dispersed weed seeds in the farms. Skins and hides are often sold to shoe factory or middle men who transport them to shoe factories. Urine is normally used for cleaning gourds and for treating FMD cases or treating hay to make it more nutritive and palatable for the animal. Some of the skins and hides is used for making skirts, water bags, sitting mats or donkey bags. Thus under the pastoral system there is nothing from the animal which is wasted.

### *3.3.8 Crops and Livestock Interaction*

A major link exists between crop and livestock production in the agro-pastoral and intensive production system. Crop residues and crop by-products are directly used as animal feeds while manure and draught power are used for crop cultivation. Cash from the sale of surplus crop or cash crops is saved by buying more livestock. This acts as a buffer to secure food supply in lean years or in case of crop failure.

## 3.4 Gender Analysis in the Livestock Production System

Gender analysis was carried out to enable us to recognise the different issues and interests women, men, girls and boys have on the livestock production system. A variation in the interests, issues and roles for men, women, male children and female children within a household was observed between the systems.

In the pastoral system, the gender division of labour is rigid becoming more flexible in the agro-pastoral and intensive systems. The gender analysis is discussed in detail under each system.

### *3.4.1 Gender analysis in the Pastoral Production System*

*Ownership and Control of Resources*

In this system of livestock production 98% of the respondents said the cattle belong to the men. Children and women mostly own the smaller stock such as poultry and rabbits. Analysis of gender issues in the pastoral societies studies indicate that ownership and control of cattle, sheep, goats is tightly vested in male heads of the household. Women have limited rights. They control the milk of certain cows allocated to her by the husband. The male heads of the pastoral society are so conservative that they even control the religious and traditional rituals of their women-folk. This is so because the ritual leader (laibon) and the age-set spokesman (laigwonak) must be a man. All the family resources and assets are controlled by the male head. Even children born to the women outside marriage belong to the husband.

*Gender Division of Labour*

The pastoral groups of Morogoro and Tanga are irregularly transhuman moving the herd and part or all of their settlements to areas where the herds will be certain to survive during particularly extremely long dry seasons. The daily work of attending them is assigned to the uncircumcised boys (ilaiyoni) who eventually miss formal education. They are helped by ilmurran if the pastures are a long distance from the settlements or sending the animals to dips; or water points. Murrans are also given the tasks of buying and selling stocks at the auctions, medical treatment of the sick animals, the branding of animals as well as any service which the elders might demand of them from time to time (e.g. transmission of messages). They also build the kraals or bomas and palisades for small animals. Calves are tended by children both boys and girls.

The life of women and girls in the pastoral society is shaped by the livestock-economic system. With marriage, which is sanctioned by a transaction of 8-15 heads of cattle from husband to father of the bride, the wife is assigned a number of milk cows and small stock. Studies revealed that 81.7 and 95.0 percent of the women in the households are involved in milking and marketing of milk and milk products such as ghee and butter that they prepare.

In addition, women pound maize or take to the mills and prepare the daily food. This consists of stiff porridge eaten with fresh or sour milk; sometimes cassavas, sweet potatoes, red beans and rice. Meat is only eaten on ritual occasions or when sick animals have to be put down. Children and women also collect wild berries, fruits, nuts and honeycombs for the family. Women milk the cows twice a day and look after the young animals, which have to be brought to their mothers twice a day and separated from them again. Women are responsible for keeping food stores and for making butterfat from milk. The work of milking as well as the control of the distribution and consumption of milk and other food types such as maize are the undisputed responsibility of the individual women in a household.

Other duties are fetching water, firewood and daily cleaning and repair of the houses which normal they accommodate calves. Women and girls make milk calabashes, which they clean daily with water or cattle urine and fire. They brew mead and prepare snuff, go to the market and maize mill. They work the skin of slaughtered animals making leather skirts, cloaks, water bugs to be carried by the donkeys and bead jewellery work for decorating women, men and children of the household. The hardest and most time-consuming work is building houses and keeping them in good repair. A well-off man, however, will pay casual labourers mainly their Bantu neighbours to build a house for his wife. However, the current migration of young energetic male members of the household into towns to seek wage labour, which is on the increase has a detrimental effect on the fabric of the household. The advantage of this move is that the man gets cash to buy grains and restock. The major negative effect is that the women who are left behind have a heavier workload of managing the rest of the family and whatever animals that are left.

Older men do not normally carry out manual work unless he is poor and does not have grownup children. They are responsible for managing all matters of public interest i.e. settling legal disputes, marriages,

bride-price, divorce and arrange ritual ceremonies. They also sanction any conflicts settled by women. The elders are responsible for the management of the herd, which includes the cattle of his children and wives. They also supervise the work of all members of the household and discipline the wrong doers. The gender-specific division of labour manifests its not only in the economy but also in the ritual and political spheres i.e. in rituals women play very small task of moving with the sons or group as a cook to a new settlement for a few years.

*Decision-making in a Pastoral Society*

Despite their considerable labour input in the care and maintenance of the herd, women are excluded from major decision making. Cultural laws and traditions rationalise this exclusion, maintaining that conflict between men and women is inevitable because women give first priority to satisfying the milk needs of their children while men put the needs of the herd first. The discrimination in gender roles is also noted where there is labour shortage. In such cases women can and do perform male tasks such as herding and watering animals but men seldom perform female tasks except in those tasks which are associated with increasing control over assets which are gaining in value.

### *3.4.2 Gender Analysis in Agro-Pastoral Production System*

*Ownership and Control of Livestock and other Household Assets*

Livestock ownership particularly cattle is mainly confirmed to men being 66.7, 76.7 and 75 percent for Iringa, Mwanza and Mara, respectively. A wife can own some animals through inheritance or purchase with money obtained from the sale of surplus food crops or any other fund-generating activities. Children are also entitled to animals which they may be given as presents by a relative or which are inherited. In case of female headed households, women own the family livestock and make decision concerning their sale or slaughter or exchange. Women also do not own the land but have access to it through the husband or their families. Husbands allocate small plots to each wife and in these plots the woman will grow food crops for the family. The produce from this plot belongs to the women and she can always sell the excess but with the husband's permission. Thus it is common for women to command the food crops and poultry which are consumed by the family, whereas men are responsible for cash crops and livestock production, with the output being at their own disposal.

*Gender Division of Labour*

The most time-consuming activity in livestock keeping is herding, which is done by boys who have left school or children on vocation. In some cases, the male head of the household will graze his animals or use hired labour. Watering the animals is usually done by men, while male children and other family members may help. During the dry season when water is in short supply the male head has to dig a well at the bottom of a river or ferry water from permanent wells using oxen carts. Construction of kraals is mostly a men's building of special houses for calves and small ruminants and chickens is the responsibility of the men.

Caring for the young stock is done mainly by children, but wife and husband can also help. By tradition milking is done by women, mostly girls. Processing of milk to ghee is a woman's job. Women also do marketing of fresh milk, skimmed milk and ghee. However, there is an exception in the Sukuma tradition, where milking is done by men but the milk is passed on to the wife for distribution as required.

Identification of livestock when on heat, pregnant, or sick is done by male head assisted by other members of the family especially those who have been herding the animals. Similarly, selection of the best animals and decisions regarding livestock are taken by the head of the household.

Other farming activities are distributed among the family members. These include cultivation of the land, sowing, transport of inputs and products, harvesting and processing and marketing of the produce. Domestic/household and agriculture/livestock production duties are closely integrated, so that there are conflicting demands for labour and other resources within a household.

*Decision-making*

A wife cannot decide to sell or slaughter her animals without consulting the husband but she can decide to use her money from sale of surplus food crop to buy livestock. Even children cannot decide on their own. On the other hand, they can dispose of chicken without seeking permission.

### *3.4.3 Gender Analysis in Intensive Livestock Production System*

*Ownership and Control of Resources*

In the intensive system, less than 50% of the respondents said the livestock is owned by men (cattle, 23.3%; goats 33.3% & sheep 22.3%). However, 40% of the respondents said the main ownership of the family assets including livestock is of the whole family. Land, belongs to men (or his clan) who has full control over it thus he can dispose it as he wishes. Chicken are mainly owned and controlled by women (33.3%) and children. In case of the man's death the elder son takes over the control of the land, livestock and other assets or the assets are divided up if the man had many sons. The wife can care for the assets on behalf of her sons if they are still young with deceased male relatives acting as advisors. Coffee, which is a cash crop, is controlled by men. Food crops such as bananas, maize and beans are controlled by women, but once they gain in commercial value the man takes over. Milk was formerly controlled by women, but nowadays it is controlled by both men and women because it now represents the main source of household income. Women have access to the income but do not have full control over it. Women are the ones collecting cash from the sales of milk, which is not the case with coffee.

*Gender Division of Labour*

The activities are distributed among the family members by gender. These activities include domestic/household and crop /livestock production, which are closely integrated so that there are no conflicting demands for labour and resources within the household. Women concentrate more on the activities related to food crop production while men are responsible for the cash crops and taking the cow to a bull for mating (48.3%). Crop farming activities, such as weeding of the coffee and banana farms, are undertaken by the whole family and labourers. Pruning of the coffee is mainly done by men, while picking and processing of the coffee is done by the whole family with the help of labourers. In most cases, men are more involved in the processing of coffee. Ferrying coffee to the market is done by women with the help of children. Collecting of cash from sales is men's activity. Men are engaged in clearing maize fields before they can start ploughing. Hand hoe or tractor is then used for ploughing, a job done by both men and women. Almost all the fields of maize and leguminous crops are sown by hand. This is mainly done by the whole family and casual labourers. Few farmers use tractors for planting, but if so the work is supervised by men.

*Workload*

Women work for 15-17 hours a day (105-117 hours a week) during the peak season of activities such as sowing maize or beans, harvesting maize, and picking and processing coffee. Men in these rural areas work hard, between 40-75 hours per week, but only on non-domestic duties, and rarely do they contribute to housework and child-care.

*Decision-making*

Women's access to money is dependent on their opportunities for earning money in the village and surrounding areas. Besides the opportunity for earning money, married women's access to money is dependent on the attitude of the husband and the resources available. In case of Wari Women, keeping dairy cattle has enabled women to have a limited control over it. Crop production is organised at the household level. The head of the household and his wife, or the female head of the household decides which crops to be grown and how the produce should be used. Slaughtering of cattle, goat and sheep is rarely done nowadays. It is done only when a special need arises in which case the head of the household, who in most cases is the husband, makes a decision on slaughtering in consultation with the wife. Slaughtering of chickens and ducks is decided upon by the wife without seeking permission from the husband. Sometimes children are consulted as they own some of them. Decision on the addition of

livestock is made by both the husband and wife, money for adding livestock is mainly from the sale of milk.

## 3.5 Food Security and Livestock Production Systems

Food security is achieved when people have access to sufficient staple foods to enable them to lead healthy working lives and participate in the growth and development of the societies in which they live. Staple food varies widely among individuals, environments and conditions. Access to food means having adequate supply of food to meet perceived needs and is acquired either by growing it or/and buying it. Lusaka Accord, (1980) established that improved food security was an essential objective in the drive towards economic liberation in any nation. Currently, the general trends of attaining food security is through food production whose levels are declining while population growth rate is soaring, level of malnutrition and infant mortality are increasing and life-expectancy is low. Let us look at the different livestock production systems, deduce their food security and discuss their limiting factors.

### *3.5.1 Pastoral System*

Although data on milk yields, household grain production, marketing of livestock and diet were not specifically included in the structured interviews, the following information on food provision for the household can be deduced from the PRA. Many of the respondents said that milk and meat produced from their herds was inadequate to feed and sustain their families as it used to be. The livestock holding size has decreased tremendously due mainly to diseases. The principle strategy of the households therefore is to cope with declining herds by cultivating maize. The source of income is the sale of livestock. Livestock are sold in the primary livestock markets (mnada) to middlemen by bargaining process then transported to terminal markets in the district or municipal for slaughter. Cattle owners are reluctant to use the weigh-bridges because animals offered for sale are weak bulls, steers, old and unproductive cows or animals not immune to diseases. Cattle prices are not controlled and vary seasonally and according to supply and demand. Marketing of milk is done through informal sector whereby the pastoralists sell directly to consumers or milk vendors who collect and sell it in urban centres. Hides and skins are normally used for household the extra ones are sold to traders by the women.

Men and women of the same family have been forced to take up other economic activities such as crop farming, poultry keeping, petty business in towns and wage labour in the cities. The move to cultivation of maize is not to secure grain but to safeguard their livestock as many responded by saying they do not want to sell their livestock for food. They are sentimental about using their animals for ploughing, thus they can only plant small plots using hand hoes. The produce from plots can only sustain the household for a short period therefore funds collected from other activities is used to buy more grain and for restocking. This has also resulted into changes in eating habits from the meat and milk to grain foods for survival. The quality and quantity of the food eaten depends on the season. The basic diet is milk and stiff porridge or ugali, some beans and tea. Adults eat twice a day but children trice a day. The taboo of not eating chicken or fish has resulted in many children being malnourished. Although many keep poultry, they do not feed their children eggs unless the doctor prescribes. This trend obviously will have a negative impact on the nutrition of pastoral families. One detrimental cultural habit is that of fasting during pregnancy so that the women may have easy delivery. Although its effect was not assessed the consequences are obvious.

### *3.5.2 Agro-pastoral System*

The agro-pastoralists are subsistence farmers whose main aim is to produce enough food to sustain the family throughout the year. They till the land where rainfall is often unreliable leading to crop failure. They keep livestock primarily as a banking system to insure survival during drought. These people try as much as possible to reduce the risks of crop failure. For example, in Mwanza region farmers inter-crop about 5-6 different crops in the same field. Similarly, in Mara they plant drought resistant crops such as cassava, sorghum and sweet potatoes. Cassava and sweet potatoes are used for the roots and leaves. During this period they normally sell their animals starting with poultry, sheep, goats and then cattle to buy grains, thus livestock play a big role to ensure that household food needs are met. Likewise livestock exchange as dowry help to assure access to food in times of shortage for families with daughters.

Productivity of their livestock is low thus tendency to keep large numbers as sign of wealth and more ability to withstand drought. Similar, livestock are sold in primary markets at a varying price depending on the season, the supply and demand. Milk is also sold informally to consumers or milk vendors who send it to the urban centres.

In the agro-pastoral system in Iringa and Mbeya, livestock contribute directly to food production by providing manure as fertiliser, power, milk and meat. Also the livestock can be sold for cash when it is needed. Land scarcity contribute to insufficient food supply to some families in the villages thus there is a great need to intensify agricultural activities or create alternative employment opportunities.

### *3.5.3 Intensive Livestock Production*

Essentially these people are crop farmers with perennial and annual crops. The perennial crops require manure thus livestock is first bought in order to supply manure for the coffee and banana plantations. However, as population increased land for grazing decreased thus these farmers were forced to stall - feed their animals. The government encouraged and helped them to acquire more productive animals (improved dairy cattle and milk goats). Farmers were encouraged to invest into good housing, improved breeds and were taught how to grow fodder and supply better animal feeds. Cash is normally received from the sales of coffee and livestock. Milk is sold directly to consumers. In some villages residents have formed co-operatives which collect milk and send it to milk factory in Arusha. Some farmers make cheese when they do not get a market for their milk. Food security in this system is good because they have bananas, maize and beans as food crops and coffee for cash. Infrastructure is reasonable thus food distribution and marketing can easily be done.

## 3.6 Factors Limiting the Contribution of the Livestock Industry to Food Security

It has been documented that agriculture contributes over 40% of GDP and 70% of export earnings of which 30% is from livestock (beef 40%; diary 30% and other livestock 30%). Despite its current important role in the national economy, the potential contribution has not been fully exploited. This is due to a number of constraints such as nutrition, health, breeds markets and capital resources. Pasture availability usually follows the rainfall pattern and this is often inadequate both in quality and quantity during the dry season. Animal health is still affected by disease such as tick borne diseases, trypanosomiasis and CBPP. Attempt to raise productivity of the indigenous breeds is hampered by lack of capital resources.

Women participation in the livestock sector is limited by several factors that contribute directly to food insecurity. Women have no right to own land in many traditions and cultures and as such she has no collateral to get a loan or credit. Similarly ownership of livestock is vested in the heads of the households whose majority are men. In addition, lack of social pointers such as education, health programmes, child care facilities, water and fuel facilities and appropriate farming technology geared to minimising the work load of women and optimising on their productive activities.

Many factors affect food security in Tanzania and these can be grouped as economic, social, institutional, structural and environmental factors. At the *household* level, key factors are:

a) Weather – dependence on unreliable rainfall for crop and livestock production.
b) Declining of land for cultivation and grazing
c) Productivity of the farms and animals is low
d) Family consumption requirements has increased due rise in human population (3%)
e) Household storage capacity not available
f) Cash requirements for other activities are increasing such as school fees, medical fees, clothing, etc.
g) No effective use of advanced technologies
h) Education levels low.

At the *national* level, the following factors prevail:

a) Price and marketing factors, insufficient attention to market forces. In some cases the prices do not provide incentives to the farmers to produce more.
b) Availability of consumers foods locally is limited
c) Availability of credit and agricultural inputs is also limited
d) Infrastructure serving production centres is inadequate.
e) Food distribution and marketing - (livestock markets, tracking routes, livestock products processing industry) is poor
f) National policies are poor or lacking tooth for biting.

## 4 CONCLUSIONS

From this study there are pointers showing that the animals serve several diverse purposes in the economy and food security of each system, but primarily to satisfy the basic needs of the family rather than to meet the demands of the market. During the present study it has been found that, first, subsistence farmers dominated the rural areas regardless of the livestock production system, and they all keep a variety of different species of livestock.

Second, rural women work hard in all production systems with a workload of 14-17 hours a day compared to that of men of 6-8 hours. However, women do both productive and reproductive work while men to only the productive work. This means that women are not only bearing children, housekeeping and child care, but are also earning income, growing food crops and ensuring the family food security. In addition, the migration of the young and energetic members of the households to cities to seek wage labour is putting the fabrics of the families at stake and increasing the workload of the pastoral and agro-pastoral women.

Third, in the pastoral system, there is no interaction between crop farming and livestock and that cultural attitudes and taboos are more ingrained and often have a negative impact. Although there is no concrete data on household consumption or nutritional status from these studies, it is clear that livestock holdings and milk yields have dropped to a level which is unable to sustain the majority of the households. In the absence of an alternative source of income to supplement the livestock economy and re-invest in livestock, poverty is increasing in the livestock based economies. This implies that local knowledge or traditional production no longer suffices the food needs of the household. There is a need for new interventions.

However, in the agro-pastoral and intensive systems, there is a strong interdependence between crops and livestock. In periods of drought, livestock provide a buffer against low crop yields or crop failure, but over the long term neither sub-sector is abandoned in favour of the other. An increasing dependence on grain is pushing households into crop cultivation to reduce the need to sell livestock in order to purchase grain, but in the end reducing grazing land. Moreover, the productivity of most of the stock is still very low and most farmers have a lot of uncertainties.

In all systems of production, men and women have developed different expertise and knowledge regarding the local environment, plants, animal species, their products and uses. The gender differentiated local knowledge is highly sophisticated, traditionally shared and plays an important role in the conservation, management and improvement of genetic resources for livestock and crops. For example, women and men's knowledge of wild plants has been used to identify plants to be used as food in times of needs, as medicines, and as sources of income. Furthermore, through experience, innovation and experimentation, sustainable practices have evolved to protect soil, water, and natural vegetation.

Thus as women hold half the universe/sky (Chinese Proverb) and sustain more than half the agriculture, if progress in empowerment of rural women and if their increase in their participation in development is to be sustained and advanced, then major changes in attitudes must come from the people who hold up the other half of the sky, the men. ‘It takes two to tango’.

More research is needed to find out the impact of the changes taking place in the household of the study areas and how it affects food security. The studies should be carried out over a specified period for conclusive data to be collected.

In summary, this paper has tried to point out that livestock plays an important role in the life of many rural women and men. Therefore, livestock productive ventures should ensure that the potential and needs of both women and men are taken into account e.g. the questions of ownership and rights to resources, distribution of work load and their management and use of biological resources.

## 5 REFERENCES


**Dickmann, N.,** (1994). The Integration of Social and Gender Issues in Smallholder Dairy Production: *International Workshop on Feeding or Ruminants on Fibrous Crop Residues. Kamal, India. pp 23-33.*

**Ellis, F.,** (1988) Peasant Economics for Agricultural Development*. Cambridge, England.*

**FAO,** (1982) The state of Food and Agriculture "World Review of Livestock Production" A World perspective. *FAO publication. Rome.*

**Gillings S.I.,**(1992) Women & Men in Agricultural Development the case of the Women in Irrigated Agriculture Project in the Southern Highlands of Tanzania *Proceedings of Conference on Agricultural Research Training & Technology Transfer in Southern Highlands of Tanzania Past Achievement & Future Prospects. 5-9 October, 1992 Mbeya, Tanzania, pg. 477-484.*

**Joekes S. & Pointing J.,** (1991) Women in Pastoral Societies in East & West Africa *International Institute for Environment and Development paper. No. 2828.*

**Lamosai, A. & Crees J**., (1992) The Contribution of Livestock to National Economy. *Proceeding of DANIDA Workshop on the Role of Veterinary Profession 27-33.*

**Maeda, N.K.,** (1988) "The Development of the Livestock Industry in Tanzania 1984 - 1988." *Paper presented in the 6th TVA Scientific Conference held from 6-8th Dec. 1988, Arusha.*

**Ministry of Agriculture,** (1993) Review of Ruminant Livestock Industry Printed by Marketing Development Bureau*. Govt. Printers. DSM 1993.*

**Ministry of Agriculture and Livestock Development animal Reports,** (1950-1988).

**Ministry of community Development, Culture, Youth and Sports,** (1988) Situation of Women in Tanzania." Printed by *Govt. Printers - DSM - Tanzania*.

**Ministry of Community Development Women Affairs & Child Care,** (1995) Tanzania women" - Country Report of 4th World conference on Women Beijing. *Govt. Printers DSM.*

**Mtenga L.A., A. Katule & Kitalyi A.J.,** (1992) Development of Livestock Production System in Tanzania. Proceeding of DANIDA *Workshop on the Role of Veterninary Profession. pg. 160-169.*

**Ole Lengisugi,** (1994) The Indigenous Knowledge and Sustainable Development; Livestock Health Care for Maasai pastoralists. *A Paper Presented at a Conference on Indigenous Knowledge and Sustainable Development, Morogoro Tanzania.*

**Orskov E.R.,** (1993) Reality in Rural Development Aid with emphasis on Livestock. *Published by Rowett Research Services Ltd. Aberdeen.*

**Sempeho G. & Rusholaza V.G.,** (1985) The Impact of Imrpvoed Technological in the Traditional Livestock sub-sector of Tanzania. *Proceed of TSAP 12:55-68*.

**Shayo S. A. & Ruruka F. M.,** (1987) The Role of the Traditional Livestock Sector ;in National Economy. *Proceeding of TSAP conf;erence VOL. 14:112.*

**Shayo S.A. & Mlay G.I.,** (1986) The Performance of the Livestock Industry in Tanzania 1972 - 1980's. *Proceeding of 4th TVA Scientific Confe;rence 4:25.*

**Smith A.J. and Magembe S. R.,** (1986) Factors Limiting Animal Production in the Tropics. *Proceedings of 4th TVA Scientific Conference 4:8-24.*

**Tanzania Maktaba Takwimu.** "Population Census" Bureau of Statistics Ministry of Planning and Economics Affairs. *Government printers 1993.*

**Task Force of National Agricultural Policy**, (1983) The Tanzania National Agricultural Policy. Government Printers DSM 1983.

# Change and Stability in the Indigenous Farming System of the Matengo

*A.Z. Mattee*
*SUA Centre for Sustainable Rural Development*
*Sokoine University of Agriculture, Morogoro*

## 1 INTRODUCTION

Mbinga District is one of the most densely populated areas in Tanzania. The indigenous system in the Matengo highlands is characterised by the Matengo pit system. This system is believed to have sustained land productivity for over 100 years. But it now faces problems related to environmental degradation caused by bush fires and deforestation. These problems have emerged due to population pressure and the growing human activities on the land.

At the same time, it is now acknowledged that sustainable rural development is one that is based on indigenous knowledge systems and sustainable agricultural practices. But an important question is what contributes to the sustainability of indigenous agricultural systems such as that of the Matengo, and how does the indigenous system adapt to changing circumstances? This paper presents a summary of the findings of the Miombo Woodlands Agro-ecological Research Project which was carried out in Mbinga District by a team of Sokoine University of Agriculture and Japanese scientists from 1994 to 1997, with the support of JICA.

## 2 THE MIOMBO WOODLANDS AGRO-ECOLOGICAL RESEARCH PROJECT

The Miombo Woodlands Agro-ecological Research project focused on the Matengo indigenous system because it is still unique in its ability to minimise soil erosion, water run-off and nutrient loss and its has so far sustained productivity for a long time in steep bare slopes. The main objective was therefore to understand the Matengo farming system as a socio-environmental complex, which would enable researchers to predict future changes in society and environment, and to identify key elements for sustainable development of farming systems (Anon, 1998).

The project aimed at analysing the indigenous farming system of Mbinga District and documenting the salient features that have made it sustainable over the years. It is currently believed that the traditional agricultural practices such as shifting cultivation, rotation, bush-fallowing and semi-permanent cultivation as practised in various areas within the Miombo Woodlands of Tanzania were well adapted to the ecological conditions. Effects on the environment were gradual and easily managed by the farmers. However, with increases in human population, more settled mode of agricultural production has subjected the environment to destruction by human activity. The interaction between man and the Miombo Woodlands has greatly deteriorated over the years, thus resulting into inevitable destruction of the natural ecosystem and subjection of the land into serious destruction. If no control measures are developed, the Miombo forest in Tanzania may disappear within a century from now (Msanya, 1995; Kimaro et al., 1996 and Magogo et al., 1996).

The research was based on the premise that sustainable agricultural development is the one which is based on indigenous knowledge systems and sustainable agricultural practices. Rather than focusing on new technologies as the panacea to problems related to agricultural improvement and productivity, it put emphasis on the analysis of the farming system in totality, to determine needs problems and constraints to which subsequent technological innovation can be directed.

In analysing the farming system in relation to sustainability, the following issues were addressed. The first issue concerned how sustainability is defined and measured. Several perspectives have been used to define sustainability (including ecological, economic, and social). Of particular importance, however, were how the small farmers themselves perceived sustainability and how such a perception has changed with time, and with changing socio-economic conditions. The second issue concerned the relationship

between farmers' perception of sustainability and their agricultural practices. The questions were how do farmers relate their farming activities to various environmental consequences? And in what time perspective? For example, can they make a link between previous farm practices and present environmental conditions or between their current activities and the future? The third issue is related to the sustainability of the indigenous farming system itself. One of the requirements for a system to be sustainable, is its ability to adapt to changing circumstances. Several questions were addressed in this regard:

First, how have socio-economic features like the land tenure system, gender division of labour, agricultural productivity and household income, demographic characteristics, topography and general ecology, modes of social organisation and institutional support services contributed to the continuation of the indigenous farming system? Second, how have these socio-economic features threatened the sustainability of the indigenous farming system? Third, how have farmers responded to changing socio-economic circumstances, with respect to the indigenous farming system? It is very likely that due to changes in political organisation, or ecological and demographic characteristics, farmers may have responded by modifying the farming system, changing gender roles, migration, and introducing new modes of organisation for production.

In order to effectively address these questions, it was necessary to adopt a holistic and integrated approach by integrating the different scientific disciplines of the participating researchers who worked as a multidisciplinary team and to use a variety of techniques to generate information considered relevant for the study.

The concept of *'ntambo'* was used to focus the attention of the various scientists on a common unit of analysis. The *'ntambo'* is a unit of land that is bordered by small (river) valleys and is normally located on mountains slopes. Although a geographical concept (delimiting a piece of land), it seems to have a socio-cultural significance, and to reflect the land tenure system. The *'ntambo'* is usually owned by a clan or an extended family. Thus, in order to have a deeper understanding of the indigenous system, scientists analysed the ntambo in terms of the technical issues of soil and water conservation, but also social issues of land tenure, kinship and land use patterns (including use of hilltops, slopes and valley bottoms – the three most important physical feature of the Matengo landscape).

In analysing the *'ntambo'*, techniques like participatory rural appraisal (PRA), personal interviews, physical measurements of land (surveying), and crop productivity estimates were used. Aerial photographs and satellite imageries were also used to map the pattern of natural resource utilisation of each *'ntambo'*. The aim was to understand the totality of how the agricultural system (including people's life styles) is organised around the *'ntambo'* so as to extrapolate to a wider geographical area, and to suggest viable approaches to improve the system.

In addition to the *'ntambo'* studies, other more basic experiments were conducted at different sites in Mbinga District relating to natural resource management and its effect on agricultural productivity. In order to determine the effect of topography and to get a historical perspective, two contrasting sites were selected for the study. The mountainous area, the original settlement area of the Matengo was represented by Kindimba Village for the *'ntambo'* study, and Mahenge and Tukuzi Villages for other complimentary studies, while the lowland areas, the areas of new settlement, and therefore less populated and more natural vegetation were represented by Kitanda Village for the *'ntambo'* study, and Lupilo Village for other complementary studies. Detailed findings of the Miombo Woodlands Agro-ecological Research Project are reported in Anon (1998).

## 3 THE MATENGO INDIGENOUS FARMING SYSTEM

The traditional farming system of the Matengo is *ingolu* or *ngolo.* This system is characterised by a combination of anti-erosion and soil fertility maintenance techniques of pits and ridges on steep slopes. The pit cultivation system evolved among the Matengo over 100 years ago (Pike, 1938). At first the Matengo used a system of cultivation using a digging stick. With the migration of the Pangwa into the

area who had the technology of smelting iron and fabricating iron tools the Matengo adopted the handhoe (Basehart, 1973).

With the invasion of the area by warlike Ngoni from South Africa, the Matengo people were forced into the mountainous areas around Litembo where they were forced to settle and cultivate on very steep slopes. The pit cultivation system was adopted as a method of survival on steep hillsides and possibly as a measure to ensure that fertile soils were not exported to the Ngoni cultivating the foothill areas.

This system of farming has evolved as a unique system capable of controlling soil erosion, maintaining soil fertility and increasing yields of crops produced on very steep slopes. In particular, the system enabled the Matengo to cultivate the same limited area over many years without a significant loss of productivity (Allan, 1965).

For a long time, the Matengo farmed the areas around Litembo – the Matengo highlands, where permanent settlement was also encouraged with the introduction of coffee as a cash crop. Although the *ngolo* system of farming has, over the years, proved to be effective in controlling soil erosion and improving soil fertility, according to farmers, the productivity of the system has been declining for the following reasons:

First, reduced fallow period due to reduced farm sizes as propelled by increased population has made people to continue cropping their farm plots without a good period of rest, something which has led to, among other things, the decline in soil fertility. For example, in such villages as Litembo and Ngima, the fallow period has been reduced from five years to less than one year (Rutatora et al., 1995). Second, due to the increased use of hired labour, the construction of the pits is not done properly as it used to be done in the past. The *ngolo* pits tend to be poorly constructed.

This has also been contributed by the fact that young girls nowadays spend more time in school rather than on the farms and do not therefore have a chance to perfect their skills. In addition, the informal education, *sengo* which is given to youngsters by their elders is now hardly practiced. Third, the introduction of the more profitable crops such as coffee has resulted in reduction of farm plots under food crops such as maize and beans in favour of coffee. Likewise, attention tends to shift from the food crops, which are cultivated under the *ngolo* system to coffee, which is not under the *ngolo* system (ICRAF, 1991).

Fourth due to population pressure, there is now a significant outmigration from the hilly Matengo highlands to other areas such as Mbangamao, Mpepai and Kitanda areas which are relatively flat, where the pit system of cultivation is not very necessary and where other forms of cultivation e.g. ridging are practised instead.

## 4 GENDER ROLES IN THE NGOLO FARMING SYSTEM

In the actual practice of *ngolo* preparation, there is a very clear division of labour between men and women. Generally, it is the men who clear and burn a wooded area initially for finger millet cultivation in a virgin area, using a typical slash and burn technique, after which the finger millet is broadcasted, weeded and harvested mostly by the women. During the second cropping season, where the land has to be put under pit cultivation, the men slash the grass and arrange it into grids on the ground (about 40 hours are required per ha). The women are responsible for covering the grass with soil dug up from the pits, i.e. constructing the tied-ridges, planting the beans, maize or wheat (about 125 hours are required per ha), weeding the crop, harvesting and carrying it home for processing and storage.

However, with increasing population pressure, and with the increasing necessity for men to have to travel to distant and remote villages to establish new homesteads, men are assuming a bigger role in some of the farming operations. Indeed, migration by the Matengo is usually done in two phases. During the first phase the head of the household would leave the family in the homestead to go and open up a new farm, where most of the operations are performed by the husband. During the second phase, usually after a coffee farm has been established, the whole family will more to the new area, and may give up

completely the old homestead. Therefore, in the course of migrating to new areas the men are obliged to assume a bigger role in the agricultural operations of the family.

At any rate, the analysis of labour input in various farm and non-farm activities according to gender, clearly indicate an immense contribution by women to the economy in the study area. In farm work, women's labour input was substantial in *ngolo* cultivation, planting, weeding, harvesting and threshing. Men contribute significant labour in land preparation, pruning, mulching and marketing (Table 1 below).

**Table 1: Contribution of Women in Farm Work**

| TASK | PERCENTAGE |
|---|---|
| Land preparation | 32 |
| Cultivation | 69 |
| Planting | 87 |
| Weeding | 71 |
| Pruning | 0 |
| Mulching | 10 |
| Application of inputs | 22 |
| Harvesting | 93 |
| Threshing | 81 |

The role of women in off-farm activities like marketing and wage labour was relatively less than the role they play in farm activities. Household activities are almost all performed by women. Women prepare food, take care of children, fetch fuelwood and water and brew local beer. The role of men in these activities is negligible.

Data on access to and control of resources and income indeed show inequality in access to both resources and income. The results show that land, labour and capital resources are equally accessible to men and women but men have an upper hand in their control. Men have both access and control of purchased inputs and credit (Table 2).

**Table 2: Proportion of Men and Women controlling Resources**

| RESOURCE | PERCENT OF WOMEN AND MEN CONTROLLING RESOURCES | | |
|---|---|---|---|
| | Men only | Women only | Men & Women |
| Land | 89 | 5 | 6 |
| Labour | 72 | 17 | 11 |
| Capital | 51 | 15 | 34 |
| Purchased inputs | 94 | 6 | 0 |
| Credit | 72 | 0 | 28 |

Income earned from crops, livestock and off-farm activities is equally accessible to men and women. However, control of the income is mainly in the hands of men.

**Table 3: Proportion of Men and Women controlling Income from different Sources**

| SOURCE | MEN ONLY | WOMEN ONLY | MEN & WOMEN |
|---|---|---|---|
| Crop production | 83 | 17 | 0 |
| Livestock | 72 | 0 | 28 |
| Off-farm | 61 | 39 | 0 |

## 5 VEGETATION TYPES AND TREE SPECIES IN MBINGA DISTRICT

Field surveys were conducted by visiting different areas in Mbinga District. Three species were identified and recorded along 20 m strips, with the assistance of three local persons including an agricultural field officer who gave the local names of trees and their uses. The four vegetation types identified include:

***i) Zambezian Miombo woodland or Brachystegia woodland***

This vegetation type usually occurs in altitudes between 600 – 1,400 m.a.s.l. It occupies a large part of Mbinga District and about ¾ of Tanzania mainland. However, a large part of Zambezian Miombo woodland in the district has been and is still being cleared through shifting cultivation for growing food crops such as maize, groundnuts, beans and potatoes and also for growing cash crops such as tobacco and coffee. Some of the important tree species include *Aflzeliaquanzensis, Brachystegia Spiciformis, Brachystegia bochmii, Julbernadia globiflora, Burkea africana, Uapaca kirkianaa, Parinari excelsa,* and *Pterocarupus angolensis* which are used for various purposes including timber, building poles, medicine, edible fruits and firewood.

***ii) Zambezian swamp and riparian forest***

This type of vegetation is usually found in areas between 600 – 1,400 m.a.s.l. along rivers, streams, swamps and near lakes. The dominant tree species found in the type of vegetation include *Treculia africana, Uapaca guineensis, Uapaca nitida, Breonardia salicina, Syzygium guineense, Syzgium cordatum, Syzgium cordatum, Syzygium owariensis, Vitex donanana and Xylopia crubesecens*.

***iii) Afromontane forest or moist Montane rain forest***

This occurs on higher altitudes of the Matengo Highlands over 1,500 m.a.s.l such as Lupembe where the mean annual rainfall is over 1,000 mm with a cooler climate. This type of forest has almost been wiped out with the exception of few places such as Lupembe Forest Reserve that is also under big population pressure. Some of the dominant tree species include *Chrysophyllum gorungosamum, Macaranga capensis, Aningiria adolfifredericii, Entandrophragma excelsum, Parinari excelsa* and *Ocotea usambarensis.*

***iv) Afromontane undifferentiated forest or sub-afromontane rain forest***

This vegetation type usually replaces the Afromontane rain forest on higher altitudes on wetter slopes or below Afromontane rain forest. The dominant tree species found in this type of vegetation observed at Kindimba and near Litembo *include Albizia schemperian, Bridelia micrantha, Dombeya rotundifulia, Macaranga capensis, Catha edulis, Cordia africana* and *Schrebera alata*. This vegetation type is in fact very rare in Mbinga District because it has been cleared through farming and settlement. Only remnants of trees can be found on farmlands.

In all the villages under this study, farmers were unanimous that there was less vegetation cover in their villages now than was ten years back. In actual fact, the disappearance of vegetation is taking place at a fast place. In the mountainous villages such as Mahenge and Tukuzi there is almost a total replacement of indigenous tree species that formed part of the *Eucalyptus spp, scypress* spp and *Grevillea spp.*

## 6 CONCLUSION

The *ngolo* indigenous farming has allowed people to farm intensively in a particular area for a long period of time without a significant deterioration of land or decline in crop production. However, some negative consequences have appeared. First, there is virtual disappearance of the natural tree cover in the Miombo Woodlands. Indeed in many areas the natural vegetation has changed beyond recognition, as the original Miombo vegetation has completely disappeared and, in some cases, has been replaced by *Eucalyptus* trees. The biodiversity of the area has therefore been adversely affected by the *'ngolo'* indigenous farming system.

Second, women, who nevertheless do not have much say on the utilisation of the income accruing from farming, contribute most of the labour in the indigenous farming system. There is, therefore, a serious gender imbalance built into the whole socio-economic system, something, which put heavy demand on women labour for both agricultural and domestic activities.

## 7 REFERENCES

**Allan, W.,** (12965). *The African Husbandman*, Oliver and Boyd, Edinburgh.

**Anon,** (1998). Integrated Agro-ecological Research of the Miombo Woodlands in Tanzania: Final Report. Foculty of Agriculture, Sokoine University of Agriculture, Morogoro and Centre for African Area Studies. Kyoto University, Kyoto.

**Basehart, H.W.,** (19834). Cultivation Intensity, Settlement Patterns and Homestead Forms Among the Matengo of Tanzania, *Ethnology* 7, pp. 57-73.

**International Centre for Development-Oriented Research in Agriculture (ICRA),** (1991). Analysis of the Coffee-Based Farming system in Matengo Highlands, Mbinga District, Tanzania, ICRA, Wageningen (Working Paper No. 15).

**Kimaro, D.N., J.L. Meliyo, B.M. Msanya, J.P. Magogo** and **J.M. Wickama**, (1996) Investigation of the environmental factors for land management in Litembo village, Mbinga District, Tanzania. Department of Soil Science, Faculty of Agriculture, Sokoine University of Agriculture, Morogoro, and the National Soil Service, Agricultural Research Institute, Mlingano, Tanga.

**Magogo, J.P., B.M. Msanya** and **D. N. Kimaro,** (1996), Environmental profile for agricultural production and development of conservation strategies in Mahenge village, Mbinga District. Department of Soil Science, Faculty of Agriculture, Sokoine University of Agriculture, Morogoro, and National Soil Service, Agricultural Research Institute, Mlingano, Tanga.

**Msanya, B.M.,** (1995) Progress Report: Natural Resources Team, Miombo Woodlands Agro-ecological Research Project. Faculty of Agriculture, Sokoine University of Agriculture, Morogoro.

**Pike, A.I.,** (1938) Soil Conservation amongst the Matengo Tribe, Tanganyika Notes and Records, 6 pp 79 – 81.

**Rutatora, D.F., J. Rugambisa, D. Mwaseba** and **A.Z. Mattee,** (1995) Socio-economic issues arising around the Indigenous Agricultural Knowledge Systems and Sustainable Development in the Miombo Woodlands of Mbinga District, Tanzania: A Preliminary Report. Faculty of Agriculture, Sokoine University of Agriculture, Morogoro.

# Local Knowledge and Food Security: The Experience of Magindu Village - Kibaha District - Coast Region

*A.S. Kauzeni*
*Institute of Resource Assessment*
*University of Dar es Salaam*

## 1 INTRODUCTION

Local knowledge (LK) as it relates to food security, refers to a wide-rage of accumulated local experience about the ecosystem or natural resources use and how they are managed in the context of local organisational and institutional arrangements. It also includes belief and value systems of the people. All these dimensions need to be carefully evaluated for possible inclusion in the rural development process at both micro and macro levels.

Local knowledge (LK) can be enhanced with the infusion of outside knowledge and vice versa. The challenge is to come up with the right dosage of local knowledge to be mixed with other outside (scientific, modern) knowledge. This mixture is particularly useful where food security issues are being considered. Local knowledge as used in this paper does not only refer to knowledge of the local environment but also to the knowledge of people existing as a system of beliefs, concepts and ways of learning (Chambers 1983).

## 2 TYPOLOGY OF LOCAL KNOWLEDGE: IS LOCAL KNOWLEDGE NECESSARY OR DISCRETIONARY?

If knowledge is known to satisfy certain physiological needs, then, it may be considered necessary but if knowledge has been based on custom and habits but does not necessarily satisfy physiological needs, then, it is discretionary. But if knowledge satisfies both physiological needs and is based on custom and habits, then, it is necessary (Mararike, 1996).

It is worth remembering that the distinction between necessary and discretionary knowledge affects the following:

i. The form of participation in the accumulation, preservation, transmission and the methods used in gathering that knowledge.
ii. The intensity of participation, that is the total labour time which participants commit themselves in the process of accumulating that knowledge.
iii. The distribution, transmission or passing it over, value and sustainability of the knowledge.

## 3 WHY LATE REALIZATION OF THE IMPORTANCE OF LOCAL KNOWLEDGE?

Local people have a wealth of accumulated knowledge on the environment in which they have lived or spent all their lives since their ancestors. Researchers are not making adequate use of this abundant knowledge to advance social and economic development of the local people. There is now a growing awareness or realisation of the importance of local knowledge.

Late realisation of the importance of local knowledge is mainly due to the fact that:

a) Some people have the notion that anything imported is superior or is of more value than the locally developed or evolved one regardless of its incompatibility with the existing social, economic and environmental conditions.
b) The type of training that some of us received has had some great influence in what we believe, value and has had an impact in the way we think and do things.

c) Lack of appreciation of local people and their knowledge and superiority complex syndrome of researchers where they look down upon local people as individuals with little of no education at all and hence cannot understand scientific complexities of the surroundings or the environment in which they have lived for so long.
d) Researchers deceive themselves by thinking that they know more than the local people.

## 4 THE STUDY AREA

The experience of use of local knowledge in food production, storage and preservation is drawn from Magindu Village in Kibaha District of Coast Region. Magindu Village is located on the central railway line about 100 km from Dar es Salaam and 25 km from the junction on the main road (at Chalinze) from Dar es Salaam to Morogoro. The village has about 1639 people from 360 households. It has an area of about 100,000 acres of which less than 2000 acres are being farmed. The village is on the coastal plain with an elevation ranging from 100-200 m. above sea level. The climate is broadly semi-arid with an annual rainfall ranging from 700-800mm. The dominant soils types are categorised as: red soils, sandy soils and the black clay soils which carry more nutrients than the other soul types. The village experiences frequent droughts and rainfall is both low and highly variable. Magindu Village's qualification for inclusion in the study was that it often suffers from food shortage and in 1991 it experienced a very severe famine. Furthermore the village residents were said to be receptive and ready to learn new ideas.

The objectives of the study were:

a) To establish the main stress factors on food security in the agro-ecological zone under study and the coping strategies.
b) To facilitate in the dialogue between village residents on one side and agricultural extension workers and administrators on the other side with the aim of providing feasible solutions to the stress factors. The basic philosophy in the study was participation of the food insecure themselves in identifying their own problems and in suggesting feasible solutions. Participatory Rural Appraisal method was therefore, the main tool used for the study.
c) To identify coping strategies or mechanisms involving local knowledge in food production, accessibility, distribution, storage and preservation.

In this paper, only results pertaining to local knowledge, gender analysis and causes of food insecurity are discussed.

## 5 LOCAL KNOWLEDGE AND ITS APPLICATION

### 5.1 Local Knowledge of the Environment

The relationship between people and their environment is something which we take for granted. The crucial questions are: What exactly do people know about their environment? How do they learn about it or pass on information about it to others? How can such knowledge be used to solve current problems? How can such knowledge be blended with other forms (scientific, modern, outside) of knowledge?

These are extremely important questions if local knowledge is to be valued and used in solving problems related to food insecurity. An interview was made with some elders who have lived in Magindu Village since 1960. In the course of interview, they were asked to explain how the villagers determined soil fertility and also the types of crops to be grown in particular types of soils. The elders had this to say:

"The types of grass and trees which grow in a place indicate to us how fertile the soil is and what crops to grow".

"We acquired such knowledge from our parents i.e. the older members of the village and that this knowledge is not documented anywhere but passed over to next generation verbally and through practices".

The elders gave examples of main types of soils and crop associations as follows:-

**Table 1: Soil Types and Crops Grown**

| SOIL TYPES | | SUITABLE CROPS TO GROW |
|---|---|---|
| Local Name | Description or English Name | Crops |
| Kiguzi | Redish soils | Cassava, sorghum, pigeon peas, cow peas and cotton |
| Nyachibu | Black clay soils | Maize, simsim and sorghum |
| Kisanga | Sandy soils | Cassava, pigeon peas and cowpeas |
| Kilongo | Loamy black soils or Black clay soils | Rice and sorghum |

They said that sorghum was the most versatile crop in terms of adaptability to the various soil types and that the black soils are best for farming.

## 5.2 Local Knowledge on Timing of Farm Activities

Food production is one of the determinants of food availability. In order to ensure good crop production, farmers in Magindu Village emphasised proper timing of various farm activities or operations particularly preparation of the fields or seed bed and planting or sawing of seeds. They have got signals for on set of rain. To them, a certain position of the moon, the flowering of mango and cashewnut trees and the early morning sound made by certain birds are associated with the on set of the rains and hence the right time for the preparation of the fields. The elder members of the village commented that strict observance of these signals is the key to success in farming. Farming seasons are well understood. Timing of farm activities and food status in the village were given as shown in the table below.

**Table 2: Timing of various Farm Operations and Food Status in the Village**

| PERIOD | ACTIVITY | FOOD STATUS |
|---|---|---|
| January – March | Cultivation | Little maize and sorghum available |
| March – April | Planting | Depletion of sorghum and maize Plenty of Cassava |
| April – May | Weeding | |
| May – June | Moving temporarily in the farm to protect crops against vermins | Plenty of sorghum rice and maize |
| July – August | Havesting | Plenty of sorghum, maize and rice |
| September - December | Land Clearing | Plenty of sorghum, maize and rice |

## 5.3 Local Knowledge on Agricultural Practices

### *5.3.1 Shifting Cultivation*

Villagers commented that cultivating the same piece of land and planting the same crops for more than three years consecutively had some detrimental effects to the land (depletion of soil fertility, accumulation of plant diseases and pests, etc.) and most important it decreased crop yields tremendously. They said that the solution to this problem was to give a rest to the field (KUPUMZISHA SHAMBA) to regain its fertility. Every three years a new piece of land was cultivated before going back to the old field. This practice is believed by farmers to increase crop yields. Technically this practice is what is called shifting cultivation, which is scientifically equivalent to rotational farming or cropping.

### *5.3.2 Intercropping*

The types of crops grown in the area include maize, sorghum, cowpeas, cotton, pigeon peas, sweet potatoes, simsim and cassava. These are grown either as pure stand or intercropped. Villagers remarked that if maize or sorghum is intercropped with cowpeas or pigeon peas they get increased maize or sorghum yields, but when cassava is intercropped with maize or sorghum the cassava plant turns yellow or gets etiolated. It gets rather tall with very thin steams. They remarked that under such situations they do not get any increase in maize or sorghum yields. Instead, they get a reduction in cassava yields.

Scientifically these are results of the shading effects on cassava because maize and sorghum grow faster than cassava. The situation is even most serious with poor spacing (close) of plants.

## 5.4 Local Knowledge of Crop Storage

Available information indicates that there are several factors contributing to food insecurity problems. Some of these are pre or post-harvest losses. A greater proportion of the total food produced is lost after being harvested. Sources of such losses are associated with the process of handling the crop from the point of harvest to consumption. The most acceptable range of crop loss after harvest is between 15 to 45% of the total production (Ministry of Agriculture and Cooperatives, World Food summit Report, 1996). Local people in Magindu Village are aware of these losses and take precautions to prevent or minimise them using local storage knowledge of various crops.

### *5.4.1 Maize*

After harvesting the maize is stored inside the house on elevated structures over the fire place so that it is in direct contact with heat and smoke which prevent it from insect attacks. Some of the maize is stored in tins bags or pots mixed with the ash in order to prevent it from rotting or attacks by insects.

### *5.4.2 Cassava*

Villagers call cassava a problematic crop because of the difficulties encountered in maintaining or storing it in the field, in processing and storing it after harvesting. The crop is often attacked by vermins in the field, particularly by wild pigs and porcupines. When the crop is still in the field before harvesting, farmers dig deep trenches around cassava fields to prevent vermins from entering in the field and attacking the crop.

Villagers said that the timing of harvesting of cassava is very important as roots tend to rot easily depending on the variety and may become woody or turn spongey if harvested rather late. Processing of cassava depends on the variety also. Sweet varieties are uprooted, peeled, slashed, dried, bagged or pounded and stored in bags, tins or pots in dry places in the house. Bitter varieties are uprooted, peeled, soaked in water for three to four days without first slashing it, dried, bagged or pounded and stored like the sweet varieties. Farmers claim that soaking of bitter cassava roots reduces or removes its bitterness. They also said that another way of preventing vermin attacks on cassava is to plant or grow bitter varieties of cassava, which are not attacked or eaten by neither wild pigs nor porcupines.

It was also pointed out that bitterness of cassava may develop when some roots of a given plant remain in the ground after the rest have been uprooted. In addition, when cassava is harvested after it has shed its leaves, roots become bitter. The same bitterness develops when tender leaves are picked regularly for relish.

## 5.5 Local Knowledge of Livestock Keeping

Livestock keeping is the second important economic activity undertaken by Maasai pastoralists in Magindu Village who practice traditional livestock keeping. When they were asked as to why they used transhumance mode of livestock keeping, they gave several reasons some of them being:

i. they were searching for new pasture and water for their livestock
ii. They were avoiding livestock diseases in areas where they have been grazing their animals for a long time.
iii. They wanted to give time for the regeneration of pasture

All reasons given seem to have some scientific backing.

## 6 TYPES OF LOCAL KNOWLEDGE AND THEIR ACCESSIBILITY/TRANSMISSION

One method of passing on or transmitting knowledge to others in Magindu Village is said to be through questions and answers. The method is highly informal but once the right questions are asked, detailed responses are given.

Unlike written documents and texts, local agricultural knowledge like any other type of knowledge in Magindu Village, seems to be stored in people's minds. It appears that willingness to pass on knowledge from one person to another depends on the nature or type of knowledge. Knowledge about the weather, environment, types/varieties of crops to grow, types of wild fruits and insects to eat, knowledge about which animals to hunt for meat is generally regarded as public knowledge. Interested members of the village could get such knowledge from elders if they asked for it. On the contrary, knowledge about certain types of medicines is regarded or treated as secrete. The same observation was made by Mararike (1996) in Zimbabwe during the interview with village elders. Researchers, therefore, may not easily obtain such information/knowledge without having to pay for it.

## 7 LOCAL KNOWLEDGE ON FOOD SECURITY ISSUES

From the experience gained in the study of Magindu Village, it appears that in order to fully understand local people's knowledge on food security issues, the following questions among others seem to be very crucial or important.

a) What do villagers know about the crop varieties they grow and eat? How do they know this? Why do they grow it?
b) What wild plant varieties/species do they eat?
c) Which food (meals) have ritual significance? What is the significance? When do they eat it?
d) What is the impact of food production on e.g. water, land quality and the environment in general?
e) What knowledge do villagers have on:
   - Food production
   - Food storage
   - Food processing and preservation
   - Food preparation
   - Indicators of soil fertility and suitability for various crops
f) To what extend and in what ways do socio-economic, socio-political, environmental, technological factors influence food patterns.
g) What types of food cannot be consumed by children, pregnant mothers, adult males? etc.
h) What rules govern the gathering of wild food species? Who enforces them?

Such questions proved to be very useful in extracting information or local knowledge from villagers.

## 8 CAUSES OF FOOD INSECURITY IN MAGINDU VILLAGE

Food security in Magindu Village is determined by four elements - food availability, accessibility, stability and sustainability. Problems of food insecurity at household level is multifactorial (Kauzeni, et al, 1998). There are factors related to food availability, stability, accessibility and sustainability as well as those factors influencing food consumption and utilisation.

### 8.1 Availability

Food availability is determined by levels of household production and the extent of food transfer from one point to another.

In Magindu Village, food production levels are very low. On the average, one household cultivates about 1.79 acres of maize per year and gets about 4 bags (of 90 kg each) of maize per acre (Kauzeni, et al 1994). This level of production cannot sustain the family throughout the year.

Causes for low levels of agricultural production are many. Some of these include:

- Small areas put under cultivation
- Dependence on rain fed agriculture
- Non utilisation of agricultural inputs (e.g. fertilisers, insecticides, improved seed varieties etc.) mainly due to their non-availability or due to their high prices when these become available.
- Non retention of food after harvesting. Large amounts of food are consumed during prolonged festivals or traditional celebrations. The remaining amount is sold to middlemen at low prices leaving the villagers hungry.
- Young people from the village migrate to Dar es Salaam, Kibaha or Chalinze during cultivation period seeking for employment, so the labour forced is lost to the village.
- Poor storage facilities
- Droughts often cause crop failures
- Poor transportation facilities between Magindu Village and the rest of the District/Region.

### 8.2 Stability

Lack of stability in food supply in Magindu Village is considered by villagers as one of the elements causing food insecurity in their village. This is partly due to government policy changes on agricultural marketing and pricing. There have been many changes in agricultural marketing and pricing systems between 1961 and 11990/91 including the suppression of the private sector and expansion of parastatals, followed by the promotion of the private sector and diminishing role for parastatals from the mid-1980s, the abolition of cooperative unions and societies in 1976 and their reintroduction in 1984, and the introduction and later phasing out of pan-territorial pricing. Since the adoption of the Economic Recovery Programme in 1987, there has been major reform in the food grain marketing system from government controlled, three-tier single channel system (Primary Society - Regional Cooperative Union - National Milling Corporation) to a multi-channel system comprising of both government and private institutions. Finally, since 1990/91 marketing season, the system of fixing producer prices has been replaced by one of indicative prices which provides a guide to farmers to negotiate prices with buyers (Ministry of Agriculture and Cooperatives, 1996). In most of these changes Magindu Village farmers were adversely affected and very often had no market for their crops. As a result of all this, villagers were discouraged from increasing agricultural production thus affecting food supply in the village.

### 8.3 Accessibility to Food

The incidence of poverty is high for Magindu Village residents. Food is always available 25 km away at Chalinze but it is not accessible and affordable due to poor communication system (impassable roads) and due to lack of financial capability to buy it. Sometimes food is brought to the village on bicycles or carried on the head because of lack of transport to ferry food to the village

### 8.4 Sustainability of Food Supply

Food supply in Magindu Village is not sustainable due to the little amount produced resulting from small areas put under cultivation among the other things and fast depletion of the little food produced as mentioned above.

## 9 GENDER ANALYSIS IN RELATION TO FOOD SECURITY

Gender dimension has a considerable impact on food availability of an area. Gender analysis in the context of food security is a systematic attempt to document and understand differences in roles and opportunities between men and women within a given context.

The gender survey and analysis which was carried out in Magindu Village involved the assembling of villagers into socio-economic groups in order to capture various gender related information or issues. Issues that formed the basis of analysis were:

a) Division of labour for various activities
b) Access to and control over resources and benefits
c) Decision making role/capacity
d) Total work load for women, men and children.

The results of the analysis are shown in the table below. Some questions asked to the villagers in order to capture the information were:

a) What resources do men and women require for their work/task?
b) Who has access to these resources?
c) Who has control over resources?
d) Who makes the final decisions on issues affecting the whole household?
e) How can changes of access to and control over resources be effected by an intervention?

**Table 3: Survey of Who Does What, Who Owns what and Who Makes the Decision**

| SOCIO-ECONOMIC GROUPS | WHO IS RESPONSIBLE FOR WHAT? | WHO USES WHAT? | WHO OWNS WHAT? | WHO MAKES MAIN DECISION? |
|---|---|---|---|---|
| Employees and Businessmen<br>Men: 12<br>Women: 9 | Women have more responsibilities than men | Both men and women have access to family assets | Joint ownership is in the farm, and the house. The rest is owned by man. | Man decides on all family matters without consulting the wife. Occasionally she may be consulted on house building, marriage of their daughter or selling of crops. |
| Livestock keepers<br>Men: 13<br>Women: 0 | Most work is done by women and girls - Except looking after livestock | Everybody in household has access to every asset | Man owns everything in the house except a house which is jointly owned and the women own milk and kitchen utensils | Man makes all decisions except for the purchasing of food which is made jointly. |
| Youth<br>Men: 16<br>Girls: 7 | Girls do most of the work. Boys occasionally hunt | Boys and Girls use available resources equally | As usual girls own kitchen utensils only, the rest is owned by boys. | Most decisions are made by boys except those related to the farm, house, decision on when to send children to school and projects which are done jointly. |
| Old men and women<br>Men: 22<br>Women: 10 | As above cases most jobs are done by women except farming which is done jointly. | All assets are used equally by man. | House and farm are owned jointly own kitchen utensils. The rest is owned by men. | All decisions are made by men according to K were culture |
| Joint village Response | Participants jointly concluded that women carry a heavier workload than men. | Assets are accessible to both men and women. | Women own mainly kitchen utensils or milk in the case of Maasai. | Men make important decisions |

## 10 CONCLUSIONS

Local knowledge related to agricultural production although not documented and valued, enhances food security because it contributes to food availability and stability at household level. Food insecurity at household level in the rural areas could partly be solved by proper blending of local agricultural knowledge with scientific or modern knowledge.

Lack of involvement of women in decision making, in control of resources and the heavier women's workload contribute to food insecurity. The most vulnerable groups of people with respect to food insecurity at household level are pregnant women and children under five years.

Causes of food insecurity are multifactorial. They are social, environmental, technical and economic in nature. The most affected groups at village level are households with holdings too small to provide sufficient subsistence food, households earning income below the absolute poverty line and food growers living in "drought prone pockets."

There is an urgent need for research that will blend local knowledge with scientific or modern knowledge in order to improve agricultural production, biodiversity conservation and gender awareness/sensitivity in the rural setting.

## 11 REFERENCES


**Chambers, R.,** (1983); Rural Development, Putting the Last First, London, Longman.

**Kauzeni, A.S., H. Kiwasila, F. Maganga, J.O. Ngana, J. Pottier and P. Sikana,** (1994): Food System Under Strees, IRA, University of Dar es Salaam, Dar es Salaam.

**Kauzeni, S.A., J.O. Ngana, F.S. Chale and M. Basheke,** (1998): Food System Under Stress in Africa, IRA, University of Dar es Salaam, Dar es Salaam.

**Mararike, C.G.,** (1996): Food System Under Stress: Proceedings of the Workshop, University of Zimbabwe, Zimbabwe.

**Ministry of Agriculture and Cooperatives**, 1990: The Nature of the Food Security Problem in Mainland Tanzania, Dar es Salaam.

**Ministry of Agriculture and Cooperatives**, 1996: World Food Summit Country Position Paper, Dar es Salaam.

# Experience of the Southern Highlands Coopibo funded Programmes in Gender, Biodiversity and Local Knowledge Systems in Strengthening Agriculture and Rural Development

*D.J.S. Biria and E.M.B. Kwiligwa,*
*COOPIBO*

## 1 INTRODUCTION

Coopibo is an international association for development co-operation founded and registered in Belgium in 1976. It entered into agreement of co-operation with the government of Tanzania in 1976. In 1997, Coopibo merged with another Flemish NGO, Vredeseilanden, to form a new NGO called VECO. The decision to merge the two organisations resulted from the need for a better service delivery. Coopibo co-operates with local partner organisations in seven countries of the south, Tanzania being one.

Coopibo Tanzania has a vision that resource poor rural communities are emancipated and empowered to manage sustainable agriculture and sustainable rural housing development. It therefore supports processes of self-development, which result in enhanced food security, production increase and general improvement of living conditions. Its mission is to support local NGOs and Community-Based Organisations (CBOs) in capacity building and networking with and between NGOs and CBOs.

Coopibo Tanzania's bureau is situated in Dar es Salaam and recently a Cluster Office has been opened in Mbeya. It has been supporting different programmes located in different regions in the country. In the past, Coopibo Tanzania supported projects directly in methodologies, financial management and human resource development. Recently it has embarked on supporting "institutionalisation" of the projects it funded. Five of the projects have acquired and NGO status and three others are still processing for registration. The NGOs are Tarime Rural Development Trust Fund, Mwanga mixed-farming programme, Mwanza Rural Housing Programme, Same Agricultural Improvement Programme and Agricultural Development Programme Mbozi. Isangati Agricultural Development, Ileje Food Crops Production Project and Sustainable Agricultural Development Programme in Kasulu are still projects.

This paper highlights the experiences of three programmes, namely Ileje Food Crops Production Project (IFCPP), Isangati Agricultural Development Programme (Isangati ADP) and Agricultural Development Programme Mbozi (ADP Mbozi TF) in tapping local knowledge systems, biodiversity and gender concerns for agricultural development.

## 2 LOCATION OF THE PROGRAMMES

Ileje FCPP is located at latitudes 9º 15' and 9º 38' South and longitudes 32º 50' and 33º 45' East along the Tanzania – Malawi border. To the East it borders Kyela District while to the North it borders Mbozi, Mbeya Rural and Rungwe Districts. Isangati ADP is working in Isangati Division which is within the Mbeya Rural District. Isangati Division is covering 2500 km². Two main agro-ecological zones can be distinguished in the Isangati Division. The pyrethrum zone is between 1800-2000 metres above sea level. This zone is characterised by fertile soils and sufficient moisture. Farmers cultivate mostly beans, maize, wheat, peas and pyrethrum as cash crop. The coffee zone ranges from 1500-1700 m.a.s.l., with a savanna climate. The soils of the coffee zone are less fertile and major rains start in November and end in April. The major crops here are coffee, maize and beans. ADP Mbozi is working in five divisions out of six divisions of Mbozi District. The Great Rift Valley divides the district into three parts with different altitudes and correspondingly different agro-ecological zones.

## 3 OBJECTIVES OF THE PROGRAMMES

The global objective of the three programmes is to contribute to the standard of living of the smallholder farmers of the respective areas. The specific objective is to increase food and cash crops production in a

sustainable way. The aspect of sustainability is reflected in the promotion of the resource efficient agriculture (REA), in the use of smallholder farmers (both men and women). Our programmes put more emphasis on the use of the locally available resources whenever possible.

In order to reach the programmes' objectives, the following are the main areas of intervention or results:

- Soil productivity improved
- Irrigation potential tapped
- Labour productivity increased through animal draft technology
- Special emphasis on women realised
- Grass-root organisational skills strengthened
- Rural economic infrastructure improved
- Initiative savings and credit services
- Livestock management improved.

In all these results gender issues are fully integrated and are accorded priority with the purpose to improve the economic situation of the marginalised and disadvantaged female farmers.

## 4 APPROACHES BEING APPLIED

These programmes use participatory approaches and methodologies as a means of enabling farmers gain self-confidence and strengthen their ability of taking development in their own hands. Participatory Research and Extension (PRE) or participatory Technology Development (PTD) has been applied for the last ten years. Farmers are usually facilitated to analyse problems, seek for possible solutions, undertake small-scale experimentation and then make evaluation of the results according to their experiences.

Research and extension in the farming community is not a new phenomenon. Greslou J., (as quoted from Pierre Stassart and Seraphine Mukandakasa, 1992) says *'farmer agriculture is not only traditional, it is also intensively innovating; it is not a vacuum that one would have to fill; a backward world which is begging to be modernised; it is a different modernity, which is only asking to develop according to its possibilities and its own identity'.*

In the farmers' world, therefore, from time immemorial (perhaps since farming started), there is an informal dynamics of research which makes agriculture evolve based on the environment constraints. At the same time, and almost going hand in hand, there is considerable farmer to farmer exchange of information related to innovations. Through this process, much indigenous knowledge has been developed and is available today, albeit there is a tendency to neglect its value.

It should be noted and remembered that, indigenous knowledge is the major source of all high technologies in agriculture. It is unfortunate, however, that the pioneer of this knowledge, the farmer, is seldom acknowledged. In fact, as Makokha (1994) reveals, scientists from First World have been transferring valuable local plant and animal species from the developing world for perfection in labs or for industrial processing, under a system which has been dubbed as "bio-piracy".

## 5 EXPERIENCES IN THE PROMOTION OF INDIGENOUS KNOWLEDGE

Through the PRE process, these programmes have been able to unearth some traditional herbs which were being used by farmers in plant protection, treatment of human beings and animals prior to the introduction of artificial external inputs. Thus, we realised that some problems which farmers encounter could be solved using their own traditional knowledge.

A summary of some indigenous technologies being practised by farmers and promoted by our programmes in collaboration with other actors is shown in the appendix to this paper.

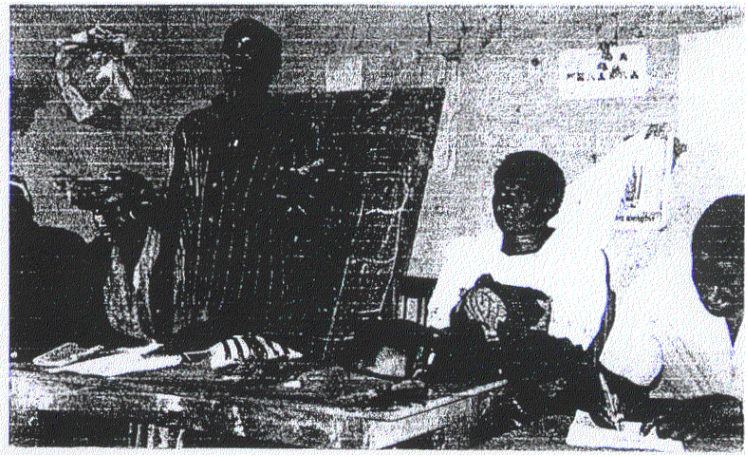

**Plate 1: A Farmer in Bundali Division, Ileje District, explaining at a meeting the different medicinal plants and their uses.**

Technology development is being done at different levels; that is, at farmers level as well as at scientists level. For example, in order to improve the indigenous knowledge, Ileje FCPP has been collaborating with research institutes especially MARTI-Uyole.

For three consecutive years (from 1996 to 1998) a grain storage trial was carried out at the premises of Ileje FCPP using different medicinal plants which were identified by farmers.

200 gms of the powdery product (dried and crushed leaves except for Nyongwe where the tuber was used) was mixed thoroughly with two tins of maize grain and stored in small granaries (vihenge) for six months. Preparation of the storage structures (granaries) and the herbs used for storage was done earlier in June while storage was done is July.

Actellic super at the recommended rate and untreated sample was used respectively as a check and control. Monthly grain damage analysis was done from October to December by a technician from MARTI-Uyole, Mbeya. Later on an interest was shown to see the effect of mixing the medicinal plants. So in 1997/98 season, 100gms of Nyongwe were mixed with 100 gms of each of the other medicinal plants i.e. Isogoyo, Mwarobaini and Utupa, and applied in two tins of maize and beans separately. Apart from being assisted in analysing the grain damage by experts from MARTI-Uyole, we are also collaborating with them in determining the taxonomy and toxicity of the medicinal plants.

Nyongwe seems to have the best performance in controlling insect pests in stores (tables 1 – 3). A combination of Nyongwe and other medicinal plants, however, gives even better results as shown on table 3. One dead rat was found in each of the Mwarobaini, Nyongwe, isogoyo and Utupa treated granaries. It appears that the rats jumped into the granaries and suffocated because of polluted air therein. As from next season the medicinal plants which have shown promising results will be introduced to farmers in form of on-farm trials. Research on indigenous knowledge by these three programmes will continue in collaboration with other interested organisations.

**Table 1: The 1995/96 Season % Grain Damage against different Medicinal Plants**

| TYPE OF MEDICINAL PLANT | % DAMAGED GRAIN | |
|---|---|---|
| | First analysis (14/11/1996) | Second analysis (23/12/96) |
| Mwarobaini | 13.0 | 13.0 |
| Isogoyo | 14.0 | 15.0 |
| Nyongwe | 15.0 | 11.5 |
| Actellic super | 0.5 | 1.2 |
| Control (no treatment) | 34.0 | 32.0 |

**Table 2: The 1996/97 Season % Grain damage against different Medicinal Plants**

| *Type of medicinal plant* | *% Damaged grain* | |
|---|---|---|
| | First analysis (16/10/1997) | Second analysis (19/11/97) |
| Mwarobaini | 1.6 | 10.4 |
| Isogoyo | 4.7 | 10.6 |
| Nyongwe | 2.7 | 7.9 |
| Utupa | 1.7 | 13.8 |
| Actellic super | 0.0 | 0.0 |
| Control (no treatment) | 11.3 | 20.7 |

**Table 3: The 1997/98 Season % Grain Damage against different Herbs in Maize and Beans**

| TREATMENTS | MAIZE | BEANS |
|---|---|---|
| | Percentage grain damaged | Percentage grain damaged |
| | ***.5.1.1..1 Analysis*** $1^{st}$ $2^{nd}$ 3rd | ***.5.1.1..2 Analysis*** $1^{st}$ $2^{nd}$ $3^{rd}$ |
| 1. Utupa | 4.96 24.00 18.60 | 11.11 26.00 29.60 |
| 2. Mwarobaini | 2.52 17.00 20.00 | 2.65 22.00 38.00 |
| 3. Isogoyo | 10.74 22.00 23.00 | 3.51 22.00 29.80 |
| 4. Actelic | 0.00 0.00 0.80 | 0.00 0.80 0.00 |
| 5. Ngonywe + Utupa | 0.00 0.00 6.60 | 0.00 0.00 11.30 |
| 6. Nyongwe + Mwarobaini | 3.25 13.00 14.80 | 0.00 1.80 28.50 |
| 7. Nyongwe + Isogoyo | 0.00 0.02 4.80 | 0.00 0.80 16.90 |
| 8. Control | 12.60 43.00 40.00 | 8.77 40.00 54.00 |
| 9. Nyongwe | 1.69 12.00 25.00 | 0.87 5.00 22.00 |

At ADP Mbozi Trust Fund, the agriculture department is compiling a manual which shows different varieties and species of medicinal plants for use in grain storage, plant protection and treatment of animals. Most of this information has been gathered from farmers and were sent to other scientists of MARTI Uyole, TPRI and INADES for getting botanical names and the appropriate dosage/application. Currently, in Ileje FCPP possibilities are being sought to propagate the most useful species of medicinal plants e.g. Isogoyo, Utupa, Nyongwe etc.

## 6 INDIGENOUS SOIL AND WATER CONSERVATION MEASURES AND BIODIVERSITY

Coopibo funded programmes use integrated approach in the preservation of the ecosystem including the natural resource base. In Ileje and Mbozi traditional irrigation systems are being improved in collaboration with farmers. For example, farmers are using bamboo trees to convey water for irrigation from one point to the other end. These trees are split into two halves and then laid across the two points. Moreover, some of them are using trash, branches of trees, stones etc. To divert water from rivers and use it for irrigation as shown on the picture below:

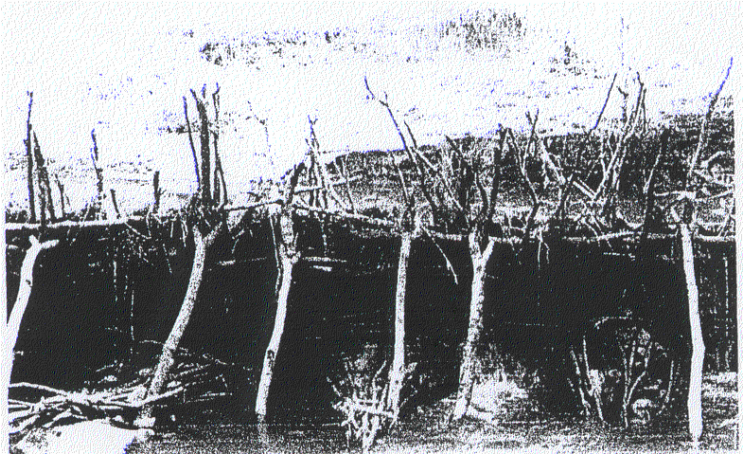

**Plate 2:A "Weir" locally made by Farmers at Ibungu Village in Ileje District.**

In order to exert higher sustainable development impact, the target group technology is integrated into their existing crop, livestock and/or tree ecosystems and farms. Interactions among crop, livestock and trees occurs in space (populations found in the same area), in time (rotations, successions, etc.). In Isangati some tree species like cypress are attacked by aphids transmitting a die-back disease. Thus Isangati ADP is promoting alternative timber species such as Grevillea, pines*, Khaya anthoteca, Podocarpus usambarensis and Hagenia abyssinicca*. To keep costs down and have a sustainable approach, small-scale nurseries run by farmers propagate the new tree species. Successful afforestation in smallholder agriculture relies on low-cost multiplication through wild seedlings. In order to increase the business perspectives of the nurseries, high-value plants such as grafted fruit trees are included.

In Bundali Division, Ileje District contour farming is being practised. In order to promote this technology dairy goasts have been introduced. Farmers are encouraged to grow fodder crops such as elephant grasses, leucena and fruit trees which conserve moisture and stabilise contours*. Fanya juu* bunds, combined with tie ridges, are the appropriate technology packages.

## 7 EXPERIENCES WITH GENDER ISSUES

COOPIBO – Tanzania has developed a gender policy since 1995. The policy clearly spells out that in all programme activities one third should involve women. Towards the end of 1998, a gender tools manual was prepared and the policy was reviewed to the effect that the target of integrating gender issues in programme activities should now be 50%. The major concern has been on the strategic needs of women. Control and access over the resources and benefits. Several sensitisation seminars, workshops and meetings have been held. Specific activities to address women were established; these include use of medicinal plants in poultry management, provision of credit to women groups, promotion of income generating activities.

## 8 REFERENCES

**ADP Mbozi TF,** Annual Progress Reports, 1995 – 1998

**Ileje FCPP**, Annual Progress Reports, 1995 – 1998

**Isangati ADP**, Annual Progress Reports, 1995 – 1998

**Makokha, F.** (1994). West's "Bio-Pirates are costing Africa millions in lost species revenue. In: The East African, Regional News December 5 – 11, 1994

**Pierre Stassart and Seraphine Mukandakasa,** (1992) . Participatory Research and Extension. The experience of the Agricultural Project of Muganza: In Pierre Stassart and Rita Van Goethem (ed.), 1992. African Exchange Seminar on Sustainable Agriculture and Farmer Participation. The view of field workers: 7 experience of African Agricultural Programmes supported by COOPIBO. Seminar held at Butare, Rwanda from April 16 – May 10, 1992.

## Local Knowledge

| ***APPENDIX: INDIGENOUS KNOWLEDGE*** | | | | | |
|---|---|---|---|---|---|
| TYPE OF TECHNOLOGY | | ANIMAL | PREPARATION/HOW | WHO | REMARKS |
| LOCAL HERB | CROP | | | | |
| 1. TOBACCO | Beans-Pod borer<br>-Aphids | | ½ kg. Of well fermented dry tobacco.<br>2" pieces of washing soap.<br>2 tablespoonful of ashes<br>15 litres of water.<br>HOW: (1) Boil 5 litres of water with two inches of washing soap, two spoonful of ashes of well fermented dry tobacco for 30 minutes at boiling point. (2) Seeve the solution. (3) Add water into solution to reach 15 litres. (4) Application follows. | Both men and women.<br><br>Both men and women. | |
| 2. UTUPA<br><br>(Tephrosia vogelii)<br>Fish bean | Maize Stalk borer<br>Bean aphids, weevils, termites, grain borer and cutworms in horticultural crops.<br>For control of pests in stored grain crops | Ticks and lice | Crush 1 kg of utupa leaves soak into 20 lts. Of water for 24 hours, filter and apply.<br>It is advisable to add 30gm of soap (not detergent) to act as adhesive material to the plant.<br>Dry leaves under the sun, grind into mortar and then apply the powder | Both men and women | Spraying on the field is done at a rate of 5cc per plant.<br>Mix 120 gm of utupa powder with 90 kg of grains. Repeat after 6 months. |
| 3. MTUPA | Maize Stalk borer | | Peel roots, cut in slices, dry and grind to form dust and apply in maize funnel. | Preparation by women<br>Application by men | |
| 4. MAHOLI | | Lice and Fleas in poultry. | Peel roots, cut into slices, dry and grind to form dust | All activities done by women. | |
| 5. USE OF BAMBOO POLES IN IRRIGATION | Horticultural crops | Drinking water for animals. | Poles are cut into 2 pieces and then laid down to convey water | Preparation by men Irrigation done by women | |
| 6. DRY SEASON MAIZE IN THE HIGHLANDS | Maize | | Alternate shallow and deep cultivation between seasons | Both men and women. | |
| 7. NDULWE (Desmodium spp) | | Treats Bloats in cows and goats. | (1) 1 handful of roots are washed clean and ground in a mortar and mixed with 1 litre of water for 10-20 minutes, (2) Filter the mixture and apply,<br>Dosage:<br>For small animals: drench 0.5 lts. of the solution<br>For big animals: drench 1 lts. of the solution<br>For human beings: (Adults) 1standard cupful per day<br>Children: * 1 teaspoonful. | Both men an women but women have to do under men's supervision. | This plant is very effective and fast acting treatment.<br>Normally, the effect is noticed within one hour after application. |
| 8. SISIVIZI (Ocetea usambarensis) East African Cemphor | | Treatment of animal fever (i) cattle, goats and sheep<br>(ii) black quarter in cattle. | (1) Pick leaves of plants namely sisivizi, nandete, ishunguti and namfundo (all are local names). (2) Take ¼ a litreful leaves of each plant. (3) Add ½ tablepoonful of caustic soda (magadi). (4) Grind the mixture and then add it to 10 litres of water. (5) Apply this mixture after 2-3 hours.<br>Dosage: Drench the adult animal with 300cc (1 standard bottle of cocacola) twice daily until the animal is cured. | Both men and women but women have to do under men's supervision | Ishunguti's botanical name is Rauvolfia caffra (quinine tree). |
| 9. ISOBOYO (Vernonia myriantha)<br>(a) Plant solution<br>(b) Plant powder | Control of pests like grain weevils, termites, stalk borer in maize; bean weevils and bean bruchid.<br><br>For control of stored grains against pests. | Kills ticks in livestock. | Crush 4 litres in a mortar, soak the crushed leaves in a 20 litres water for 12 hours. Filter and spray directly to plants or livestock.<br>4 litres of leaves are crushed and dried. The powder is sifted and applied. | | Mix 1 litre of powder with 5 bags of maize or beans.<br><br>N.B: When in contact with eyes, it irritates. |
| 10. ISONGOLE<br><br>(Lippia javanica) | Controls stalk borer in maize, millets, sorghum and pastures. | | 2 litres of leaves are crushed then mix with 4 litres of water and leave it for 12 hours. Therefore the mixture is strained and filtered ready for use. | | Direct spraying of the solution on plants at 2cc per plant.<br><br>Dead stalkborers appears on the plant usually after 2 days. |
| 11. INJIMA (Physalis peruviana) Cape goose-berry | Control of maize borer Bean weevils and beans bruchid | For human beings it is used for treatment of tooth ache. | 1 litre of fresh leaves crushed and mixed with 10 lts. Of water. Use the solution after 1-2 hours. | | Spray solution directly at a rate of 10 cc per plant. The result is usually noticed after 6 hours. |

# Land Use in Chiwambo: Legitimizing Rural People's Knowledge With Video*

*Stephane Dondeyne[1,2], Laurence Emmanuel[1] and Jozef Deckers[2]*
*[1]Naliendele Agricultural Research Institute, Mtwara*
*[2]Institute for Land and Water Management*
*Catholic University of Louvain, Belgium*

## 1 INTRODUCTION

Chiwambo, a village in Southeast Tanzania, is located at the foot of the Makonde Escarpment, which rises to 300 m above an undulating plain (Fig. 1). Water oozes out at the foot of the plateau, forming a myriad of springs. This water is distributed through a network of tanks and pipes to villages in three neighbouring divisions. To ensure sustainable use of the land, extension staff wanted to develop a village land use plan. Because of the limited success in the past of top-down imposed plans, a participatory approach was preferred. As researchers from the local agricultural research institute, we jointed in this process to assist in getting a better understanding of issues related to soil erosion and land use.

Soil conservation programmes were initiated around the Makonde Escarpment as early as 1948 (Liebenow, 1971). Considering that there are about 130 villages around the Makonde Escarpment - and the low impact of past initiatives - it could hardly be seen a luxury to invest some time in trying to understand how people use the land and what they perceive as major problems. In this process video was used to get insights into issues related to land and to stimulate discussions in the village.

## 2 VIDEO IN A PARTICIPATORY RESEARCH PROCESS

In a first stage, *Participatory Rural Appraisals* (PRA) were organised as group meetings during which land use was analysed by transect walks, preparing matrices, using a terrain model and drawing maps. Along with the PRAs, an anthropologist investigated aspects of land tenure. This study revealed the importance of the clans in the control over land. We also realised that the group discussions had largely been influenced by better-off people and by members of the dominating clan. Therefore, prior to elaborating on a land use plan, we wanted to understand the dynamics of land use better: What is the nature of changes in land use? What do people perceive as prospects and potentials of the land? How does this differ between: men and women, old and young, richer and poorer people? Above all, we felt that a wider group of villagers should be drawn into the discussions. At this stage, the idea of using video emerged. If villagers would explain *how* and *why* they use the land the way they do, a framework could be established to foster further discussions.

The term participatory video can be applied to a wide range of experiences: at one end, participants may research, shoot, edit and make their own video reports; at the other end, they make final decisions over what is said and shown but they are not involved in the technological aspects of video production. The aim is always to help develop analytical and negotiation skills among the participants (Protz, 1998).

During the PRAs, villagers had grouped the uses of the land of their village according to four themes: forest, agriculture and livestock, water, and earth. Before setting-off with the camera, we asked villagers to classify the land uses into 'old' and 'new' ones. 'Old' land uses were already practised by their ancestors, 'new' ones started in their life time. Their classification is presented in Table 1. By making this distinction, we aimed at getting a picture of the dynamics of land uses.

* Modified from Dondeyne *et al.*, 1999.

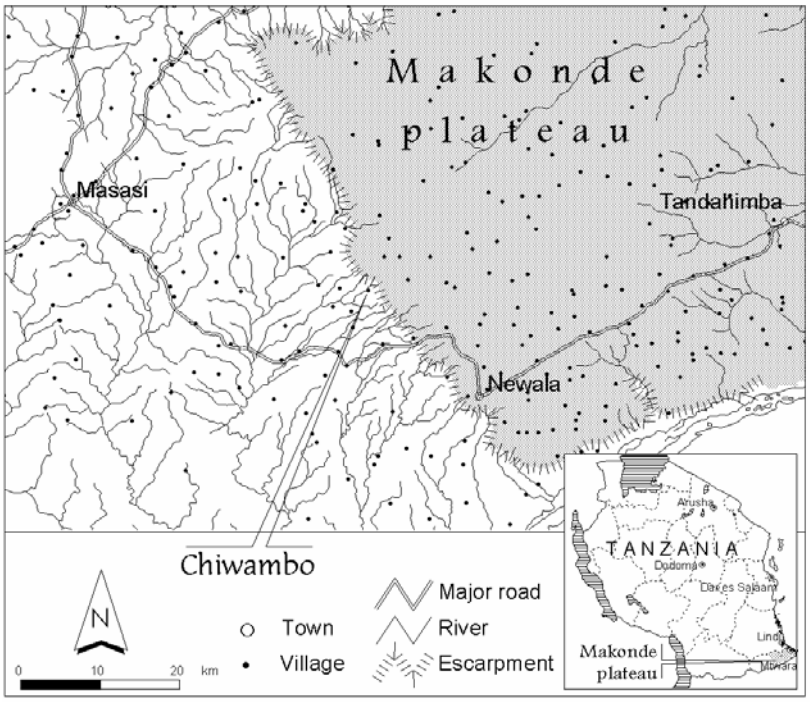


***Figure 1. Location of Chiwambo Village***

***Table 1.*** *'Old' and 'New' land uses of Chiwambo*

| Theme | 'Old' Land Use | 'New' Land Use |
|---|---|---|
| **Forest** | Collecting firewood, mushrooms, building poles, honey, ropes medicines, fruits, hunting Place for initiation rites | Making charcoal, sawing timber |
| **Crops** | Cassava, sorghum, maize, sesame, groundnut, cowpea | Cashew, coconut, fruit trees |
| **Livestock** | Goat, sheep, chickens, Pigeons | Dogs, cats, pigs, guinea fowl, cattle |
| **Water** | Fetching water for drinking, cooking, washing | Water channelled by pipes, used for fish ponds, and watering vegetables |
| **Earth** | Making clay pots, plastering houses, making wells for burials | Making bricks, pit latrines, mining gemstones. |

We explained that the edited video could not be longer than about 30 minutes. We therefore asked the village people to select land use types they particularly wanted to illustrate, including an 'old' and 'new' land use in each of the four themes. They unanimously disregarded the idea of showing anything on the initiation rites. They also arranged who would illustrate the land uses. Inevitably, the village chairman and the secretary of the village environmental committee made sure they got an important role. We managed to lessen this bias by getting contributions from farmers met by change in their fields.

Five hours of footage were recorded during two visits of four days. Because of the technological complications, we could not involve villagers in the editing. However, one week before showing the video in the village, we invited four representatives to the studies to comment and amend the video.

We left it up to them to appoint suitable persons. The appointees were the village chairman, the chairman, the secretary and a lady of the village environmental committee.

The video was shown twice, one evening, on a big screen in the village centre. The next day, we went around the village to get some reactions and to have discussions on it. As soil erosion had come out as an important issue, we agreed with the villagers to look at soil erosion in more detail. Together we did a survey of the occurrence and degree of soil erosion prevailing in the village area. The main conclusion was that gully erosion on the footslopes is a bigger problem to farmers than the erosion on the escarpment. Of course, to farmers this was nothing new, but having done the survey together, everybody understood where the conclusions came from. The idea of making a village land use plan seemed irrelevant at this stage and was shelved. Instead, villagers and extension staff worked out a plan to deal with the fully erosion. This plan was submitted to the Rural Integrated Project Support programme (RIPS), a Finnish funded rural development programme devoted to participatory interventions.

## 3 KNOWLEDGE IS POWER

Villagers clearly took the opportunity for providing evidence of their skills and knowledge. Thrupp (1989) has urged careful consideration of 'ethical issues of how scientists or researchers should (or should not) extract, study, and use knowledge of Third World rural people'. Presenting and investigating rural peoples' knowledge with video, has the advantage that people feel that they are taken seriously, indeed they are 'the starts'. A second advantage is that their knowledge is not taken out of its context. This legitimised and confidence. This is most important in the local context where some government officials have a negative image of people living in Southeast Tanzania. They often label them as 'lazy' 'backward', 'having poor farming practices' knowledge'. By demonstrating their skills and knowledge in the video, villagers make the point that they deserve more respect.

Another consequence of giving co-authorship to villagers is that the meaning of some scenes may not be fully understood by an unformed viewed. In one scene for example, a lady demonstrates how she processes maize for making porridge using a grater to remove the gains from the cob. Such a grater is, however, only used when the grains are not fully dry. The scene implies that she has already exhausted her stocks from last year's harvest and indicates how precarious her food security is. This is obvious to anybody familiar with the area but not to an outsider. Having to discuss such scenes to understand them fully puts the outside 'expert' in a learner's position.

By covering a wide section of land use types, we had indirectly aimed at embracing a wide section of villagers. The video covers some land uses everybody is involved in, as collecting ropes or mushrooms in the forest. It also covered activities only better-off people do, as timber production or establishing fish ponds. The video reveals some of the social tensions as between farmers and livestock owners, herdsmen and livestock owners or the precarious livelihood of a landless farmer. Using video offered a forum to people who are usually not heard in village meetings such as women, young herdsmen or land squatters.

Once shown in the village, villagers definitely would have discussed what had been shown and not shown. This is a process largely out of the control of researchers or extension staff. We could only gauge it indirectly by interviews, information discussions and by observing changed attitudes of villagers. This was most apparent when villagers did not allow extension staff anymore to impose 'how things should be done', while elaborating the plan to control gully erosion.

## 4 CONCLUSIONS

Video helped to improve research and extension staff their understanding of dynamics in the land use and social factors linked to it. Villagers took the opportunity to demonstrate their knowledge and skills. Using video had the advantage that people feel that they are taken seriously. Additionally, it allows to present rural people's knowledge without taking it out of its context. This legitimised their

knowledge and clearly improved villagers' self-esteem and confidence. It further gave a forum to people who are normally not heard in village meetings.

## 5 ACKNOWLEDGEMENTS

We thank the villagers of Chiwambo for their enthusiasm and co-operation, and *Farida Nyamachumbe* and *Dominick de Waal* of the Mtwara Media Centre, for their patience when teaching us how to produce a video. Many thanks *to Alfred Chigogolo* for his substantial contributions during the fieldwork. This study was made possible by the Belgian Administration for Development Co-operation.

## 6 REFERENCES

**Dondeyne, S., Emmanuel and J. Deckers,** (1999). Land Use in Chiwambo: Video as a Participatory Land Survey Tool. *The Land* - Journal of the International Land Use Society, Vol. 3.2, in press.

**Liebenow, J. G.** (1971), *Colonial rule and Political Development in Tanzania: the case of the Makonde.* East African Publishing House, Nairobi.

**Protz, M.,** (1998) Video, Gender and Participatory Development. In I Guijt and M. Kaul Shah (Eds.) *The myth of community: gender issues in participatory development,* Intermediate Technology Publications, London.

**Thrupp, L. A.,** (1989). Legitimizing Local Knowledge: From Displacement of Emplowerment for third world People. *Agriculture and Human Values* **3**, 13-24

# Developing Participatory Agricultural Extension in Lindi and Mtwara Regions: Experiences from the Rural Integrated Project Support (RIPS) Programme

*M.G.A. Kajimbwa*
*Rural Integrated Project Support (RIPS) Programme, Lindi and Mtwara Regions*

## 1 INTRODUCTION

When RIPS Phase II became operational in October 1994, The National Agriculture Extension Policy Environment was that of expert driven extension services. The World Bank has been funding the Training and Visit (T & V) system of extension under the National Agriculture and Livestock Extension Rehabilitation Project (NALERP) since 1998. Lindi and Mtwara regions were incorporated into NALERP in 1991 with a view of strengthening the capacity of the agriculture extension service to manage and train field staff on the delivery of extension messages to farmers.

The agriculture extension departments in each of the II districts in Lindi and Mtwara regions control a widely dispersed field force of division and village - based officers and the departments were the most mobile and well-organised in the rural areas. The extension staff in both regions had however reached the end of the road. Lacking an alternative to technology transfer and the professional skills that involve farmers in building capacity to reassess their own situation and develop solutions which address their social and economic issues concurrently. In 1993 RIPS organised a training workshop on the use of participatory approaches in development. The workshop provoked debate in the agriculture and natural resources departments on how to accommodate participatory approaches as a working methodology.

In the RIPS Programme Phase II Document, the Programme purpose is to reform, strengthen and create decentralised rural institutions that can interact directly with rural people, helping them to adapt, secure and diversity their livelihoods. Six areas of operation are noted for special prioritisation of institutional development. Emphasis is put on the local integration of development efforts, including support of extension services to develop approaches which are more cross-sectoral, demand driven and participatory.

## 2 DEVELOPMENT OF PARTICIPATORY AGRICULTURAL EXTENSION

During the visit to Lindi and Mtwara Regions by the National Extension Service and World Bank Advisory in October 1994. Mtwara Region extension officers and RIPS extension advisers negotiated on now to develop participatory extension. It was clear that the local extension service needed to become both more focused and more involved in reflecting on reviewing extension activities and developing alternative approaches. An agreement on how the programme was going to support the department of Agriculture in the introduction of participatory extension in the two regions was reached in October 1994, between the Ministry of Agriculture the World Bank and RIPS. District Agricultural Department development plans which clearly indicated the contribution of all the stakeholders i.e. District Council, Community, Ministry of Agriculture. World Bank and RIPS, in order to better coordinate this collaborative initiative.

### 2.1 Participatory Skills Training

RIPS policy towards the extension departments has taken into account the relative strength and real potential of agricultural extension to involve other technical services departments in shared activities. Support has consistently encouraged the building of a confident technical institution making its own decisions and directing its own action within its own institutional setting.

Subject Matter Specialists for Lindi and Mtwara Agriculture Extension and Natural Resources Departments assisted by RIPS advisers. Formulated training plans and extension training contents for developing participatory extension.

Since 1994 RIPS has directed considerable resources to assisting the agriculture extension services in Mtwara and Lindi Regions in developing more cross-sectoral demand driven contextual and policy. The Departments of Agriculture at regional and district levels have undertaken a reform process through a series of organised training sessions with a view of institutionalising participatory extension A multitude of leaning by doing events have been supported financially and by bringing in skilled facilitators in order to develop processes with the departments which could facilitate the philosophy of:

> *Rural development is a learning process. It cannot be predicted designed and imposed from above. To support it we must start by learning together with rural people. In that learning process we develop shared understanding on issues, which enable us to start doing something about them right away with the imperfect knowledge and whatever resources that are at hand.."(RIPS 1993).*

The training focused on equipping the technical staff with participatory skills, as a software on:

- how to establish dialogue with farmers/communities
- how to enable farmers/communities identify issues, constraints, problems of their concern
- how to identify focus/interest groups (who own what issue/constraint/problem)
- how to actively involve identified farmer groups in analysing their own identified issues/constraints/problems-why the situation is sub-optimal.
- how to facilitate focused groups in the community to develop an action plan using resources from a wide range of sources for implementation, monitoring and how to evaluate.
- how to keep up the process.

**Table 1** ***Number of Extension Staff Participants in RIPS - Supported Training and Planning Events***

| YEAR | TRAINING TOPIC/EENT | MTWARA | | LINDI | |
|---|---|---|---|---|---|
| | | Senior Staff | Field Staff | Senior Staff | Field Staff |
| 1995 | Basic PRA approach and tools | 12 | 13 | 1 | |
| 1995/96 | Basic PRA approach and tools | 21 | 167 | | |
| 1996 | Participatory teaching skills course | 28 | | 28 | |
| 1995/96 | Basic PRA approach and tools | | | 40 | 11 |
| 1996 | Advanced PRA for trainers | 1 | | 5 | |
| 1996 | Review of role of PRA in NAEP II | | | 44 | |
| 1997 | Advanced PRA course for District trainers from several departments | | | 32 | |
| 1997 | Planning for operationalising PRA in extension under NAEP II | 18 | | | |
| 1997 | NAEP II Operational and Training supplement in support of Participation in Extension | 25 | | | |
| 1997 | Visit to Zambia/Bukoba to study extension methods and practice | 12 | | 11 | |
| 1997 | Planning for operationalising PRA extension under NAEP II | | | 28 | |
| 1998 | Participatory Planning and Monitoring Skills. | 25 | 150 | 26 | |

These events were an eye-opener for many of those involved. Technical officers were surprised by the wealth of traditional and evolving agricultural know-how of village communities. They began to see the shortcomings and inappropriateness of many conventional general extension messages and the

importance of considering agricultural details within the context of rural life and different rural communities.

## 3 OUTCOME OF PARTICIPATORY AGRICULTURAL EXTENSION SUPPORT

### 3.1 The Approach and Methodology Change

The series of training events in participatory skills through learning by doing for the extension technical staff has led to a situation that accommodated participatory philosophy to become the official working methodology of agriculture extension staff.

### 3.2 Building Participatory Planning Capacity

District extension departments in all Lindi and Mtwara developed, for example in 1997 a phased plan (Operational and Training Supplement of District annual Workplans) by the extension staff. The aim of the plan was to build on their knowledge of participation in agriculture such that extension methodologies and extension contents to be used in NAEP II, are increasingly reflecting the issues, problems and priorities of different interest groups in the rural areas where work is being conducted.

Today the agricultural extension district departments in both regions are increasingly able to review, analyze learn from past pilot efforts, plan and act. They are now spreading extension methodologies which involve rural clients in their own analysis and action. They are increasingly developing extension contents which reflect the issues and priorities of those clients. Senior officers are very aware of the multifaceted nature of many rural problems and are increasingly prime movers behind district thinking on how to develop active cross-sectoral responses to local advisory issues. The temptation of by-pass solutions, favouring short-term efficiency and quicker tangible results, has been consciously rested.

## 4 MECHANISMS FOR IDENTIFYING INDIGENOUS TECHNICAL KNOWLEDGE.

### 4.1 Pilot Projects as a Learning Ground

The early stages of RIPS phase II supported a number of agriculture pilot projects of limited scale in the districts. RIPS support policy persistently emphasised the short-term nature of these pilot projects. Their primary function was to act as a learning ground rather than the main vehicle for the spread of participatory extension of creating a learning process for understanding farmer innovations. These were essentially the result of the initiative of individuals or small groups of extension officers. They were part of the response to RIPS provision of funds for conducting PRA session and the follow-up of issues which emerged in the pilot learning projects including agroforestry/soil fertility, rice cultivation, horticulture, forage and cashew management. These pilot projects provided the extension staff with an opportunity to realise the immense contribution of farmer knowledge for their livelihood development.

### 4.2 Establishment of Ward Integrated Extension Teams

During the initial training it was realised that many agricultural issues are closely related to many other factors, for example, access to land labour education and knowledge. A need for pooling together the trained personnel and resources from different disciplines became evident.

Consequently Ward Level Integrated Extension Teams were established in Newala and Nachingwea Districts. The teams facilitate communities in their working stations to search for opportunities for developing activities that identify issues, analyse situations and design strategies on how to intervene in a sub-optimal situation. It make sense to see the task first of learning from and assessing farmers opportunities and problems and later facilitating the development of initiatives and integrated planning processes from a broader view than that of a conventional single discipline approach.

## 4.3 Development of Technology with Farmers

### *4.3.1 The Case of Ngogo seed in Msijute Village.*

Farmers carry out experiments not only in reaction to out side intervention such as the introduction of new technologies by extension agents but also on their own initiative. In Msijute Village Mtwara Region farmers practice cassava seed is ngogo. Farmers occasionally out of curiosity it seems transplanted self-sown cassava seedlings that they came across in the field to see what will come out of them. They continued to propagate the new variety vegetatively if they find it useful. Mr. Cosmas a farmer from Msijute was systematically collecting seeds from mother plants for sowing in seedbeds. He tagged these seedlings planted them out in his field and monitored what became of them. He observed that different seeds from the same mother plant could show distinctly different qualities and he continued to cultivate the new varieties that showed a desirable combination of qualities. His experiment has however its limits. He started to loose some of the desired characteristics with time. Cosmas did not understand the biology behind the loss of the qualities he liked. It was at this juncture when the research intervention was commissioned by extension to respond to respond to Cosmas need of how he could maintain desirable qualities of cassava in his field. Researchers responded by developing with Cosmas on-field experimental design with a view to enhancing his understanding of the basic principles behind his locally developed technology and underlying biological processes. The experimental design developed was not confined to defining treatments and layout. It was a joint search to produce a better understanding of biological processes involved. In this way Cosmas was able to understand the principle behind cassava breeding technology on-field he feels confident he own the technology and his capacity to experiment has been strengthened.

## 4.4 Meeting the Farmer Seed Experts

Rural seed fairs held in 1997 and 1998 in a total of 150 villages within all 11 Districts in Lindi and Mtwara Districts. Brought together about 2000 farmers. This provided a unique opportunity for farmer seed experts, extensionists and local researchers who do not normally meet to exchange knowledge on seed issues: It created awareness across the zone of additional alternative seed and planting materials and created working contacts between farmer seed experts extensionists and researchers which have continued to exist and developed after the seed fair.

Farmers without the means to adopt high-external-input technologies, but under pressure to prevent heir situation from deteriorating can be very innovative in experimenting with "unconventional" inputs and techniques

## 4.5 Development of Farmer Innovator Workshops

Following the practical training for agriculture extension and some of the researchers on participatory approaches participants saw evidently that there was a dimension missing from most of the accounts of research and extension services the basic attitude of the outsider profession of failing to learn from farmers and hence failing to effectively meet the actual technological need of farmers. A consultative and participatory workshop was organised in 1995 by the extension department in Mtwara with a view to build on the tremendous scope for learning from farmers and be able to identify and document farmer innovation- Indigenous Technical Knowledge. Participants from extension and research were able to discuss some crucial questions related to how to identify farmer innovations and what to do with the new farmer knowledge. Farmer innovator workshops were proposed as one of the mechanisms for co-ordinating efforts that bring a closer collaboration between researchers extensionists and farmers in identifying and documenting indigenous technical knowledge. Models for identifying indigenous technical knowledge were developed.

## 4.6 Feeding into the Local Government Reform Process

The facilitation initiative for capacity building of agriculture institutions is relevant to Tanzania's Local Government Reform Agenda 1996-2000 immediate objectives: (I) the autonomy of local authorities. (ii) the responsiveness of authorities to local priorities as expressed through democratic

organs. (iii) council resources mobilisation from all sources: and (iv) the operational of efficiency of councils.

The facilitation process has developed the mechanisms by which the local authorities are able to build into the existing structure of the Councils the ability to foster a planning process that responds to peoples demands. For example the extension service is currently articulating farmers needs and priorities into the local government planning process.

### 4.7 Integrated Planning Process using the Local Government Planning

***Procedures:***
Using the local government structure, the Integrated Extension Teams initiate a process of participatory ward and district level planning with the community Ward and/or district development strategies are developed which also indicate the main priorities between sectors an areas and which are then a basis or agenda for the Village Development Committee. Ward Development Committee and District Full Council. The Councillors are fully involved right from the beginning (in the searching process) and should formally endorse it. This process is seen as an opportunity to provoke debate among Councillors about development issues and in particular about priorities between their respective wards.

With the assistance of Integrated extension teams. Councillors with his/her different groups in the community are facilitated to prepare simple development strategies and plans for their own wards as a basis for identifying local needs and priorities. These strategies are prepared in full consultation with other leaders, including those not represented in the official local political structures. This has proved in Newala District not only to provide a rational basis for identifying appraising and prioritising proposals, but also make the planning process ore visible in the local community thereby making it more difficult for the Councillors (or other leaders) to dominate the planning agenda.

Not all planned activities or projects at village or ward level need to be forwarded to the District Full Council for funding. Participatory planning processes facilitated by extension teams enable the community to identify what they can do, using their own resources and what needs external support. In this way a sense of ownership and responsibility is created.

Facilitation work with Integrated Extension Teams (technical staff) in Newala has led to development of means and ways of how the political leaders. Mainly Councillors, can get as much information as possible about the likely implications of their decisions in terms of ward/ district development, so that it is more difficult for them to justify making decisions solely on the basis of personal and/or political factors.

The role of technical staff has not been therefore to provide the community with standard recommendations/messages for community to follow but to provide opportunities for the communities to identify means and ways for intervention in making their own living while providing room for the decision makers to be well informed of the development process taking place in their won areas and feeding this into the decision making structures( The Village Development Committee. Village Assembly, Ward Development Committee and District Full Council).

## 5 CONCLUSIONS AND RECOMMENDATIONS

Institutional capacity to develop more participatory and facilitative public services is needed. It is achieved through participatory skills training enabling the realisation that solutions can often be found among farmers themselves and not necessarily only from professional researchers and extensionists. This in itself is an important reversal in thinking in agricultural extension. The crucial issue is to facilitate and strengthen this process. This can be made possible if the extension officers have the capacity to play their role as local experimenters and facilitators to farmer experiments. Mechanisms developed in identifying indigenous technical knowledge are a result of reversal towards the

importance of farmers' role in agricultural innovation and change which is complemented by formal research. The use of pilot learning grounds farmer innovator workshops, skills to identify farmer experimenters. integrated extension teams and linking the initiatives into the local government planning structure will facilitate the whole process of looking at ITK and its rationale in rural livelihoods and agricultural development. The ability of the extension service to initiate a process of developing mechanisms for dealing with indigenous technical knowledge depends on the participatory capacity of extensionists and the researchers open-mindedness and readiness to accommodate the farmers ideas and opportunities.

## 6 REFERENCES

**Laurens Van et al.,** (1997). Developing Technology with Farmers: A trainers Guide for Participatory Learning.
**Rural Integrated Project Support Programme,** (1993).RIPS Programme Document

# Local Knowledge and Farming Systems in Tanzania: Peasants' Coping Mechanisms and Survival Strategies

*Ndalahwa F. Madulu*
*Institute of Resource Assessment*
*University of Dar es Salaam*

## 1 INTRODUCTION

The purpose of this presentation is to highlight some of the traditional practices that have developed in the farming systems of Tanzania in response to local adaptations to the local environments. Different communities interact and respond to their environments differently. In most cases, the adaptation strategies are influenced by long-term experiences and practices employed on a trial and error approach. The different responses to the environment are often observed in the people's livelihood and survival strategies.

## 2 LOCAL KNOWLEDGE AND PEOPLE'S COPING MECHANISMS

Various coping mechanisms have been developed by different societies as a result of long-period accumulated experiences and skills. Many farming techniques and approaches have evolved through adaptations to the environmental conditions and modification of the communities' experiences over time, hence, may be viewed to be part and parcel of the socio-cultural values and customs of the communities concerned. Through such adaptations, communities have managed to increase their agricultural production, hence, ensured food security. Through adaptations, many skills and practices have been imparted from one generation to another to ensure continuity and sustainability. Most of the coping mechanisms adopted by the local communities through long-term experience result into environmentally friendly farming systems that are sensitive to food security and bio-diversity conservation.

To demonstrate the different coping mechanisms and people's adaptations to their environment, few case studies have been selected and highlighted as examples. These examples include the Matengo pit system; the Ufipa mound system; the traditional terracing systems of the Iraqw; and the rotational following systems in Mufindi District. These examples demonstrate how the local communities, through their own local knowledge were concerned about the protection of their environments against various agents of land degradation (especially soil erosion) and ensuring food security. Like in many other communities, the technological advancement in these farming systems has in many cases overshadowed by the impacts of population pressure and lack of policy support.

## 3 THE MATENGO PIT/NGORO SYSTEM (MPS)

The MPS is a traditional farming and land management techniques developed and practised by the Matengo people who reside in Mbinga District, in Southern Tanzania. The system is used to ensure that the land is protected from severe soil erosion, especially in the steep hill slopes of the Matengo Highlands. This is a unique farming technique system whereby a pit or Ngoro is dug surrounded by four ridges that are tied together to intercept and prevent the destructive effects of surface runoff in the cultivated hill slopes of the Matengo Highlands (Lyimo and Kangalawe, 1996). In so doing, the technique has been very effective in protecting the land from severe gully erosion on the steep slopes.

The history of the MPS goes back to over a hundred years when the Matengo people started living in the Matengo highlands due to social and ethnic unrest in the region. The resettlement and the availability of intensive rainfall (1500 - 1700 mm per annum) in the Matengo Highlands necessitated an effective farming technique that was to overcome the threats of soil erosion while maintaining or raising agricultural productivity in the fragile and highly vulnerable highlands.

The adoption of the MPS led to many positive impacts, including moisture retention through interception and trapping of runoff water in the pits. The other benefit is the conservation of soil fertility through composting of the organic matter collected in the pits.

Over time, various changes have occurred in the MPS. The main factors that have influenced the dynamism in the system include the influence of land use and land tenure changes; labour constraints; shortened fallow periods; limited spread of the system; intermarriages; and lack of policy support of the system.

## 4 THE UFIPA MOUND SYSTEM (UMS)

The Fipa people in Rukwa Region practice the UMS. This farming method provides a remarkable soil conservation and soil fertility restoration measure that have developed from people's experiences and adaptations to their environment. The local knowledge that is embodied in the system has been incorporated in the local practices and traditions that are carried on through generations (Lyimo and Kangalawe, 1996).

The UMS involves making compost mounds locally called "intumba"; whereby heaps of grass and bush are covered by overturned soil resulting into cone-like mounds. The process of making mounds starts by selecting a piece of land that has a well established grass or bushy vegetation. The process involves the slashing of grass or bush, collection and pilling them into heaps. The heaps are then covered by soil using a special hoe locally called "ise". Normally, the mounds are arranged in rows at an offset position. The mounds are mainly prepared by planting cassava and beans. When these mounds are destroyed the soil is spread and then maize and / or finger millet are planted.

Generally, the UMS follows a rotation system whereby mounds are made in one season; followed by flat farming in the next season by spreading the mounds. During the third season, mounds are made again by buying the crop residues; and this is followed by flat cultivation. After few years of rotation, the land is left fallow to restore the natural vegetation and soil fertility before another round of mounds are made again. The UMS is geared towards maintaining soil fertility, and thus, enhancing sustainable crop production while preventing the occurrence of land degradation.

There are many factors that have influenced changes in the UMS. These include land use and land tenure changes; labour constraints; the introduction of ox-ploughing; the use of industrial fertilisers and improved seed varieties; and lack of policy support for the expansion of traditional farming systems. The UMS is generally beneficial because it restores soil fertility; it has easier weeding operations; and it minimises competition for nutrients, water and space but it is labour intensive (Lyimo and Kangalawe, 1996).

## 5 THE TRADITIONAL TERRACING PRACTICES OF THE IRAQW

The Iraqw people live in Mbulu District, Arusha Region. The area is a highland area and is densely populated and population growth is high. These demographic characteristics have led to high and increasing population pressure over the available resources, especially land. Over time, there has been an expansion of land fragmentation practices, hence, the need for a mechanisms that can increase agricultural productivity under conditions of land scarcity (Kauzeni, 1994). Loiske (1996) argue that the difficult agricultural conditions in this hilly area have been overcome through well established practices of soil conservation that have been developed by the local farmers over a period of 200 years. These practices include ridging, digging of cut-off drains, mulching, manuring, intercropping, and terracing.

The application of terracing techniques in Mbulu has been necessitated by land scarcity in the area. Terracing is used to ensure that organic matter contents and water is kept on the farms so as to increase productivity. Although terracing in some areas is done by moving soils with a hoe from the

higher parts of the field to lower parts (Loiske, 1996), most farmers have developed a unique system of terracing whereby ridge are made using the crop residues piled for many successive years. This system ensures sustainable use of the hill slopes even where labour to dig the terraces is a problem. However, the main constraint to this system is the changing land use and land tenure systems, adjustments of land boundaries; long distance to farms; and common property land ownership system.

## 6 ROTATIONAL FALLOWING PRACTICES IN MUFINDI DISTRICT

Historically, rotational fallowing has been a feature of the Hehe people in Munfindi District for many years. This farming technique has been developed in response to the landscape of the area that is dominated by steep slopes and deep valleys. In many areas settlements are located along the mountain ridges, and farms are distributed along the hill slopes and in the valley bottoms (Madulu, 1998).

Studies done in Kibengu and Mapanda wards indicate that although the rotational fallowing practice is continuing, it has been minimised by the impacts of population pressure and land fragmentation. Traditionally, farms were separated by fallow lands located at various levels of the slope (say, at the top, middle and at the bottom). Fallow lands were rotated after a particular period. This strategy was used to enable natural soil fertility to be restored and regeneration of vegetation cover to take place. In a way such practices acted as a trap for the sediments that were eroded and transported in the runoffs from the hill tops, to the rivers in the valley bottoms.

The importance of rotational fallowing has been aggravated by the high prices of agricultural inputs that are not affordable to the majority of the peasants (Madulu, 1998). Apart from restoration of natural soil fertility, fallow lands are regularly used as sources for fuel wood for household use, and pasture for the livestock. However, the increase of population pressure has rendered this farming system obsolete. Land fragmentation has been widely practised to enable family members to have access to the land. Very few families still have enough land to enable them to use the rotational fallowing system.

## 7 CONCLUSION

This paper has reviewed livelihood patterns and copying mechanisms in various rural communities in Tanzania. It has demonstrated various strategies that communities do apply to tackle issues related to agricultural productivity in general and food security in particular. The lesson learnt from these reviews is that there are many different copying mechanisms and strategies that are used to ensure food security. Communities know their environments through long-term experiences and contacts. Such experiences have enabled accumulation of a pool of valuable knowledge that can be documented and used effectively to tackle food security problems.

It is tempting to seek cross-cutting generalisations with regard to food security and agricultural development in sub-Saharan Africa in general, and Tanzania in particular. Clearly, the advantage of discovering generalisable approaches and strategies is that policies of wide applicability can then be devised to tackle the causes of food insecurity or that can influence people's lifestyle. However, there is a strong reason to be cautions in this respect because communities are different and respond differently to their own environments. This has been demonstrated by the examples cited in this presentation. Such generalisations are neither desirable nor necessary for the practicability and sustainability of the policies.

## 8 REFERENCES

**Kauzeni, A.S.,** (1994), Land Tenure and Natural Resource Management in Gitting Village, Hanang District, Institute of Resource Assessment Research Report, No. 87, University of Dar es Salaam.

**Liwenga, E.T. and I.S. Kikula,** (1997), Household Food Security and Coping Mechanisms in Severely Eroded Areas: The Case of Kondoa Eroded Area, Tanzania, Institute of Resource Assessment Research Papers, No. 45, University of Dar es Salaam.

**Loiske, V.M.,** (1996), "Socio-Economic Aspects of Land Management in Gitting Village", in C. Christiansson and I.S. Kikula (eds.), Changing Environments: Research on Man-Land Interrelations in Semi-Arid Tanzania, Regional Soil Conservation Unit, Nairobi.

**Lyimo, J.G. and R.Y.M. Kangalawe,** (1996), The Role and dynamics of Traditional Farming Systems in Agricultural Sustainability: The Case of Matengo Pits and Ufipa Mound Systems, Institute of Resource Assessment Research Report, No. 100, University of Dar es Salaam.

**Lyimo, J.G.; A.S. Kauzeni and S.A. Mohamed,** (1994), Resource Inventory for Land Use Planning at Village Level: The Case of Ntendo Village, Sumbawanga Urban District, Tanzania, Institute of Resource Assessment Research Report, No. 91, University of Dar es Salaam.

**Madulu, N.F.,** (1998), Main Socio-Economic Study for the Kihansi River Catchment management Plan (CMP), Report Prepared for the NORPLAN/TANESCO, Dar es Salaam.

**Mohamed, S.A.,** Farming Systems and Land Tenure Issues in the Kondoa Eroded Areas: The Case of Haubi Village, Kondoa District, Institute of Resource Assessment Research Report, No. 81, University of Dar es Salaam.

**Yanda, P.Z. and C.g. Mung'ong'o,** (1999), The Farming Systems of Kasulu District, Western Tanzania, Institute of Resource Assessment Research Papers, No. 45, University of Dar es Salaam.

# Wild Food Plants and Additives in Health and Dietary Sufficiency

*F. C. Uiso and R.L.A. Mahunnah*
*Institute of Traditional Medicine*
*Muhimbili University College of Health Sciences*
*Dar es Salaam*

## 1 INTRODUCTION

The purpose of this presentation is to draw your attention to the health and dietary dimensions of plant utilisation in traditional food, food additives, flavouring agents, relishes and spices. The issue will be addressed in two dimensions:

i) Nutritive aspects of food / dietary plant use
ii) Extra-nutritive (Health related) aspects of food phytochemistry

The importance of green leafy vegetables as sources of nutrients in societies where consumption of animal based food products is low is well recognised (FAO 1988). Green leafy vegetables and certain fruits are important sources of pro-vitamin A carotenoids and other nutrients (Simpson and Tson 1985, Teply 1986). Traditional societies have been able to maintain adequate nutritional status through a wide use of varieties of food staples together with wild leafy vegetables and fruits (Grivetti 1978; Ogle and Grivetti 1985). Some fruits, roots and leafy vegetables are consumed routinely, while many species are of importance only during times of seasonal shortage or drought. Many fruits and roots are recognised as components in diets of children and are apparently under reported in dietary surveys.

Although the bulk of these diets are composed of staples which contain low levels of nutrients other than carbohydrate, nutritional adequacy is maintained on the average due to their wide diversity in consumption of wild leafy vegetables and fruits.

The majority of these staples are low in protein and in most cases with incomplete essential amino acid composition when compared to animal sources. The use of a wide variety of vegetables, even though they are low in the amount of protein, tend to complement each other in amino acids and leads to overall adequate protein intake (Ogle and Grivetti 1985).

Rural populations in most tropical countries, and developing countries in particular, are familiar with edible wild vegetables and fruits. In a study conducted in Mara Region, Tanzania, 38 edible wild fruits and vegetables were identified. The same study identified 53 cultivated food plants.

It is common to find them planted in home gardens. For most of these plant species there is scanty information about their identity, let alone nutrient value and chemical composition.

The nutrient data that are available indicate that these plants can be good sources of carotene, ascorbic acid, folic acid, riboflavin and the minerals such as iron, calcium and magnesium (West et al., 1988 and FAO, 1968). They can also be important sources of trace minerals and protein.

Some of the indigenous food plants encountered in household gardens as weeds and wild plants are not only highly nutritious but are also strategic reserves of essential nutrients that are available at certain critical periods of the year when other more common sources of these nutrients are scarce or completely unavailable (Okigbo 1977).

Some trees or perennial leaf vegetables produce leaf flushes during the dry season when conventional annual vegetables are scarce or unavailable. It has also been shown that leaf flushes can be regulated or stimulated by pruning.

## 2 EXTRA-NUTRITIVE HEALTH RELATED ASPECTS OF FOOD PHYTOCHEMISTRY

It has been suggested that dietary phytochemicals may play a role in the prevention of chronic diseases. There is a strong correlation of high fibre diets and low colon cancer incidence. Fibre aids gut mortility and increases gut emptying. At the same time phytoestrogens and lignans have been shown to inhibit carcinogenesis. It is also know that the presence of phytic acid, lectins, phenols and amylase inhibitors in grains and vegetables help to lower blood glucose, thus aid in the management of diabetes.

High consumption of plant foods has been associated with low risk of coronary heart disease (CHD). The beneficial effect is associated with antioxidant properties of the food components, especially the carotenoids and other unsaturated compounds. Traditional societies especially the Masai and Batemi have been noted to add non food items in their meat based diets. These food additives have been shown to contain cholesterol lowering activity in an in vitro study. Such identified food additives with cholesterol lowering properties are Albizia antihelimintica, Acacia goetzii and Myrsine africana.

Some traditional foods are also used as medicines. Most plants used for gastrointestinal disorders are also used as food Plant like *Tamarindus indica, Bidens pilosa, Cajanus cajan* and the baobab tree *(Adansonia digitata)* have this dual use.

Some food plants and food additives have been shown to have pharmacological activities. Common food additives like Ginger and Capsicum have antibacterial activity in addition to promoting gastric mucosa integrity. In addition Onions, garlic and basil have anti-inflammatory and anti-microbial activity.

Some plant related components have antinutritional effects thus reducing their food value. The value of vegetables as dietary sources for minerals could be adversely affected by high contents of oxalate, phytate and cynogenic glycosides. However, it has been observed that traditional cooking methods rid vegetables of most of the soluble oxalate when the cooking water is discarded. This would otherwise complex with divalent metals in the diet, rendering them unavailable for human absorption. At the same time prolonged cooking rids vegetables of cyanogenic glycosides. However, prolonged cooking denatures proteins and destroy heat sensitive nutrients such as B-carotene.

Given the importance of leafy vegetables as nutrient sources to the diets of most developing countries, Okigbo (1977) has expressed concern about the little attention they have received in horticultural and economic development. Chweya (1985), have identified some indigenous leafy vegetables used in Kenya which could be developed as cultivated or semi-cultivated crops. The identification is on the basis of their B-carotene, Vitamin C, Mineral and protein content. Such identified plants are: *Amaranthus hybridus, Solanum nigrum, Gynandropsis gynandra, Erucastrum aravicum, Crotalaria brevidens* These are common indigenous leafy vegetables in most parts of East Africa. There is little information about their chemical composition other than nutrient data.

Wild food plants knowledge is in the danger of being lost through reduced species diversity and other biotic simplifications that have become the signature of agricultural development programs. Cultivated plants lose their genetic base leading to low resistance to diseases and low content of other beneficial phytochemicals. Agriculturalists should search more on wild species to boost up genetic base of cultivated plants. Close relatives of maize, beans etc. should be hybridised with cultivated ones.

## 3 CONCLUSION

1. Wild food plants are important sources of nutrients to societies whose diets have low animal food intake.

2. Dietary phytochemicals play an important role in the prevention of degenerative chronic diseases.
3. We urge that agriculturalists should play a leading role in promoting the cultivation of these wild food plants in an effort to increases food base, sufficiency and diversity.

## 4 REFERENCES


**Chapman L., Johns T. and Mahunnah R.L.A.,** (1997). Saponin - like in vitgro characteristics of Extracts From selected Non-Nutrient Wild Plant food Additives Used by the Maasai in Meat and Milk Based Soups. Ecology of Food and Nutrition 36; 1-22.

**Ceneya J.A.,** (1985) Indetification and Nutritional Importance of Indigenous Green leaf Vegetables in Kenya. Acta Hortculturae 153; 99 - 108.

**FAO** (1988). Traditional Food Plants. Food and Nutritional paper 42. Food and Agriculture Organization of the United nations, Rome.

**Grivetti L.E.,** (1978) Nutritional sources in a Semi-arid Land. Examination of the Tswana Agro-Pastoralists of the Eastern Kalahari, Botswana. AM. J. Clin. Nutr. 31; 1204 - 1220.

**Johns T., Mhoro E.B., and Uiso F.C.,** (1996) Edible Plants of Mara Region, Tanzania Ecology of Food and Nutrition 35; 71 - 80.

**Ogle B.M. and Grivetti L.E.,** (1985). Legacy of the Chameleon: Edible Wild Plants in the Kingdom of Swaziland, Southern Africa. A cultural, Ecological, Nutritional Study. Part 4 Nutritional Analysis and conclusions. Ecology of Food and Nutrition 17; 41 - 64.

**Okigbo B.N.,** (1977). Neglected Plants of Horticulture and Nutritional Importance in Traditional Farming systems of Tropical Africa. Acta Hortculaturae 53; 131 - 151.

**West C.E.,** Pepping F. and Temalilwa C.R., (1988) The Composition of Foods Commonly eaten in East Africa. Wageningen Agriculture University Wageningen.

# Why Agro-biodiversity Conservation - Who is Responsible for what?

*S.O.W.M Reuben and E. Mgembe*
*Department of Crop Science*
*Sokoine University of Agriculture, Morogoro*

## 1 INTRODUCTION

Agro-biodiversity conservation is an important ingredient with potential for food security and for medicinal purposes. In the marginal semi-arid areas of the world, there is often nutritional deficiency due to low level of edible flora diversity during most parts of the year. Availability and knowledge on the utilisation of available indigenous and traditional flora as a food source is therefore important to alleviate nutritional and health problems of people in these areas. In Tanzania for example, there are several species of indigenous plants, both herbs, shrubs and trees available in both marginal and fertile areas with high rainfall areas which are either known or unknown to the local people as nutritional and medicinal plants. An example of such plants available in Tanzania is shown in Table 1. However, the current situation indicates that loss of agrobiodiversity is on the increase. It is estimated that about 34,000 species, constituting about 12.4% of plant species are in the danger of being extinct. This results into the depletion of food to the rural and urban people and loss of plants for healing various ailments for animals, plants and humans.

Evidence of the accelerating depletion of natural resources and other environmental and social problems has resulted to a global consensus on the need to see development in terms of long-term sustainability (see Quiroz, 1994). The need for "sustainable development" requires no further emphasis. Since more than 80% of Tanzanians live in rural areas and, depend on agriculture, the "sustainable agriculture in rural areas in particular, must be given priority. It is generally accepted that natural ecosystems are much more complex than Agricultural ecosystems. However, traditional agricultural ecosystems are less simplified compared to modern agricultural ecosystems are less simplified compared to modern agricultural ecosystems. This is to say that it is only in areas with high agrobiodiversity where we can find more life forms, and hence high chances to survive due to diversified food sources. We need to link conservation and development so as to see the importance of this activity for appropriate policy development to address accompanying problems. Ecological security should always be linked with livelihood security in terms of food security.

Thus we should conserve agrobiodiversity for the sake of food security, medicinal needs, conservation of soil water, moderation of the macro and microclimate and maintaining an ecological balance.

## 2 WHY LOSS OF AGRO-BIODIVERSITY?

To date, there is widespread burning and clearing of vegetation in the search for more land to produce crops for feeding the ever increasing world population. Overgrazing, harvesting of trees for charcoal, clearing for construction, mining etc. have accelerated tremendously less of plant species in recent years. There is therefore a seemingly conflict between biodiversity conservation and economic development particularly in the areas of agriculture, mining and energy. The loss of biodiversity is clearly linked with poverty, population growth and environmental degradation. Thus, natures' diversity is seen as not intrinsically valuable in itself, but rather its value is conferred only through economic exploitation for commercial gain. This attitude then, reduces diversity to a problem, a recipe for capitalist orientation.

Bad/weak governance, poverty, ignorance and bad cultural values are among the leading factors to the loss of agrobiodiversity. Loss of agro-biodiversity leads to the loss of indigenous knowledge and vice versa.

## 3 WHO IS INVOLVED IN LOSS OF AGRO-BIODIVERSITY?

There is no definite answer to the question of who is involved in loss of agro-biodiversity, but this depends on culture, division of labour, gender potentialities in specific ethnic groups, property and economic rights, type of economic activity etc. In Tanzania for example, there are more than 120 ethnic groups, each with a different cultural habit. In some tribes or households, men are more involved in farming while in others, women play a leading role in farming. In the majority of the tribes however, both gender sections are equally involved in farming, thus land clearing in search for more agricultural land. In activities like hunting, mining, construction, lumbering, charcoal making, grazing, men take a leading role. Thus, environmental degradation from such activities should solely be due to activities of men. One may wonder on how hunting can result into loss of biodiversity! Look at the reason(s) leading to indiscriminate burning of vegetation on the Uluguru Mountains in Morogoro Region, Tanzania. although farming and grazing are generally implicated as the objectives, hunting for animals particularly "Ndezi", vermin has also been cited by local people is the reasons why fire is used in the bush. Fire chases the animals from hiding and thus exposes them to the hunters. Evidence has shown that search for firewood by women as a source of domestic energy at home plays a very minor role in loss of agrobiodiversity. They mostly look for dry wood and hardly out down fresh wood for the purpose. In this way, they make judicial harvesting of the natural resources, pruning the existing trees/shrubs for a better stand. Yet, women are mostly the victims of loss of agro-biodiversity because they are the ones searching greens for the potherb during lunch and dinner and energy for the household. They are compelled to travel long distances in search of these. The issue of loss of agro-biodiversity through overgrazing among the Sukuma, the Gogo and the Rangi need no overemphasis. It is their culture to keep so many herds of animals, which in turn degrade the environment. Thus, sustainable development and agro-biodiversity initiatives should include ethnoscience (i.e., the scientific description of races and cultures of mankind) together with gendered knowledge and skills and cultural backgrounds of specific groups of people (see also, Rochelau, 1991).

## 4 MEASURES TO CONSERVE THE LIFE SUPPORTING SYSTEM: AGROBIODIVERSITY

### 4.1 Gender and Cultural Considerations:

As noted earlier on, women are the day to day managers of the environment and the house holds although men are the owners in absentia. This is because in most cases, the men are the decision makers, while women are the implementers of these decisions. Similarly, the rural people are the ones managing the countryside contrary to the urban people concentrated in cities. We therefore need to empower the rural people particularly women in programmes of agro-biodiversity conservation. The experience and skills of rural women in recognising their potent plants, use and conservation should never be ignored. Shiva and Mies (1993), noted that women marginalization and destruction of the environment go together. Domot et al. (1994) noted the importance of looking into the relationship between women and agriculture, forestry and population dynamics in order to examine critically the role of women in conservation of biodiversity. On the other hand, men are the decision makers and also, actively involved in specific activities which abuse the ecosystem. We therefore need to address them through extension workers on conservation packages. In many of African Societies, Tanzania is no exception, there are several ethnic groups with different cultural backgrounds, knowledge and skills not only on the potential use of plants in their vicinity, but also on conservation activities. For instance, a baobab tree (*Adansonia digitata*) is potentially know as a leaf vegetable plant, refreshing drink and also as a remedy against cholera in several parts of Dodoma Region Tanzania. However, the people of Kilimanjaro Region utilise it only as a drink and only scarcely. In several parts of Zimbabwe, the fruit is made to flour and a highly nutritious food can be prepared from it. We therefore need to recognise and use traditional wisdom and techniques taking into consideration gender potentialities in specific ethnic groups. These however, should be combined with modern science and technology so that rural livelihoods are strengthened through conservation and rational use of indigenous plants as noted by Swaminathan (1994). Thanks to the International Community in which

the 1990's have been postulated by some observers (e.g. Rocheleau et al., 1992) as the decade of women - and - environment or women-and-sustainable development. However, both men and women should be looked at taking into consideration the various roles played by each of them in specific cultural backgrounds. In this postulate, the daily experience of rural people is viewed as an important element in conservation. In particular, gendered property, gendered work and gendered knowledge are advocated. We need to use a bottom up approach in the whole issue of conservation and utilisation of indigenous plants.

Although Quiroz (1994) advocates that women control over their resources, decisions and actions should be a key factor in the success of projects on conservation, we need to be cautions. Both men and women have specific roles to play depending on the division of labour, ownership rights and decision making responsibilities as accepted norms in specific societies. We should build on already accepted norms by the society in general taking into consideration gender differences. Rocheleau et al., (1995) noted the necessity of addressing current gender imbalance between rights and responsibilities in resource management. Probably surveys need to be conducted first, to establish what norms are accepted or not by the majority and then, disseminate packages according to accepted norms. This is a bottom up approach. Then and only then, we need to recognise, reinforce and improve specific roles, knowledge and capabilities according to gender in such undertakings on a sustainable basis as also noted by Quiroz, (1994).

### 4.2 Community Involvement

In order to effectively conserve lands beneficial for all life forms, we need to involve the community as a whole which include all classes of people e.g. livestock keepers, farmers, lumberers, hunters, bee keepers, miners, institutions etc. Before we go into details, two assumptions may arise:

i. There is a knowledge gap between different classes of people in the community, and therefore one class does not know the effect if has on the others in terms of agro-biodiversity loss.
ii. There is no knowledge gap, every class in the community knows its effect on the others.

Although grassroots people are important in conservation projects, we need rule of law to effectively oversee that the generally accepted regulations on conservation are not violated by some individuals. This can effectively be implemented by local governments at village, ward and divisional levels. A typical example to that effect is that of Mvumi Division in Dodoma Region, Tanzania. A destocking project which allows only Zero grazing of a limited number of improved breeds of livestock financed by the CCT Dodoma, was launched more than 10 years ago (sometime in 1986). Villagers were first made aware of the negative effects the uncontrolled rearing of animals had in the environment and on the positive impacts zero grazing in the proposed project would have. Specific areas for away from the villages were identified where only livestock could be reared in a controlled manner. The villagers organised themselves in such a way that any violator of this regulation was put to task by the local governments. Today, there is widespread vegetation, improved agro-biodiversity, resurgence of streams and other water sources, and hence increased availability of indigenous vegetables and fruits. The local community itself has witnessed the fruits of conservation and never again would they like to go back to the old days (Mattee and Reuben, 1996). Morse and Stocking, (1985) advocate the use of incentives in community conservation projects. Provably we need to arrange in such a way that those responding positively to conservation regulations should be rewarded while those going against should be punished accordingly.

## 5 POLICY

We need a well defined policy on the role of different classes of people (e.g. men, women, farmers, pastoralists, etc) on the exploitation, use and conservation of natural resources. This will help government's plan programmes, finance and enforce them in order to realise intended goals.

An ecologically sustainable diversity programme should be a priority in all national policies taking into consideration appropriate cultural and ethnological backgrounds if packages are to be received and implemented by the grass root people. Domoto et al, (1994) noted that women have a great role to play on food security, yet over the years, there has been negative impacts of modern development policies and agricultural industrialisation on the ability of women to under take sustainable agriculture, particularly in the exclusion of women from training, extension and planning. Recently however, there has been a tendency to give more priority to women in recruitment and sponsorships to higher education for instance at Sokoine University of Agriculture and SACAR sponsorships. Priorities should also be looked at for them to specialise in the areas of Nature conservation. Similarly, policies should be in place, to improve institutional arrangements and project financing to better incorporate and address gender considerations as it deems appropriate in the villages. Policy implications should shift away from the present cultural settings, in most of world societies on women status to the modern on women entitlements to environmental resources as noted by Leah et al. (1995).

## 6 POVERTY ERADICATION

Poverty is amongst the most important factors leading to over exploitation of natural resources. Increased population at a greater rate than production and provision of social services, bad land tenure systems, development of classes in society and many other factors have led to inequalities; increased depletion and degradation of available natural resources including agro-biodiversity and they increasing appropriation of these resources for the benefit of the few. Thus, when for instance most of the potential areas are held by few individuals, the majority remain with the rest of the marginal lands to exploit. This leads to over exploitation of the countryside to meet the daily requirements. Nations, particularly developing countries, should strive to eradicate or at least reduce poverty and have this target on top of their agenda. Tanzania for instance has resolved to implement the International Declaration for eradicating poverty but this needs strengthening efforts towards good governance (Mkapa, 1998).

## 7 REFERENCES


**Domoto, A; Krattiger, A.F.; McNeely, J.A.; Lesser, W.H.; St Hill Y, (eds) and Senanayake, R.,** (1994): Women and the Connvention on Biological Divesity. In: Widening perspectives on Biodiversity. P 219 - 224. International Union for Conservation of Natgure and Natural Resources (IUCN); Gland Switzerland.

**Leach, M.; Joekes, S; Green, C,** (eds). (1995). Gender relations and Environmental change. In: IDS - Bulletin 26: 1,1 - 8.

**Mattee A.Z. and Reuben S.O.W.M**., (1996). CCT Consultant Work on community Development at Mvumi Division, Dodoma Region, Tanzania.

**Morse, S. and Stocking, M.,** (eds). (1995). People and Environment 223 p. Univ. of East Anglia, School of Development Studies, Norwich NR4 7TJ, Norforlk, U.K.

**Mkapa, B.W.,** (1998). In: Declaration on Poverty eradication in Tanzania. Nov. 3, 1998 Issue: Govt. Press, Dar es Salaam.

**Quiroz, C.,** (1994). Biodiversity, Indigenous Knowledge, Gender and Intellectual Property Rights. Indigenous - knowledge - and - Development - Minotor. 2:3, 12-15.

**Rocheleau, D.E.,** (1991). Gender, Ecology, and the Science of survival: Stories and Lessons from Kenya. Agriculture - and - Human - Values. 8: 1 - 2, 156 - 165.

**Rocheleau, D.; Borkenhagen L.M. (ed) and Abramovitz, J.N.**, (1992). women as Farmers in the Rural Landscape: Lessons from Kenya. Proceedings of the International Conference on Women and Biodiversity, Kennedy School of Government, Harvard University, October 4 - 6, 1992; 40 - 51. World Resources Institute; Washington, D.C.; USA.

**Rocheleau, D.E.; Leach, M.,** (ed); **Joekes, C.,** (ed); **Green, C.,** (1995). Gender and Biodiversity A Feminist Political Ecology perspective. Gender Relations and Environmental Change. IDS Bulletin 26: 1, 1 - 16.

**Shiva, V.,** and **Mies, M.,** (ed) (993). Women Indigenous Knowledge and Biodiversity Conservation: In Ecofeminism, 164 - 173 Zed Books; U.K.

**Swaminathan, M.S.,** (1994). Reaching the unreached: Ecotechnology and Rural Employment: A Dialogue. Macmillan India Ltd; Madras; India.

**ANNEX 1:**
***ACRONYMS AND ABBREVIATONS***

| | |
|---|---|
| ADP | Agricultural Development Programme |
| CBD | Convention on Biological Diversity |
| CBO | Community Based Organization |
| CHD | Coronary Heart Disease |
| DONET | Dodoma Environmental Network |
| FAO | Food and Agriculture Organization |
| FTPP | Forestry, Tree and People Programme |
| GIS | Geographical Information System |
| TDS | Institute of Development Studies |
| ICRAF | International Centre for Agroforestry |
| IK | Indigenous Knowledge |
| IKS | Indigenous Knowledge System |
| IRA | Institute of Resource Assessment |
| ITK | Indigenous Technical Knowledge |
| LK | Local Knowledge |
| LKS | Local Knowledge System |
| MARTI | Ministry of Agriculture Research and Training Institute |
| MPS | Matengo Pit System |
| NALERP | National Agriculture and Livestock Extension |
| NEMC | National Environment Management Council |
| NGO | Non-Government Organization |
| NSC | National Steering Committee |
| PLA | Participatory Learning Action |
| PRA | Participatory Rural Appraisal |
| PRE | Participatory Research and Extension |
| PTD | Participatory Technology Development |
| RIPS | Rural Integrated Project Support |
| RPA | Rapid Rural Appraisal |
| SCSRD | SUA Centre for Sustainable Rural Development |
| TAMWA | Tanzania Media Women Association |
| TGNP | Tanzania Gender Network Programme |
| TFNC | Tanzania Food and Nutrition Centre |
| TPRI | Tanzania Pesticide Research Institute |
| TSZ | Tanzania Shorthorn Zebu |
| UDSM | University of Dar es Salaam |
| UMS | Ufipa Mounds Systems. |