

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

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## 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 it 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, a 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 in inevitable destruction of the natural ecosystem. 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 mountain 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 features 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 complementary studies, while the lowland areas, the areas of new settlement and therefore less populated and with 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, *senko* 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 move 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  $\frac{3}{4}$  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 boehmii*, *Julbernardia globiflora*, *Burkea africana*, *Uapaca kirkiana*, *Parinari excelsa*, and *Pterocaropus 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*, *Syzygium cordatum*, *Syzygium cordatum*, *Syzygium owariensis*, *Vitex donanana* and *Xylopia crubescens*.

### *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 schimperian*, *Bridelia micrantha*, *Dombeya rotundifolia*, *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 pace. 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.

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