

## MULTIPLE USES OF SMALL-SCALE VALLEY BOTTOM LAND: CASE STUDY OF THE MATENGO IN SOUTHERN TANZANIA

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**ABSTRACT** Many recent studies have examined wetlands as a food supply resource in sub-Saharan Africa. Although a number of studies have investigated the use of large-scale wetlands such as swamps and floodplains, little is known about the use of small-scale valley bottom lands. The Matengo, who are Bantu speakers living in mountainous southern Tanzania, have developed intensive use of *ntambo*, the principal unit of land tenure and use. *Ntambo* land use is based on an indigenous farming system called *ngolo* as well as coffee cultivation. At the same time, small valley bottom lands (*kijungu*) have also been used. In recent years, people have begun to pay greater attention to diversifying *kijungu* land use against the backdrop of economic liberalisation, climate change, and population pressure. Cultivating the *kijungu* provides the Matengo not only with food during times of scarcity but also with petty cash called '*hela ya haraka*' for daily use throughout the year. As their use is diversified and expanded, *kijungu* may be vital for sustaining the Matengo's livelihood and will become increasingly important in enforcing relationships between other subsistence activities.

**Key Words:** Cooperative Union; El Niño; *Ngolo*; SAP; Taro.

### INTRODUCTION

Droughts in semi-arid areas of Africa in the 1970s and 1980s raised awareness among national governments and international development agencies about the importance of irrigation (Adams & Anderson, 1988). Wetlands including valley bottom lands were identified as indispensable for the expansion of food production because of their potential for irrigation. By the late 1980s, a number of African countries had also introduced Structural Adjustment Program (SAP) that included market liberalisation. In this new situation, market trends began to directly affect livelihoods, including crop sales and purchases. Because wetland farming is often used to produce high-value garden vegetables for market sales (Scoones, 1991), wetland farming has taken on an important role in food production and income generation.

Several studies have looked at wetland use in sub-Saharan Africa, focusing on such subjects as seasonal swamps (Turner, 1986; Shimada, 1995), riverbanks (Matsuda, 1996), and floodplains (Trapnell, 1953; Scudder, 1962).<sup>(1)</sup> These types of wetlands generally allow for relatively large areas of cultivation; however, little is known about uses of the small-scale indented valley bottoms commonly observed in mountainous areas. Richards (1985) documented many indigenous irrigation systems in West Africa, but did not mention small-scale valley bottom land use. While other studies have mentioned valley bottoms, they have tended

to list only the crops cultivated there (e.g., Ruthenberg, 1971). While valley bottom land represents only a small portion of the land in mountainous areas, it is important to local subsistence. Furthermore, as wetlands are increasingly vital to livelihoods, the use of small-scale valley bottom land must be clarified to better understand current agrarian practices in Africa.

South-western Tanzania is located at the edge of the Great Rift Valley and contains several mountainous areas, including the Kipengere (Livingstone) range. Plentiful rainfall has made the area a major breadbasket for domestic consumption. A year is clearly divided into two seasons: dry and rainy. The main farming activities are practised during the rainy season, although many small valley bottom lands have sufficient water for crop cultivation during the dry season. People regularly use such valley bottoms, but little research has examined land use patterns.

Tanzania introduced SAP policies in 1986, and the associated macro-scale shift to a market economy reached even into rural areas. A number of studies have described how people were forced to adapt to the new situation by diversifying income-generation activities (e.g., Seppala, 1998; Larsson, 2001). However, these studies have focused mainly on the increased diversification of non-farm activities, with little reported on the agricultural sector, let alone valley bottom land use in the production of high-value vegetables or other crops. An exception is Kondo's (2003) study of the *fiyungu* cultivation system of valley bottom land by the Bena in the Iringa Region of Tanzania, which included a detailed soil analysis. The Bena successfully developed valley bottom land and introduced several technical innovations under conditions of socioeconomic change.

The Matengo are Bantu speakers who live in the Mbinga District of the Ruvuma Region in southern Tanzania. They practice sedentary agriculture, including a unique indigenous farming system called *ngolo*.<sup>(2)</sup> They also cultivate coffee (*Coffea arabica*) as a cash crop. Coffee was introduced in the late 1920s when the territory was a British mandate. Coffee cultivation expanded, and the Matengo developed an intensive land-use system based on a combination of *ngolo* and coffee cultivation. However, as detailed below, this system changed under pressures created by economic liberalisation brought by the SAP. In the past, coffee production was supported by the Mbinga Cooperative Union (MBICU), which provided agricultural inputs and marketed the coffee. However, following economic liberalisation in 1993, private buyers entered the coffee market. The MBICU could not compete with private buyers and declared bankruptcy. Because private buyers could not provide all of the services previously rendered by MBICU, farmers had to obtain money to purchase inputs themselves. In 1996, the government abolished subsidies on agricultural inputs, which led to sharp price increases. These changes made it difficult for coffee growers to sustain their production. In 1997/1998, when El Niño-related weather events seriously damaged food production. The people began to use valley bottom land in response to these circumstances and as part of their diversification of income generation activities (Nindi, 2004; Mhando, 2005).

This study describes the recent use of small-scale valley bottom land, con-

sidering the associated socioeconomic and environmental factors and the role of valley bottom land use in Matengo society.

## RESEARCH AREA

The Matengo live in a mountainous area called the Matengo Highlands (Pike, 1938), which range from 900–2,000 m above sea level (Fig. 1). The average annual temperature is about 18°C, the average annual rainfall is about 1,000 mm, and the rainy season lasts from November to May. The area below 1,400 m above sea level is covered with open woodlands (*miombo*), which are dominated by Caesalpiniaceae trees (Itani, 1998).

According to the East Africa census, the Matengo population exceeded 57,000 in 1957 (Baseheart, 1972). A major characteristic of the Matengo livelihood has been *ngolo* cultivation in upland fields during the rainy season. The development of this farming system relates closely to the Matengo's history. Originally, the Matengo inhabited a large area in clan units. There was no hierarchy by which one clan governed over others. In the middle of the nineteenth century,

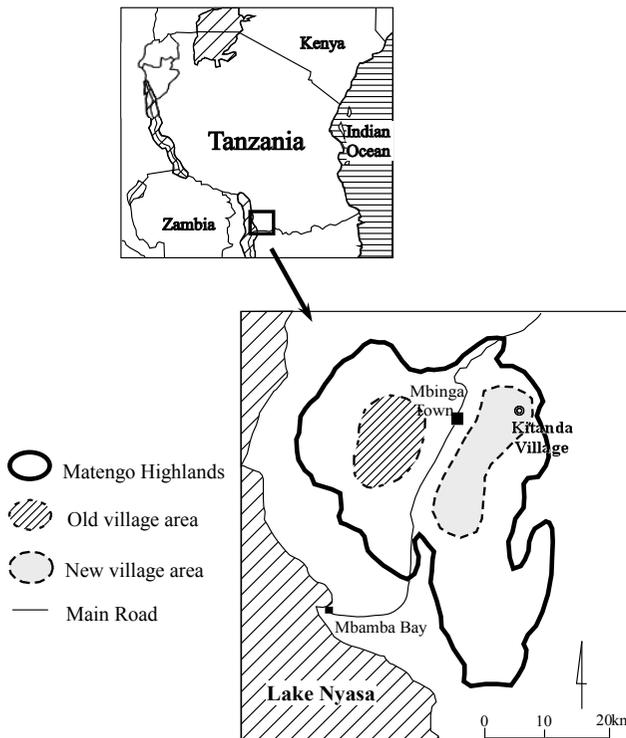


Fig. 1. Location of the Matengo Highlands and Kitanda Village [After JICA (1998)]

the Ngoni people fleeing from Chaka's Zulu Kingdom in South Africa, and the Ndonde, who had occupied the north-eastern part of the Matengo Highlands, began to invade the fertile Matengo Highlands. The Matengo hid in caves in the mountains and began to form a political hierarchy (Baseheart, 1972; Ndunguru, 1972).

The Matengo invented the *ngolo* system to use steep slopes and narrow areas more effectively. Several researchers have studied *ngolo* cultivation and have provided details of its development.<sup>(3)</sup> At the beginning of the twentieth century, during the German colonial period, the Ngoni influx abated, and the Matengo began to expand their territory. After the introduction of coffee, they established intensive land-use systems based on a complementary relationship between *ngolo* for food production and coffee cultivation for cash income.

However, by the late 1960s, population growth had led to land shortages. People began to migrate to engage in seasonal cultivation in eastern parts of the district, where emigrants formed new villages. Here, I refer to the villages in the mountainous area as "old" villages and these newly formed villages as "new" villages. In the old villages, elders exert strong control over society, whereas in the new villages, middle-aged and young people participate in decision-making processes (Sugimura & Rutatora, 1996). My research took place in the new village of Kitanda (Fig. 1), located 15 km east of the town of Mbinga, the seat of the district government office. Kitanda comprises seven sub-villages: Lami A & B, Nsenga A & B, Muungano, Machimbo, and Kiblang'oma.<sup>(4)</sup> The 2003 census recorded 507 households and a total population of 2,358. I conducted research in this village intermittently for 27 months between October 2001 and June 2006.

## FARMING SYSTEMS AND LAND USE

### I. *Ngolo* Farming System

*Ngolo* cultivation involves a 2-year, one-cycle rotation of crops with a short fallow period (Fig. 2). Farmers cultivate maize (*Zea mays*) as a staple food<sup>(5)</sup> and beans (*Phaseolus vulgaris*), as follows. First, to prepare the field, men cut the grass using a reaping hook with a long blade (*mbopo*). Slashed dried grasses are piled into ridges on vertically and horizontally square grids but are not burned. Women then stand at the centre of the square and dig out soil to cover the grasses and form a pit called a *ngolo*; bean seeds are broadcasted on the grid ridges. During the dry season, people begin to harvest the beans as soon as they are dry, and after the harvest, the *ngolo* field is left fallow until the rains begin again. Around November, people make furrows of about 5 cm depth on the ridges and sow maize seeds. After about 1 month, they begin weeding the field, and the maize harvest occurs around July of the following year. The harvested field is left uncultivated until the following March, when

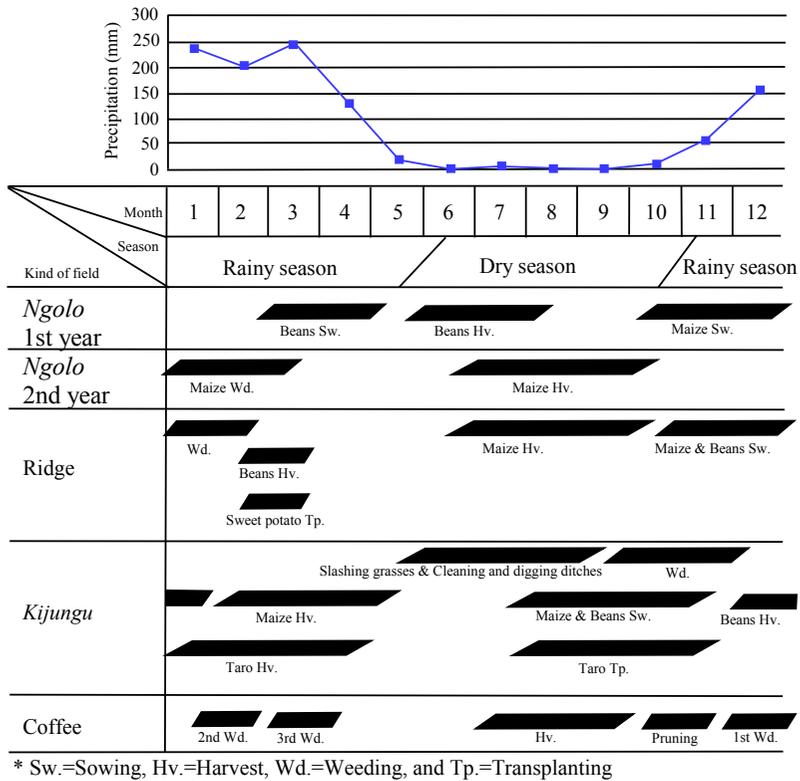


Fig. 2. Average monthly precipitation for 1985–1999, 2002, and the farming calendar  
 Source of precipitation data: Mbinga District Agriculture and Livestock Development Office.

a new *ngolo* is started. The steep slopes are susceptible to soil erosion during heavy rain, but the pits function like sedimentation tanks. As a result, the pits help prevent soil erosion, and at the same time, the buried grasses provide nutrients as green manure. Because of these aspects, the *ngolo* farming system is considered relatively sustainable.

The Matengo have ensured food security by cultivating at least two seasonally rotated *ngolo* fields. Cassava can also be planted in the field where farmers sowed maize and beans. If preparation of the *ngolo* field for beans is delayed, cassava is planted around April or May when the rainy season is over. A *ngolo* field with only cassava is called a *kibagu*. Although cassava needs about 2–3 years until harvest, it provides a complementary staple food during the seasons of food shortage.

## II. Ridge Cultivation

The Matengo also practice conventional ridge cultivation during the rainy season. The ridge cultivation procedure is different from that of *ngolo*. Every year men slash grasses before the rain begins, and after the grass dries, they burn it. Women generally then make ridges and sow maize seeds and beans immediately after the rains start. Commonly maize, beans, and sometimes cassava are mixed in these fields. Beans are harvested around March and maize is harvested around July in the dry season, after weeding the field once. People also cultivate high ridges for sweet potato in home gardens. Sweet potatoes require 2–3 months until harvest and are consumed at scarcity of food.

## III. Coffee Cultivation

Recent coffee production in the Mbinga District accounts for 20% of the total domestic coffee production (Kato, 2002). Almost all households cultivate coffee in a garden near their house. The main tasks in coffee cultivation throughout the year are applying fertiliser/manure and pesticides, harvesting, pruning, and weeding. Some households use herbicides, although most households cannot afford them. Instead, weeding is done 3–4 times using the hand hoe during the rainy season.

As noted above, the MBICU handled coffee marketing in the Mbinga District until 1996. The MBICU provided agricultural inputs on a loan basis and helped coffee farmers manage their coffee trees. In addition, the MBICU made payments in two or three instalments. The first payment, comprising most of the total payment, was made around July to September. Farmers used most of this payment to purchase goods for their home (such as furniture and utensils) or to extend or reconstruct their houses. A second payment around January helped farmers purchase daily needs and agrochemicals despite a small amount. Households arranged their livelihoods throughout the year based on this MBICU payment system. Income from coffee is indispensable for all the cultivators, and if a harvest was failed, the MBICU would provide loans without interest to help support coffee production.

After the liberalisation of coffee marketing in 1994, private buyers were allowed to purchase coffee and compete with the MBICU. Private buyers paid cash once in a manner that differed from that of the MBICU. At the same year, the price of coffee on the world market increased due to droughts in Brazil. Thus, many farmers preferred selling to private buyers, who paid large amounts of cash all at once. As a consequence, the MBICU could not compete with private buyers and collapsed in 1996.

However, Brazilian coffee production recovered in the following year, and prices declined to their previous levels. In addition, the price of agricultural inputs rose in 1996 because the Tanzanian government abolished subsidies. Private buyers were not interested in supplying agricultural inputs; therefore farmers were obliged to pay cash for inputs and transportation services that the

MBICU had previously supplied to ensure sound coffee production.

#### IV. Land Tenure and Use

The Matengo use a land tenure unit called a *ntambo*. As a topographical unit, a *ntambo* is defined as a ridge delineated by valleys (JICA, 1998), although *ntambo* can also refer to a land-use unit. The extended family is the basic unit of use for each *ntambo* (Kato, 2002). In the middle of the slope, people build a house; in the kitchen garden, called *nndwi*, they cultivate leafy vegetables and pumpkins (Fig. 3). Around *nndwi* is a coffee garden usually planted bananas (*Musa* spp.) and *Grevillea robusta* as shade trees for coffee. The slope is called the *uheleu* and is used to cultivate more than two plots of *ngolo*. The valley bottom (*kijungu*), as described in greater detail later, is used for dry season cultivation. People also fetch water from springs in the valley bottom. Mountain-top forest (*kitengo*) and fallow land (*lipusa*) provide firewood, and grasses for livestock such as goats and cattle. The Matengo have established a relatively stable livelihood based on intensive land-use management without seriously soil degradation.

The Matengo society is patrilineal, and thus sons inherit land from their father within his *ntambo*. The sons use the land to cultivate coffee gardens for cash income, and *ngolo*, and *kijungu* for subsistence. Basically, each household can maintain self-sufficient subsistence within *ntambo*. If the number of sons increases to the point where *ntambo* use is saturated, elder brothers may migrate to a new village and obtain new *ntambo*.

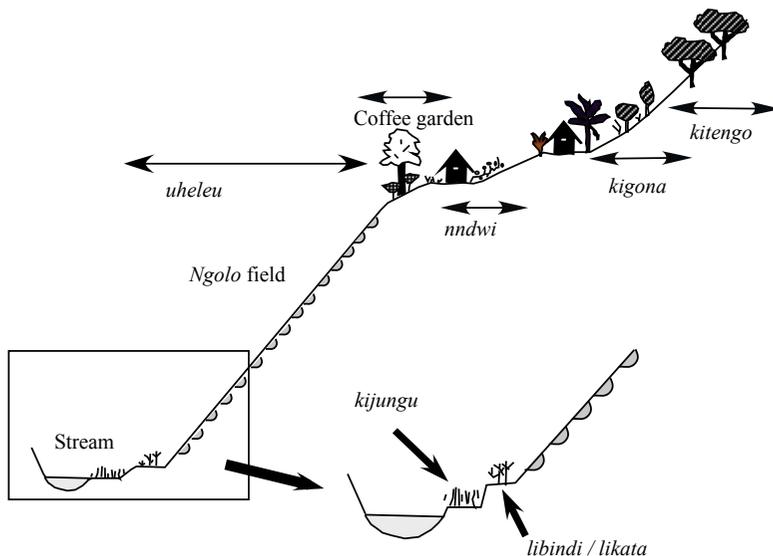


Fig. 3. Cross-sectional view of land use in a typical *ntambo* [After JICA, (1998)]

## VALLEY BOTTOM LAND USE

This chapter examines the role of valley bottom land in the Matengo's livelihood.

### I. Typology of Valley Bottoms

The Matengo classify riverine lands into two types by moisture condition. A relatively dry flat land in riverside is called *libindi* (pl. *mabindi*)/ *likata* (pl. *makata*). In *lbindi/ likata*, people prefer to feed livestock rather than cultivate crops. The second type is *kijungu* (pl. *ijungu*), referring to places where the riverbank retains sufficient water for crop cultivation even in the dry season.

Around the valley bottom land, the dominant woody plant species is *Syzigium cordatum*, and the most common grasses include *Bidens pilosa*, *Cyperus esculentus*, *Galinsoga parviflora*, *Carex* sp., *Malestoma* sp., and *Hyparrhenia* sp.

### II. Crop Cultivation in *Kijungu*

#### 1. *History of Crop Cultivation*

The Matengo have a long history of valley bottom cultivation. As noted earlier, during the Ngoni invasion, the Matengo retreated to caves in the mountains for defence and cultivated steep slopes in those areas. However, the Matengo also cultivated fertile valley bottom land close to the caves, keeping watch for raiders to the best of their ability (Pike 1938). Food was made readily available to raiders in the most accessible and fertile valley bottoms. As long as these valley bottom supplies lasted, the less accessible hillside cultivation was left alone (Stenhouse, 1944). According to Basehart (1973) who studied the Matengo Highlands in the 1960s, some Matengo whose land holdings included valley bottoms with streams allowing for irrigation cultivated small quantities of vegetables, including onion (*Allium cepa*), cabbage (*Brassica oleracea*), tomato (*Lycopersicon esculentum*), and Chinese cabbage (*Brassica* sp.); however, most holders of bottom land planted early maize and beans. When coffee and food productions were stable in the uplands, the Matengo apparently practised *kijungu* cultivation passively. Fig. 4 shows the large valley bottom land in an old village in 2001. According to a researcher visited there in 1994, all the valley bottom lands in this area were covered with bush. However, after the El Niño weather events and economic liberalisation, most of valley bottom lands were converted into cultivated fields within only 7 years. The district council has also promoted the cultivation of valley bottom lands by requiring such cultivation by all adults. In Kitanda, the ordinance requiring valley bottom cultivation was enacted in 1990.<sup>(6)</sup>



Fig. 4. Valley bottom in a mountainous area in 2001

## 2. General Aspects of Crop Cultivation in Kijungu

People begin to cultivate *kijungu* in the dry season after completing the harvests of *ngolo* and ridge fields and selling coffee. As the water level decreases in the mid dry season, they start cutting the grasses; and the dried grasses are burned. They then roughly turn over the soil to dry and break up the soil clumps in preparation for seed broadcasting. They usually make furrows about 5 cm deep, called *likenya*, for sowing. Normally maize and beans are mixed, and weeding is done just once before bean vine growth. Chemical fertiliser and pesticide applications are uncommon for maize and beans. When the rainy season arrives, the *kijungu* fields may become flooded and crop growth and harvests are frequently damaged by the increased water level. Thus, people usually dig ditches to lower the water level. The *kijungu* harvest is consumed during the difficult time of beginning the *ngolo* cultivation, which is the most important agricultural activity for the Matengo. Therefore, harvest from *kijungu* supports the labour necessary for *ngolo* cultivation. Other crops cultivated in *kijungu* are some leafy vegetables, pumpkin (*Cucurbita* spp.), tomato, taro (*Colocasia esculenta*), and sugarcane (*Saccharum officinarum*), as well as coffee seedlings (Table 1). Bananas and bamboo (*Oxytenanthera abyssinica*) are planted at the periphery of *kijungu* in small communities. The sap of bamboo is made into an alcoholic beverage called ‘*ulanzi*’ in the rainy season.

To cultivate leafy vegetables, farmers raise seedlings and transplant them to small beds, using pig manure as a basal dressing. Pumpkin is mixed with maize and beans. The young leaves of pumpkin and beans are also served as a side dish; thus, *kijungu* cultivation plays an important role in providing fresh vegetables during the dry season. Seedlings of sweet potato grown in *kijungu* during the dry season are transplanted to *ndwi* in the rainy season. For tomato cultivation, many people make beds fertilised with manure or ammonium sulphate and then either sow seeds directly or transplant seedlings. For taro, seed tubers are usually transplanted. Taro cultivation is labour intensive because the plants must be earthed up three to five times to encourage corm growth. How-

**Table 1.** Crops and plants found in *kijungu* (n = 53)

Swahili name	Common name	Scientific name	Part of use	Number of the cultivating household
<i>mahindi</i>	maize	<i>Zea mays</i>	grain	53
<i>maharage</i>	kidney bean	<i>Phaseolus vulgaris</i>	leaf, seed	53
<i>figiri</i>	rape	<i>Brassica</i> sp.	leaf	n.a.
<i>chainizi</i>	Chinese cabbage	<i>Brassica</i> sp.	leaf	n.a.
<i>kabeji</i>	cabbage	<i>Brassica oleracea</i> .	leaf	n.a.
<i>ndizi</i>	banana	<i>Musa</i> spp.	fruit, sheath	n.a.
<i>magimbi</i>	taro	<i>Colocasia esculenta</i>	corm, petiole	45
<i>nyanya</i>	tomato	<i>Lycopersicon esculentum</i>	fruit	n.a.
<i>maboga</i>	pumpkin	<i>Cucurbita</i> sp.	leaf, fruit	45
<i>kahawa</i>	coffee	<i>Coffea arabica</i>	seed	n.a.
<i>viazi vitamu</i>	sweet potato	<i>Ipomoea batatas</i>	leaf, tuber	n.a.
<i>miwa</i>	sugarcane	<i>Saccharum officinarum</i>	stem	17
<i>mihogo</i>	cassava	<i>Manihot esculenta</i>	stem, tuber	1
<i>vitunguu</i>	onion	<i>Allium cepa</i>	bulb	n.a.
<i>mianzi</i>	bamboo	<i>Oxytenanthera abyssinica</i>	sap	n.a.

ever, almost all households cultivate taro, indicating the importance of taro as a emergent crop. In season of food shortage, a 20-litre bucket of taro can be worth up to 2,000 Tshs<sup>(7)</sup>; therefore, some households also cultivate taro for cash income.

Based on Global Positioning System (GPS; Garmin Co.) measurements, the average total *kijungu* area of 34 households in Muungano sub-village is about 1 acre (about 4,900 m<sup>2</sup>; Fig. 5). About 80% of households in the village possess/cultivate the valley bottom fields of almost 1 acre, and there is relatively little disparity among households. The few exceptional households that possess large plots do not necessarily cultivate the entire area and instead may allow neighbours to cultivate there on a yearly basis.

Characteristically, in *kijungu* cultivation many farmers cultivate more than one plot in several places. Fig. 6 shows the number of plots cultivated, with 66% of respondents from the 53 households reporting that they cultivated more than one plot.

Most farmers mix maize and beans in one plot and then plant another plot with taro only, while other crops are cultivated on the periphery of plots. Reasons given for cultivating more than two plots include the desire to increase the harvest and dispersing the risks due to the high water level that seriously damages maize and beans. As the population has increased, the land has become divided into smaller plots. Some households that cannot cultivate enough land buy or borrow plots in others' *ntambo*.

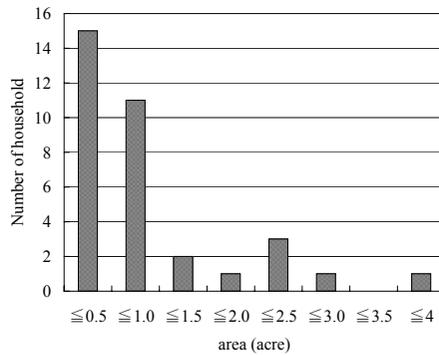


Fig. 5. Total *kijungu* area held by each household (n = 34)

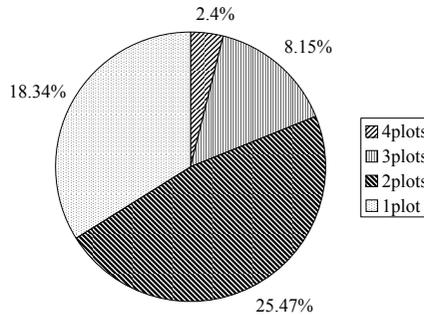


Fig. 6. Percentage of households owning more than one *kijungu* plot (n = 53)

Some problems have occurred in *kijungu* cultivation. One is root damage caused by a caterpillar called *kilinga* (not identified). Second is damage by *magu'wal* or *lisosasosu* birds (not identified). Third is the effect of excessive moisture. If the rains begin earlier than normal, high water levels can affect the growth of maize, and the maize ears may emerge too earlier and die without bearing grain. In addition, while a *ngolo* field can generally be cultivated in 2 days, a *kijungu* of the same size takes the same number of people about 1 week to complete. Furthermore, cultivating heavy clayey soil under strong sunshine is more difficult work than *ngolo* cultivation.

People indicated that *kijungu* cultivation is very important to them. For example, in 2001/2002 and 2003/2004, 31 of 53 households harvested maize in *kijungu* with an average yield of 154 kg.<sup>(8)</sup> In comparison, the average yield of 37 households from *ngolo* was 768 kg in 2002/2003 while the average of 35 households from ridge cultivation was 324 kg. Thus, although the yield from *kijungu* was less than that from upland farming, the harvest is important because it comes at a time of food shortages.<sup>(9)</sup>

## CURRENT TREND OF VALLEY BOTTOM LAND USE

## I. The Introduction and Expansion of a New Variety of Taro

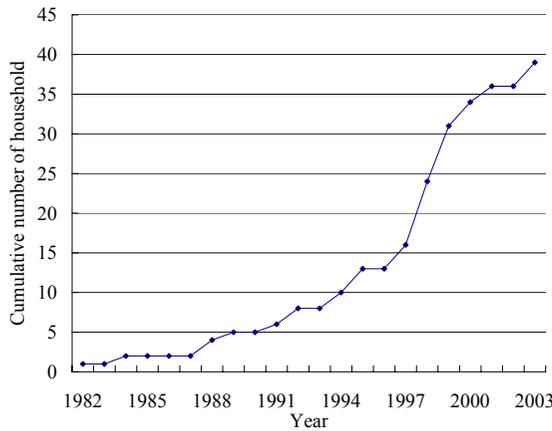
Taro is cultivated by most households in the study village and is a key food in seasons of food scarcity. The variety cultivated now was spread in the village recently. A farmer, who lives in the sub-village of Kiblang'oma, introduced this new variety of taro to Kitanda Village. Below, I describe how the new variety was introduced and spread throughout the village, based on information provided by him.

M is a 51-year-old man. Because he owns a used car and manages a milling service, he has earned some respect from others. He lost his right leg because of illness some years ago, but in his youth he travelled to a number of places in Tanzania. When he visited a neighbouring village, he learned of a new variety of taro from a friend and obtained some seed tubers. He transplanted the new taro into his coffee garden, as he had previously done with the indigenous variety. After 5 years, he met the friend again and learned that the new variety is also suitable for *kijungu*. He verified this information by successfully planting the taro in his *kijungu*. Afterwards, he continued to cultivate taro in the *kijungu*.<sup>(10)</sup> Neighbours observed his progress and gradually have adopted the new type of taro.

Expansion of the new variety of taro in Kiblang'oma began around 1984 or 1985 for two main reasons. First, the new variety is easy to propagate, and growers can obtain enough seed tubers for stable cultivation after only 2 or 3 years. Second, the leaf of this taro is suitable feed for pigs. In the mid-1980s, pig husbandry became popular among the Matengo; pigs were usually fed food residue or maize bran ('*pumba*'), but '*pumba*' could involve costs or be unavailable in the late rainy season. Thus, taro leaves became an important feed.

Although the new variety of taro expanded in Kiblang'oma, its introduction and spread throughout Kitanda is more recent. Fig. 7 shows when residents of Muungano began to cultivate this variety of taro. The number of households using the new variety of taro increased, especially in the late 1990s, suggesting a connection to the impacts of economic liberalisation and El Niño.

A number of reasons may have led to the cultivation of the new variety of taro: no inputs are needed, it provides much calories at hard working especially the *ngolo* cultivating season, its leaves can be fed to pigs, and even one bucket can be sold for income. Based on these characteristics, the new variety of taro was adapted to *kijungu* cultivation and has also helped activate the use of *kijungu*.



**Fig. 7.** Years when households began to cultivate the new type of taro

\*In 2004, 39 of 43 responding households in Muungano Sub-village cultivated the new taro.

Source: Mbinga District Agriculture and Livestock Development Office.

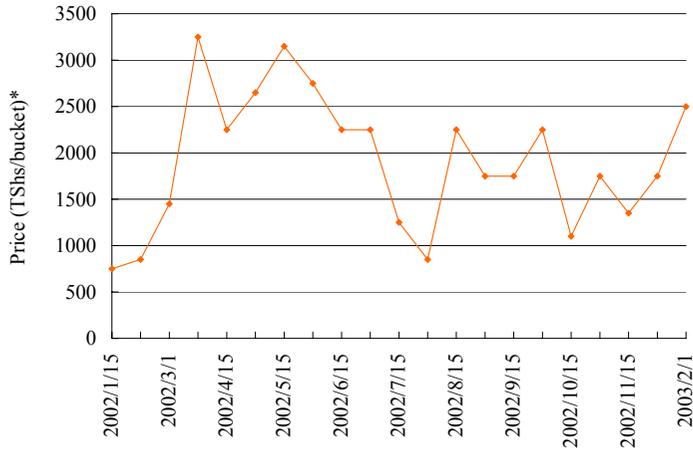
## II. Tomato Cultivation without Input

Another recent trend is the cultivation of tomatoes for sale. As with taro, new varieties of tomato has been introduced. An old variety cultivated in the 1960s required fungicides such as Blue Copper during the rainy season, as well as support frames. A new variety called Money Maker was then introduced, but like other old varieties, was highly perishable. However, more recent varieties called ‘Rome’ and ‘Dumudumu’ do not need support frames and are less perishable. These varieties have prompted an increase in the number of tomato cultivators. Middlemen at the Mbinga market went to Makambako town, in a neighbouring Iringa Region famous for tomato cultivation and trade. However, around 2003, they abandoned that practice and began buying tomatoes brought to market by the Matengo from nearby villages.

Tomatoes are cultivated in both the rainy and dry seasons. The cultivation method varies from direct seeding to transplanting and may include a basal manure/fertilizer dressing or a top manure/fertilizer dressing. In the rainy season, farmers make ditches on the slope and prepare the beds. During this season, agrochemicals are also needed to avoid disease, making rainy season tomatoes more expensive (Fig. 8).

However, tomatoes cultivated in *kijungu* during the dry season can be managed without special inputs. Thus, it is easy for many people, including young people with little capital, to begin tomato cultivation in their *kijungu*. For example, a 28-year-old man planted 8,000 tomato seedlings in his *kijungu* to raise enough money for marriage. He sold 200 of 20-litre buckets to acquire the necessary bride budget.

However, most informants said that they grew tomatoes for self-consumption and petty income. Self-consumption reflects a change in diet. In the past, toma-



**Fig. 8.** Seasonal fluctuation in tomato prices at the Mbinga town market (January 2002–January 2003)

\* Price of a 20-litre bucket

Source: Mbinga District Agriculture and Livestock Development Office.

atoes were not a popular food and remained unsold in the village market. However, individual preferences appear to have changed in recent years, and there is a growing demand for tomatoes even when there is a small supply during the rainy season. Today, tomatoes are used in meat dishes as well as with beans and small fish (*'dagaa'*).

In the dry season, people can earn a lot of money by selling coffee and maize. However, bank accounts are unpopular; at the same time, a person with a lot of money cannot refuse others' requests for it. Saving is thus a very difficult matter in the Matengo society. As a result, people spend their income by purchasing items such as galvanized iron sheet, livestock, and motorcycles as soon as they are paid. Coffee enables a relatively high material standard of living in this area, but because that income is spent immediately, daily life is surprisingly austere. The large sum of money derived from coffee sales is called *'hela ya msimu'* (seasonal income). In contrast, the small sums of money mainly used to purchase basic items such as salt, soap, and cooking oil and to cope with emergency, are called *'hela ya haraka'* (daily income). *'Hela ya msimu'* does not necessarily ensure *'hela ya haraka'* because of their consumption behaviour. Therefore, *'hela ya haraka'* refers to the cash that is available whenever it is needed throughout the year for minimal effort. People usually manage this *'hela ya haraka'* by means of selling a small amount of maize or small livestock or taking part-time jobs. Because tomatoes require 3 months to mature, tomato cultivation in the dry season from *kijungu* provides *'hela ya haraka'* without special capital.

### III. Immature Maize Cultivation

The Matengo enjoy roasted and boiled immature maize as a snack before the harvest season. In seasons of food scarcity, roasted maize is sold at roadside stands in Mbinga. Women peddlers visit offices with buckets of boiled maize. Roasted and boiled maize is an important snack not only for villagers but also for town residents.

Maize that is consumed as roasted and boiled is produced mainly by *kijungu* cultivation. Middlemen who come to villages to buy various crops are called *mchuruzi*; they also buy immature maize for about 70 Tshs/cob and sell it for 150 Tshs in town in November, December, and March. In January and February, four cobs cost about 100 Tshs in the villages and are sold for 400 Tshs in town. In Kitanda, people indicated that *mchuruzi* began to buy crops in their village around 2000.

A 48-year-old man started to sell immature maize 4 years ago. According to him, when *mchuruzi* first appeared in the village, people were reluctant to sell their crops because they were unfamiliar with this process or because they saw the maize as an important staple food. Currently, however, *mchuruzi* are commonplace and buy various crops.

At the same time, people say that crops cultivated in *kijungu* are easily stolen. There are rumours that neighbouring villagers or *mchuruzi* take fully matured maize and sell it in town. In addition, if the maize is left in the field until it is dry, birds will start eating it. Many farmers consider that it is better to sell immature maize before the harvest to avoid these problems. In 2002/2003, that man sold more than 1000 cobs in total, and in the 2003/2004 season he had already sold 270 cobs at the time I interviewed him, and sales were still ongoing. Of the 43 households I interviewed, 18 sold immature maize in 2002/2003.

As stated above, *kijungu* plots are relatively small compared to upland fields, and it is difficult for some households to harvest dried maize. Even when they can harvest the dried maize, it is not necessarily enough for consumption as porridge '*ugali*.' Sometimes it is more reasonable for households that own small plots to sell immature maize, considering the time required for harvesting and the fee for milling. The increased demand for immature maize provides an economic opportunity for households that cultivate small *kijungu*.

### CONCLUSION

While the price of coffee is declining, the need for cash in daily life is increasing. Given this situation, people must find ways to sustain their life during food scarcity seasons. For the Matengo, *ngolo* and coffee cultivations were critical as backbone of their subsistence. In the era of MBICU, which managed coffee cultivation and marketing, paid cash in instalments, and the second payment provided cash for daily needs. However, after the introduction

of SAP, coffee marketing was liberalised and the MBICU went bankrupt, and then, the installment also was no longer available. The economic change influenced all the livelihoods related to food supply and cash income, and the farmers had to search for alternatives. For increasing the food production, however, it was not easy for the farmers in Mbinga to expand their fields as well as to increase agricultural input applications and labours due to economic constraint. In addition, El Niño-related weather events in 1997/98 season heightened insecurity regarding the daily income acquired by selling a portion of the harvest from upland farming, as well as the food supply in general. It also triggered the intensive use of *kijungu*.

Because of its small scale, *kijungu* cannot be a major subsistence option. Despite the geographic restriction the cultivation does have several advantages; maize and beans harvested from *kijungu* are important to compensate a normal diet, taro is also valued to support labour for *ngolo* cultivation practiced in the food shortage season. The wet condition of *kijungu* was favourable for the introduction of hygrophytic crop such as new variety of taro and various vegetables. Active commerce and exchanges between Mbinga and nearby town have diversified the high-value cash crops such as tomato, leafy vegetables, immature maize, and taro. Villagers now have new various income-generation opportunities with low productive costs through the intensive use of *kijungu*. Because the cropping system of *kijungu* cultivation is entirely different from that of *ngolo*, some new crops have been introduced and spread into the indigenous farming system of the areas without seasonal competition of labour.

In the Matengo society, people also try to create income generators for daily needs by using the seasonal income from coffee. They frequently talk about their plans to invest seasonal money in available assets for generating daily cash income such as milling machine, second-hand vehicles for transportation business and various daily goods for kiosk. These investments of seasonal money in small businesses indicate the importance of having daily income throughout the year. On this point, *kijungu* cultivation supplements the daily income by producing new cash crops such as tomato and leafy vegetables during the dry season and immature maize and taro in the rainy season. The diversification of daily income generators through the *kijungu* cultivation indicates that is not only substitute for the installment by the MBICU but also economic self-reliance based on their farming system from the state. As a result, the use of *kijungu* can help households generate daily income throughout the year, reinforcing the linkage between other subsistence activities. *Kijungu* is of increasing importance not only because they provide food and income during food shortage season but also because they support the Matengo's overall system of livelihood.

Finally, the recent use of *kijungu* in the Matengo Highlands also relates to major trends in sub-Saharan Africa. As mentioned above, wetland use has expanded against a backdrop of encouragement by international institutions and national governments and the changes were brought by economic liberalisation in sub-Saharan Africa. In other areas, wetland use is also related to issues such

as land enclosure and social stratification (Woodhouse & Hulme, 2000).

However, in the Matengo society, these problems are not obvious until now. Although there are occasional quarrels about boundaries of lands, most people own farm plots of a similar size. Even those who do not possess valley bottom land can often borrow plots without cash payment. For example, a person with large holdings of *kijungu* may lend some plots to neighbours. In this case, he does not request cash but instead often receives a small portion of the harvest. Through this procedure, almost all households can retain the available *kijungu* and major disparity is not appeared. This situation is possibly attributable to the normative force rooted in *ntambo* land use system that imposes similar conditions for subsistence on all members of the society.

As the market economy expands, agrarian society may become more capitalistic, creating greater social stratification and a collapse of the commons. I suppose this has not yet happened among the Matengo through the analysis of agricultural changes from a view point of *kijungu* utilization. The fact that there is no economically outstanding person in this area is possibly related to the norms based on *ntambo* land use system.

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#### NOTES

- (1) Researchers differ somewhat in their definitions and typologies of wetlands. For example, Windmeijer & Andriess (1993) have assigned these types of wetlands the generic name ‘inland valley.’
- (2) In this article, the Swahili words are presented with quotation marks. Other local vocabularies are the Matengo, except for *fyungu* of the Bena word.
- (3) For further details on the *ngolo* farming system, see Pike (1938), Allan (1965), Basehart (1973), ICRA (1991), Itani (1998), JICA (1998), Kato (2001), and Nindi (2004).
- (4) Provinces in Tanzania are sub-divided as follows: Region, District, Division, Ward, Village, and Sub-Village.
- (5) A staple diet of the Matengo is a kind of thick porridge called ‘*ugali*,’ which is often made of maize flour.
- (6) From an interview with the chairman of Kitanda Village.
- (7) Tanzania Shillings, the currency of Tanzania. In 2006, 1 US\$ = 1,100 Tshs.
- (8) Harvest (‘*ku-vuna*’ in the Swahili) refers to the gathering of maize after it has dried in the field. This term is not used to refer to the gathering of immature maize for roasting or boiling. Thus, in this case, 22 households did not harvest maize.

- (9) Usually a household comprised of two adults and two or three children consumes about 120 kg of maize a month.
- (10) M indicated that he also tried to transplant the indigenous variety into *kijungu* but it did not grow as well as the new variety.

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