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Land Use Change and Livelihood Diversification In Usangu Plains, Tanzania

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Abstract

This paper presents the assessment of land use changes and its implication to household livelihood in the Usangu Plains, Mbarali District. Remote sensing, participatory and questionnaire survey methods were used in the study. Findings shows that the Usangu Plains have experienced changes in land use towards agricultural land use intensification due to high population growth, market demand for rice, and the impact of liberalization policy. This has consequently contributed to high demand for land and farm labour, as well as their commercialisation. Households adapt to these emerging conditions through livelihood diversification, depending on their access to livelihood assets. *Well-off* households have heavily been involved in commercial rice production and diversification to high capital investments. *Intermediate* households with few livelihood assets were restrained from commercial rice production, and thus diversified to less capital investments. *Poor households* pursued survival strategies due to very limited endowment of assets and livelihood options, and diversified to activities with non-cash investments (casual labour, sales of charcoal/ firewood). The *well-off group* is more successful in exploiting available opportunities, while the *poor group* is the most vulnerable to changes, and their strategies have had more negative impacts on the environment. Diversification to off-farm income-earning activities is increasing with changing market conditions (liberalisation). However, this does not imply farewell to farms at the expense of off-farm income-earning activities. The on-farm and off-farm income activities are interlinked and crucial to household livelihood in the Usangu Plains.

Keywords: *Land use change, livelihood diversification Usangu plains, Tanzania*

Introduction

Agricultural land in sub-Saharan Africa (SSA) is a critical resource and basis for survival for most of the population. Agriculture contributes about 40% of the regional gross domestic product, and employs over 60% of the labour force (World Bank, 1998). In Tanzania, agriculture is the backbone of the national economy, contributing about 45% of the GDP, 60% of export earnings, and provides livelihood to 82% of the population (URT, 2005). Thus, one of the big national challenges is to increase agricultural productivity to achieve sustained economic growth and poverty alleviation.

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This has been envisaged in various national strategies and policies. The National Strategy for Growth and Reduction of Poverty (NSGRP) has underscored the need to improve smallholder farmers' rural livelihood, and consequently ensure sustainable growth and poverty reduction (URT, 2005). This goal is also envisaged in the Agricultural Sector Development Strategy (ASDS), and the agricultural policy of Tanzania (URT, 1997).

Many SSA countries have undergone major social, economic and political reform to enhance rural development and economic growth. Among other aspects, the reforms aimed to reverse the decline in economic growth. Since 1980s there has been extensive deregulation, which includes agricultural market reforms that encompasses rapid withdraw of state regulations and gradual state disengagement from crop marketing (Havnevik et al., 2003). These reforms have led to continuous changes facing African governments, communities, and the private sector. Some of such reforms have constrained productive and commercial developments, while in some other cases they have provided an opportunity for agricultural development and rural livelihood diversification (Ponte, 2002). As such, most agricultural land use systems have been subjected to changes to meet the needs and constraints induced by such reforms.

Since independence, the agricultural sector in Tanzania has experienced various socio-economic and political related changes, including high population growth, villagisation programme, agricultural market reforms and trade liberalisation (Larsson, 2001). With market liberalization, demand has dictated the type of crops farmers have to produce (Ponte, 2002). Some farmers were compelled to produce more crops that fetch high demand and competitive prices in the market. This situation has influenced household livelihood strategies, including diversification and access to agricultural resources (e.g., land and labour). Livelihood strategy encompasses the range and combination of activities pursued by households to provide sources of livelihood. In adapting to the changing conditions, households have opted for different livelihood strategies, which varied from one community, as well as from one household, to another. Such differences reflect the level of endowment of livelihood assets and vulnerability to change.

This paper assesses agricultural land use changes, main drivers to change, and the implication to smallholder farmers' livelihoods. It also examines household livelihood strategies in adapting to changing conditions in the Usangu Plains. To address patent issues in smallholder agricultural production, it is important to understand land use dynamics and household differences in adjusting to land use changes.

Theoretical Understanding of Agricultural Land Use Changes and Rural Livelihood

Agricultural Land Use Changes

To date there is extensive body of literature and theories accounting for agricultural land use changes. One body of literature is based on consumption (needs based approach), and focuses on the relationship between land use changes and population growth. The discussion of the linkage between population and agricultural land use changes can be traced back to the Malthus/Boserup debate (consumption-demand approach). This debate has emerged from the classic debate of the dynamics of population growth and density inspired by Boserup's critique of Malthusian interpretation. The Malthusian theory postulates that the power of population to grow when unchecked is indefinitely greater than the power to produce subsistence for mankind (Malthus, 1960). He argues that as rural population grows, land per capita diminishes, and household food sufficiency becomes threatened.

Malthus held negative expectation of the relationship between agricultural growth and population. He saw land expansion as an alternative response to increased population pressure, leading to cultivation of marginal land, land fragmentation, decreasing productivity and famine—a pathway to poverty and environmental degradation. However, he undermines the role of technological advances in improving agricultural production to sustain needs of the growing population. With increasing population there are also some possibilities of households to diversify to other income-earning activities besides agriculture, as well as to migrate to other areas with more livelihood earning opportunities. However, despite such shortcomings, his perceptions of resource scarcity, as well as the effect of population growth on land resources, cannot be ignored in understanding agricultural land use changes and resource use in many developing countries, including Tanzania. Malthus raised awareness of resource scarcity that, at a point in time, may be depleted in terms of quantity and quality. He also recognizes processes that contribute to scarcity of resources. Such a situation raises concern on the need for conservation and sustainable use of resources. Malthus recognized that with increasing population there is a possibility of expansion of agricultural land, where land is available to meet food demand of the increasing population. Malthus' predictions have prompted alternative views such as those from Boserup, which relate population growth and agricultural intensification.

Focusing on the same issue of population, Boserup (1965) deviates from Malthusian assumption of constant technology by emphasizing the role of high population growth in stimulating agricultural intensification through development and adoption of new technologies. The consumption approach to agricultural intensification is based much on theoretical propositions from

Boserup (1965 and later revised in 1981, 1985). Under Boserup's perspective, agricultural change is driven primarily by the changing consumption need of the local population due to population growth. Boserup (1965) argues that demographic pressure act as catalyst in compelling farmers to adopt intensification of agriculture. As population pressure increases, arable land becomes scarce, and this spur of scarcity necessitates people to intensify agricultural production. Similarly, it has been noted that high population growth and higher population density compel farmers to intensification process to meet the needs of the growing population (Netting, 1993).

Intensification may be achieved through increasing output from limited land by development and adoption of new technologies, use of more input such as labour and manure/fertilizer, frequent cropping, or investment of capital for long-term land improvement (Boserup, 1965; Pingali et al., 1987; Netting, 1993). Some case studies done in Sub-Saharan Africa have suggested that agricultural systems are intensifying, and therefore improving ecosystem and yield (Netting, 1993; Turner et al., 1993; Tiffen et al., 1994). These studies have shown that with increasing population pressure and shortening of fallow periods, farmers are using techniques to substitute the effect of shortened fallow period on crop field to improve productivity. This is achieved by the application of fertilizers, manure or agroforestry. Likewise, irrigation intensifies production by enabling techniques of more continuous cultivation over the year (Gray, 2000).

In general, the consumption theories discussed above have been criticised for undermining the linkage of the household mode of production to the external market. Although Boserup later considered market development, she views it as endogenous factor stimulated by population growth (Boserup, 1981; 1990). She argues that as population density increases there will be intensive land use, with most of the land between villages inhabited/settled. In such a situation, a point will be reached where small market emerges as well as urban centres. Thus, market centres will emerge where population density is high, and agricultural land use would be intensified around such market centres. In the contemporary situation, most households produce both for domestic use and surplus for market (Ellis, 1998). In the same line, it has also been argued that small farm holders do not live in isolation from larger networks of economic exchange or political organization: their desire of goods and services, as well as their resource scarcity link them to external relationships (Netting, 1993). Thus, other factors such as land tenure system, fluctuation in physical environment, government policy and market may have influence on land use change, suggesting that population pressure is not the only stimulus for agricultural land use change (Tiffen et al., 1994; Reenberg, 1998).

The second body of literature linked agricultural land use changes with the market. It has been argued that households are risk-takers and profit-maximisers who are driven by higher income to maximise production by responding efficiently to farm market innovation in allocating their land and labour resources in farming (Schultz, 1964; Wharton, 1969). Reviewing West African cases, Gleave and White (1969) suggest that the production of cash crop could lead to land use intensifications much similar to those induced by high population. Thus, changes in the market, in terms of price incentives, create changes in land use. Brush and Turner (1987) argue that market demand could compel households to produce surplus above their subsistence needs. This will be due to market incentives that make farmers allocate more resources in their limited land so as to maximize profit. In this aspect households invest their scarce resources, such as labour, as long as the market is providing incentive in terms of profit.

The role of market in agricultural intensification has also been demonstrated in von Thunen's model of the 'isolated state' (see also Hall, 1966; Brush & Turner, 1987; Dicken & Lloyd, 1990). The model shows how market processes could influence land use in different location. The model focuses on market and its associated distance as a determining factor in the intensification process. The model assumes that land use close to a market will be highly intensified with high frequency of cultivation associated with production of high value products and perishable crops. Meanwhile, the extent of intensification decreases as farms become further away from a market, depicting zones of different land use intensity. In other words, agricultural production will intensify in areas near to a market to support high population demand in the market and vice versa. Despite the fact that the assumptions are too oversimplified to be realistic, the model still have some usefulness on the way a market and its distance to a given locality influence land use intensity. We may, however, acknowledge a strong relationship between transport system and agricultural land use patterns. Also, as one gets closer to a city, the price of land increases.

Although peasants may be seen as profit maximisers by responding to market demand through increasing labour or capital investment in agricultural production, they cannot easily achieve the economic efficiency in the allocation of resources. It has been argued that peasant households are not true risk takers; rather they tend to be risk averse and optimisers who produce to meet subsistence needs as their survival strategy (Lipton, 1968; Schulter & Mount, 1976). In the same line of argument, this implies that subsistence farmers may suspend production of certain crops if they fear that their labour output would decline due to various factors, including environmental and market related risks of cultivation.

Market influence is not the only factor that can explicitly provide an explanation for agricultural land use change. Pingali et al. (1987) concluded from their study in Sub Saharan Africa that population growth and access to markets were the main determinants of intensification. It has also been argued that agricultural land use change is a response to the interaction between demands (consumption or market demands), and the biophysical environment in which it exists (Brush & Turner, 1987). Human-environment relationship is shaped by various constraints imposed by the physical environment, and the technological abilities of households to match with these constraints (Bayliss-Smith, 1982; Blaikie & Brookfield 1987; Brush and Turner 1987). Biophysical factors such as soils, seasonality of rainfall and inaccessibility to irrigation water may have an impact on land use change despite the presence of high population and good market incentives. The biophysical factors may act as constraints to agriculture intensification as it offers certain kind of limitation to production.

Land Use Change and Household Livelihood Diversification

The concept of livelihood as a means to illustrate changes emanating within local community and household diversity in the access and allocation of resources has increasingly gained importance in rural studies (c.f. Chambers et al., 1981; Reitsma et al., 1992; Ellis, 1998; 2000; Birch-Thomsen et al., 2001; Bryceson, 2002; Carney, 2002). These studies have emphasized rural diversity and demonstrated the importance of non-agricultural income-earning activities in constituting household livelihood. Studies carried out in rural communities have shown that rural households are not homogeneous, they differ in their size and composition, access to livelihood assets, as well as their consumption patterns (Reitsma, 1992; Sepalla, 1998; Ellis, 2000; Liwenga, 2003; Lyimo, 2005). Such a situation reflects different livelihood strategies pursued by households in improving their living standards. Opportunities for income may thus vary between different households in a community due to such differences in gender, age, assets, etc. (Ellis, 1998). For example, access to land is one of the key determinants of distinct livelihood strategies pursued by poor compared to better-off households.

Various literatures on livelihood have shown that livelihood strategies and diversification have been commonly analyzed together (see, for example, Ellis, 1998; Bryceson, 2002; Ponte, 2002). In its simple form, diversification in rural areas implies the combinations of farming and other different types of off-farm income-earning activities (Larsson, 2001). Over the past two decades various studies on rural development have shown that there is evidence of gathering momentum of livelihood strategies based partly on farming on one hand, and on increasing participation in off-farm income-earning activities on the other (Bryceson & Jamal, 1997; Bryceson, 2000; Ellis, 2000; Larsson, 2001; Ponte, 2002).

Bryceson has argued that rural areas in SSA have undergone rapid changes, and that rural income diversification through non-agricultural employment is taking place at the expenses of agriculture; terming the process as *'de-agrarianisation'* (Bryceson, 1997; 2000). Moreover, she argues that policies such as structural adjustment programmes and the market liberalization of peasant production have affected rural production and infrastructure. Farming in remote areas has experienced decline in market services, and the removal of subsidies in agricultural inputs has constrained agricultural production. Also, the reduction of public funding on schools, hospitals and other social services has led to increasing needs for cash. As a consequence to all this, the lack of flexibility of peasants to accommodate these changes has led to long-term occupational adjustment, income earning reorientation, social differentiation and spatial relocation of peasant away from strictly agricultural-based livelihood *(de-agrarianization). De-agrarianisation* takes the form of urban migration, as well as the expansion of non-agricultural activities in rural areas providing new income sources and occupations to rural households (Bryceson & Jamal, 1997).

Materials and Methods of the Study

The study of this paper was undertaken in Imalilo Village, Usangu Plains, Mbarali District (Fig. 1). The plains are important for irrigated rice production, which contributes about 20% of rice produced in the country (SMUWC, 2001). It also has numerous rivers which flood during the rain season, thus making the area potential for irrigation. Agriculture is the main sources of livelihood, dominated by small farm holders who produce for domestic consumption and partly for the market. It also comprised of large and medium scale rice farms, which offer seasonal farm employment.

Data Collection

Documentary Data Search

Relevant secondary data on socio-economic and physical aspects were obtained from various records, both published and unpublished literature from within and outside the Mbarali District headquarters.

Aerial Photographs and SPOT Image Interpretation

Aerial photograph and SPOT image interpretation was used to generate general land use maps to show the extent of agricultural land use changes. A comparison was made from aerial photographs and the SPOT images at a scale of 1:50,000 taken in July 1977 and June 1995 respectively. This is a medium range scale, commonly used for mapping vegetation cover and land use types (Lillesand & Kiefer, 2000). The 1995 SPOT scene was used because at the inception of the study it was not possible to acquire more recent image coverage of the area. Preliminary interpretation of the imagery and aerial photographs preceded fieldwork to validate the interpretation, and to relate

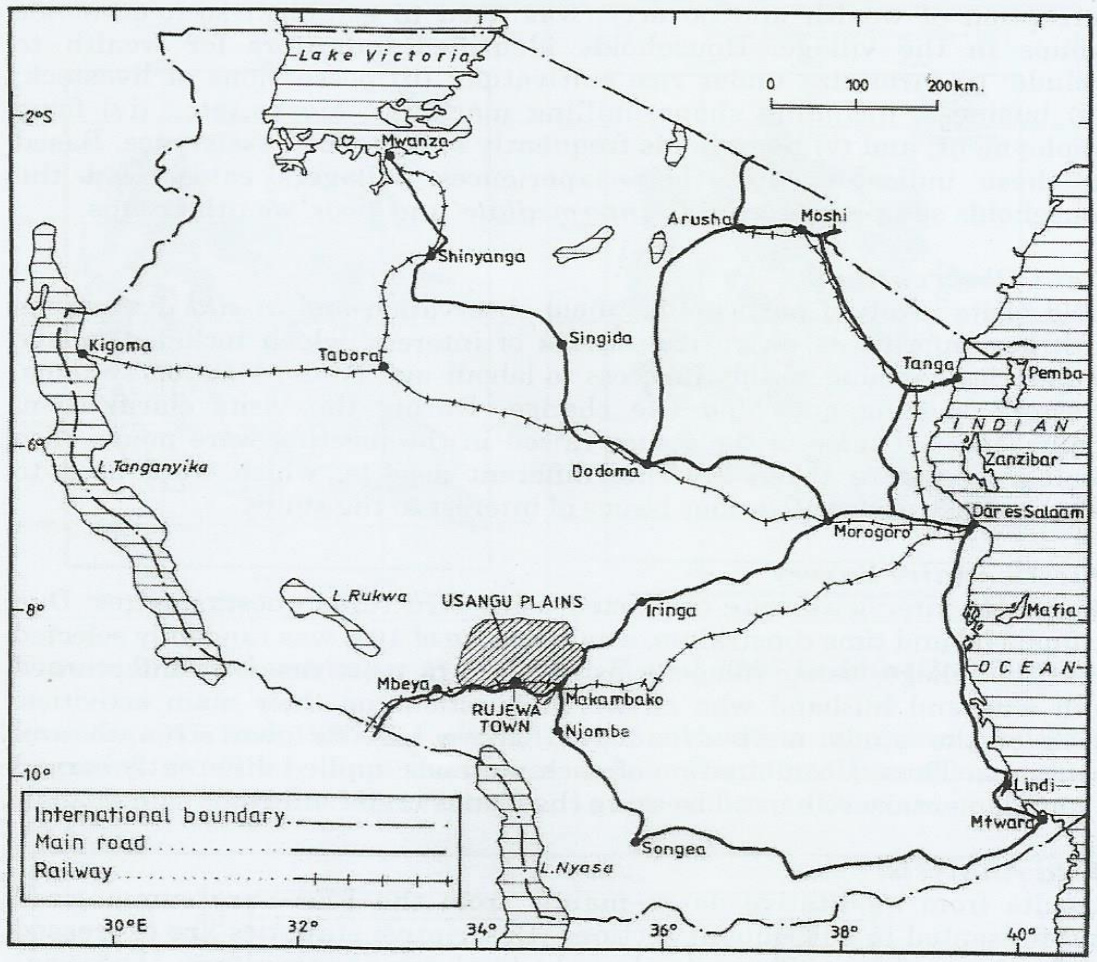

Figure 1: ***Map of Tanzania Showing the Location of the Study Area with Rujewa Town as district headquarters***

the image with current features on the ground. Result from the land use analysis was complimented with qualitative information from key informants and other most recent related studies done in the area.

Participatory Rural Appraisal (PRA) Method

The study used the PRA method to get an in-depth knowledge of the local people (Chambers, 1994). The method provides reliable information since it allows discussion and free dialogues among the local people on their issues and to cross-check each other's knowledge. Among the various PRA techniques the study adopted focus group discussions, wealth ranking, and participatory field observations. Wealth ranking, based on the villagers

perception of wealth and poverty, was used to establish socio-economic groups in the village. Households identified indicators for wealth to include: (i) farm size under rice cultivation; (ii) possessions of livestock; (iii) business, including shops, milling machines, kiosks, etc.; (iv) farm employment; and (v) households frequently seeking food assistance. Based on these indicators and their experiences, villagers categorized the households sample to *'well-off', 'intermediate'* and *'poor'* wealth groups.

Field Observations

Field visits involved participatory field observation and *in situ* discussions with key informants on various issues of interest, which included village boundaries, farming methods, access to labour and land, irrigation systems, livestock keeping and land use change. During the visits clarification/ confirmation of some of the issues raised in the meeting were made. Also photographs were taken covering different aspects, which were used to provide illustrations of various issues of interest to the study.

Questionnaire Survey

Household interviews were conducted using structured questionnaires. Due to financial and time constraints, a sample size of 10% was randomly selected from the village, using village register book. In most cases we interviewed both wife and husband who answered questions on their main activities. Each of the study methods adopted above has its own strength and weakness. Thus, a combination of such methods applied differently served a complementary role in addressing the issues under study.

Data Analysis

Results from qualitative data—mainly from the PRA—are summarized and presented in subsequent sections. Descriptive statistics are expressed in the form of percentage. Analysis of land use changes from the aerial photographs and SPOT imagery for each land cover are summarized and presented in the form of land use maps, and as percentages in histograms.

Results and Discussion

Analysis of Agricultural Land use Changes in the Usangu Plains

Understanding of the processes of land use changes in the Usangu plains is complex as it involves interactions of various factors within, as well as beyond, households' sphere of influence. The analysis shows an overall increase in agricultural land use with conversion and modification of land use/cover types (Figs. 2 & 3). This has contributed to expansion of agricultural land frontier as well as selective agricultural intensification mostly associated with irrigated rice production.

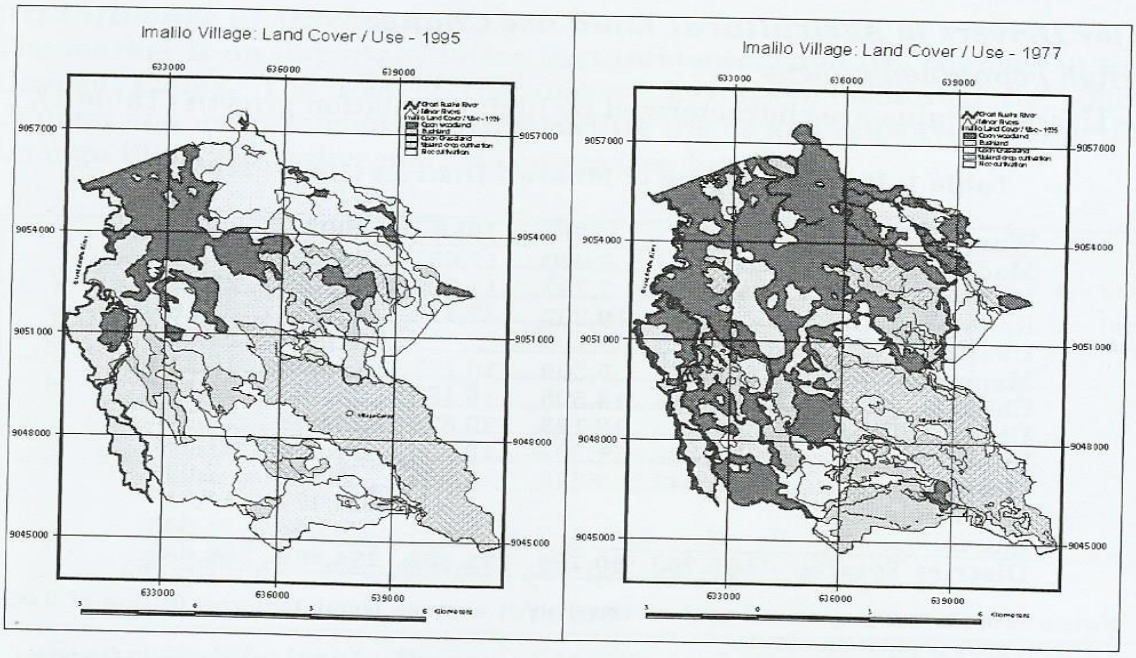

Figure 2: ***Land use/cover types in 1977 and 1995 in Imalilo Village***

Between 1977 and 1995, for example, rice cultivation increased by 188% compared to other land uses/cover types (Fig. 3). Discussions with villagers also confirmed increasing expansion of rice cultivation.

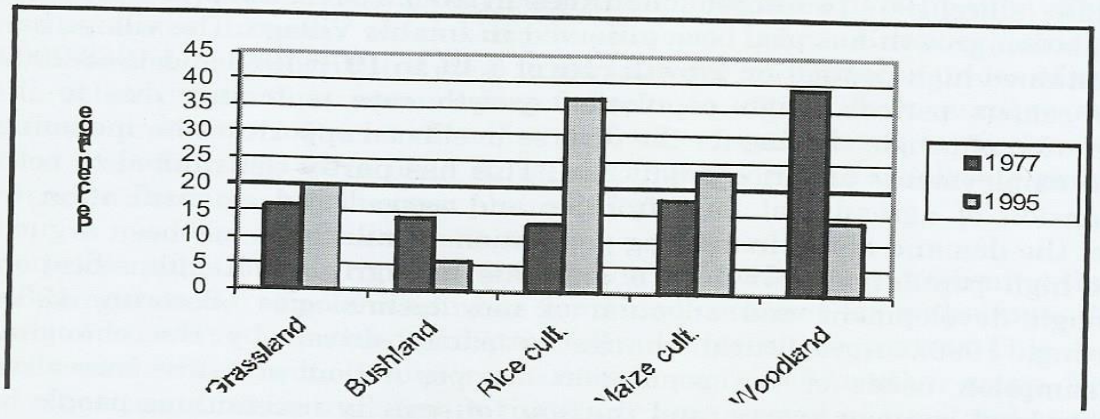

Figure 3: ***Changes in Agricultural Land Use/Cover Types in Imalilo Village***

Source: Field survey (2003) and Interpretation of 1977 aerial photos and 1995 Spot Imagery

Major Drivers to Agricultural Land use Change

(i) High population growth

The Usangu Plains are characterized by high population growth (Table 1).

Table 1: Population size of Mbarali District (1967 – 2005)

Ward	1967	1978	1988	2002	2005[1]
Madibira	4,823	8,000	17,657	28,414	31,048
Mawindi	6,928	7,767	17,728	27,138	29,654
Rujewa[2]	9,995	19,202	37,417	27,553	30,108
Ubaruku				31,928	34,888
Mapogoro	4,278	5,509	10,111	15,808	17,273
Chimala	9,116	14,505	15,183	23,395	25,564
Utengule/Usangu[2]	7,473	18,123	29,875	25,868	28,266
Ruiwa[2]	9,508	11,307	19,556	10,421	11,387
Msangaji	4,642	6375	5,355	6,438	7,034
Mahongole				14,477	15,819
Igurusi[2]				23,468	25,643
District Total	**56,763**	**90,788**	**152,882**	**234,908**	**256,684**

Notes: [1]Population projection based on the district average population growth rate of 3.06 from 2002 population census

[2]In 2000 the Rujewa, Utengule/Usangu and Ruiwa Wards were split into Ubaruku, Igurusi and Mahongole Wards respectively, contributing to the declining population sizes.

Source: URT 1989; 2003.

The annual population growth rate in 2002 was about 3.06% compared to 2.9% for the whole country (URT, 2003). The population has increased steadily since 1967 to almost four times in 2002 (URT, 1989; 2003). High population growth has also been observed in Imalilo Village. The village has maintained high population growth rate of 3.4% in 1978-1988 and 1988-2002 inter-census periods. High population growth rate is mainly due to in-migration of people seeking for the diverse livelihood opportunities, including farm employments and rice production. This has partly contributed to both expansion of agricultural land frontier and agricultural intensification to meet the demand of the increasing population. Similarly, it has been argued that high population growth is a stimulus for agricultural intensification through development and adoption of new technologies (Boserup, 1965; Netting, 1993). Agricultural change is partly driven by the changing consumption needs of the population. As population pressure increases, arable land becomes scarce, and the *spur* of scarcity necessitates people to intensify agricultural production. Likewise, it has been noted that when land becomes scarce due to in-migration or natural population growth, the desire to increase farm output per unit area and higher population density, compel farmers to intensification (Netting, 1993).

(ii) Influence of Market

The market is an important factor that influences land use changes in the Usangu Plains. The role of the market has been facilitated by policy changes and improvement of infrastructure (roads and railways) linking the Usangu Plains and other market centres (see Fig. 4).

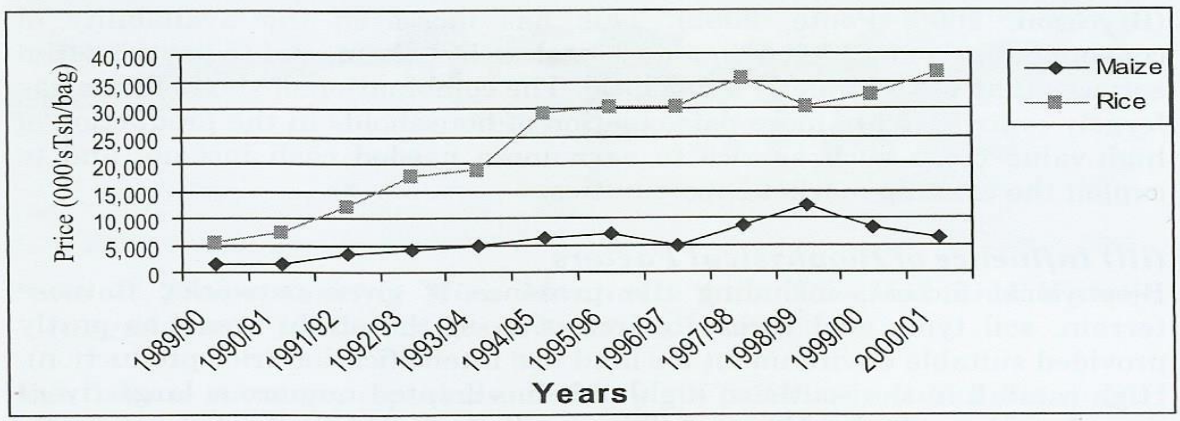

Figure 4: ***Wholesale Prices of Maize and Rice in Mbeya Town***
Source: MAFS (2003)

Good access to Rujewa town has facilitated the interaction of traders to the market, with Rujewa becoming an important rice-trading centre. The implementation of liberalisation policy has largely improved the market for agricultural crops. This has partly been due to increased participation of the private sector in crop marketing in Rujewa town. However, market liberalisation has contributed to a rapid increase in producer prices of rice than other crops, thus encouraging farmers to extend farm acreage and increase production. Prices of maize and rice from Mbeya town, located 50km from Rujewa, were used to reflect changes in the wholesale prices for the two crops in the Usangu plains[2] (Fig. 4).

The prices of both crops have increased over time. However, assuming that the marginal cost of production has remained constant for both crops, the price of rice has increased substantially compared to maize. This has partly made rice production more attractive compared to other crops. The actual prices of maize and rice in the study area varied in time and space. During the field survey, the price of 100kg bag of maize ranged from Tsh

[2] With market liberalisation system there are various unrecorded market outlets including private traders buying crops directly from farmers without been registered to avoid paying tax as well as buying crops directly from the field before being harvested and weighed. Such situation made it difficult to keep proper and reliable records on crop yields.

3,500[3] during harvesting time, to Tsh 6,000 before new harvesting season. For rice, the price of 100kg bag ranged from Tsh 10,000 during harvesting time to Tsh 25,000 before the commencement of a new cropping season.

The implementation of structural adjustment policy increased the commercialisation of rural life as observed in other parts of Tanzania (Bryceson, 2000; Ponte, 2002). This has increased the availability of consumer goods and high demands of cash to buy them, and to pay for social services that were formerly subsidised. The combination of such factors has largely contributed to more participation of households in the production of high-value crops such as rice to earn more needed cash income, and to exploit the existing market opportunities.

(iii) Influence of Biophysical Factors

Biophysical factors, including the presence of river networks, flatness terrain, soil types and access to irrigation in the study area has partly provided suitable environment for land use intensification (rice production). High rainfall in the southern highlands has created numerous large rivers that flow through the Usangu plains, making the area flooded especially during the rainy season, and potential for irrigation (See Fig. 2). Flat terrain has made the soil less prone to water erosion, with most of the soils fertile to support rice production without the use of fertilizers. Brush and Turner (1987) have also noted the influence of biophysical factors by arguing that agricultural land use change is a response to the interaction between demands (consumption or market demands) and the biophysical environment in which it exists.

To sum up, high population growth and land scarcity alone may not be sufficient factors that bring about land intensification in the Usangu Plains, as well as in rural areas in Tanzania. Favourable conditions such as access to markets, infrastructure development, good policy supporting small farm holders' production and suitable ecological conditions are crucial to stimulate agricultural intensification. The observed land use changes are functions of interplay of various socio-economic factors such as high population growth and market access, and biophysical factors. Moreover, the changes are also influenced by household's desire to meet their livelihood as conditioned by these factors.

Implications of Agricultural Land use Changes

Agricultural land use changes have contributed to increasing commercialisation of irrigated rice production as reflected by the increase in

[3] One USD in 2005 was equivalent to Tsh. 1000/-

acreage under rice cultivation (Fig. 3). The rice production system is labour intensive as most of the field operations are done manually, including transplanting (Plate 1) and harvesting.

Plate 1: ***Transplanting Rice Manually in a Levelled and Water-logged Rice Field.*** Photograph by James Lyimo (2003)

High labour shortage, especially during peak periods, is one of the major problems in rice production, partly contributing to poor crop performance. With increasing commercialisation of rural life and rice production, access to farm labour has led to more labour hiring practice than work parties, which were commonly used in the past. Such a situation has led to the development of a vibrant labour market in the Usangu Plains. Also, high competition of land for rice production has led to land scarcity, with development of land market including land renting and purchasing. Access to reliable irrigation water and proximity to market centres have added value to land to the extent that renting and purchase of land for rice production are increasingly becoming more prominent.

Mobilisation of adequate labour at the right time, as well as access to productive irrigable land, are very crucial to optimise output from land use intensification given the seasonality of agricultural operations. However, the success of households in mobilising and allocating agricultural resources depends on their livelihood strategies, which is largely influenced by access to livelihood assets and flexibility to mobilise them.

Household Livelihood Diversification

An analysis of livelihood strategies shows that besides on-farm activities by all households, another important livelihood adaptation has been diversification to off-farm economic activities. The extent of involvement in such activities and their importance to households vary considerably from one wealth group to another given their differences in livelihood assets and flexibility in resource mobilization and allocation (Table 2).

Table 2: Livelihood assets of the Wealth Groups in Imalilo Village

Wealth group	Well-off (n=10)	Intermediate (n= 50)	Poor (n=20)
Average Household size	11.8	7.3	5.0
Average farm size-rice (ha)	3.2	1.7	0.3
% HHs keeping livestock	All	28	0
Average no. of livestock	154	45	0
Average income -crops (000's Tsh.)	593	156	23.5

Source: Field survey (2003)

Livelihood assets include (i) human capital (e.g., skills, knowledge and ability to work; (ii) natural capital (e.g., land, water and environment); (iii) financial capital (e.g., savings, remittances and cash income); (iv) physical capital (e.g., transport, water, and communications; (v) social capital (e.g., networks, groups and access to institutions). Households in their respective wealth groups are all engaged in farming in different scales cultivating rice and/or upland crops such as maize *albeit* their differences in the scale of engagement and level of incomes derived from such activities.

The *well-off group* has access to more livelihood assets and high capability to do things in the village. Such a household group has high flexibility in mobilising and allocating farming resources, including labour and land. It owns and cultivates the largest and productive rice farms, and has a high number of livestock (see Table 2). In contrast to other groups, it is very successful in exploiting existing market opportunities and the ecological potential through commercialization of rice production. Given such conditions, well-off households have acquired more fertile land and expanded their agricultural land frontier into new potential areas for rice production. Due to the possession of financial, human and social assets, they accumulate additional productive land through purchase and renting, and mobilisation of farm labour through hiring when required (Table 3).

Table 3: Means of Access to Additional Land for Rice Cultivation

Means of access to land	Well-off Group *(n = 10)*	Intermediate Group *(n = 50)*	Poor Group *(n = 20)*
Borrowing land (%)	14	27	38
Renting (%)	52	36	16
Purchase (%)	61	15	7
Village Govt. (%)	10	19	47

Note: Each household may have more than one means of land acquisition

Source: Field survey (2003)

A *well-off group* diversifies to high capital business (groceries and wholesale of rice) and rents assets to expand its level of production to complement on-farm income (Table 4). To a large extent this group, using its cumulative strategies, secures high income from crop sales (mainly rice), and from business and rents of assets.

Table 4: Percentage of Households by Wealth Groups Reporting Income from Off-Farm Activities

Off-farm income source	Percentage of household in the wealth groups reporting income from off-farm activities		
	Well-off (n = 10)	*Intermediate (n = 50)*	*Poor (n = 20)*
Business	66	35	28
Piece work	0	28	80
Local beer	8	46	12
Rents	57	19	0

Source: Field survey (2003)

The *intermediate* wealth group is the majority among the three wealth groups. Households in this group posses more assets and high flexibility to mobilise and allocate resources than the *poor* group, though not to the extent of the *well-off* group (Table 2). Those in this group cultivate average farm sizes, especially for rice, as compared to the *well-off* households. They own rice farms which are not well accessible to irrigation, and less productive. Due to limited financial capital, land borrowing and renting are the main source of access to additional land for rice production (see Table 3). However, most of such land is less productive, with unreliable access to irrigation. Those in this group are not exclusively subsistence farmers as they produce crops mainly for their own consumption and engage, to a limited extent, in production for the market. Most are not very successful as compared to the *first* group in optimizing gains from the changing marketing conditions. Family labour predominates, except at peak periods when they use work parties and hired labour to supplement family labour.

Diversification to off-farm income earning activities involves making and selling local beer (Plate 2), carrying out small capital businesses, and to the lesser extent engaging in casual labour and rental of assets. Such activities do not involve high capital investment (see Table 4).

The *poor group* consists of households of different background including widows, divorced women, single parents and old people who unable to work. In contrast to other groups, those in this group have very limited access to livelihood assets and less flexibility in mobilising and allocating agricultural resources (see Table 2).

Plate No. 2: ***Preparation of local beer as a source of livelihood***

Of the three wealth groups this is the most disadvantaged since it cannot acquire adequate productive land for rice production and access to adequate labour. Few cultivate the smallest rice farm sizes, mostly accessing water very late, which is thus inadequate. In many occasions they spend much time doing casual labour than working on their farms. Such a situation negatively affects their farm harvest. Social networks play important role in providing food assistance and other supports to such a group during adverse conditions. Most households in this group are least successful in promoting their agricultural production through intensification. Thus, they are unable to harness market opportunities and irrigation potentials in the area. Consequently, they have the lowest average income from on-farm activities mainly from sales of low value crops such as finger millet and sometimes maize. This group diversify to off-farm activities that do not require financial capital, such as engaging in casual labour and sales of wood products to complement low farm income that cannot sustain their households (see Table 4).

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Conclusion

The Usangu plains have experienced substantial expansion of agricultural land frontiers and land use intensification, particularly in areas accessible to irrigation and potential for rice production. High population increase, access to irrigation and market development as conditioned by infrastructure development and the liberalization policy has differently influenced changes in land use patterns. The combination of these forces in play act simultaneously, as well as differently on the various livelihood strategies, resulting to: (i) intensified agricultural land use and commercialisation of land, which has been associated with rice production; (ii) intensified agricultural labour use and commercialisation of labour largely influenced by market liberalisation and increasing commercialisation of rural life; and (iii) intensified livelihood dependence on agriculture and livelihood diversification to non-farm related activities. Diversification to off-farm income earning activities is increasing with changing market conditions (liberalisation). However, this does not imply farewell to farms at the expense of off-farm income-earning activities. The on- and off-farm income activities are interlinked and crucial to household livelihood in the Usangu Plains. Socio-economic differentiations based on livelihood assets determine strategies undertaken by households in adapting to changing conditions. Households with more livelihood assets are successful, pursuing cumulative strategies to optimize their income, food security and vulnerability to change. Households with very limited assets pursue survival strategies, and are highly vulnerable to change, including shocks. Any interventions for improvement of smallholder farmers' livelihood should reflect such variation among households.

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