

Full Length Research Paper

Role of wetlands resource utilisation on community livelihoods: The case of Songwe River Basin, Tanzania

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The role of wetland resources on community livelihoods was examined in Katumbasongwe and Mpunguti villages in Songwe River Basin (SRB), Tanzania. The study focused on wetland resource utilization patterns and its significance in supporting rural livelihoods. Various methods were used to complement each other in addressing the study, namely structured questionnaires, participatory methods and remote sensing techniques. The study shows that 81.7 and 85.6% of the sample population in Katumbasongwe and Mpunguti village respectively depended largely on wetland resources for their livelihoods. These include rice production, livestock keeping, fishing and harvesting of macrophytes for weaving. Wetland resource utilisation patterns have been towards expansion of rice production and settlement at the expense of other land cover types. This has been driven largely by high market demand for rice and increased population. The study observed that the nature and extent of wetland resource utilization patterns vary considerably from one socio-economic group to another depending on their flexibility and access to livelihood assets. Agricultural intensification and input support to farmers is expected to increase agricultural productivity. However, such intervention should take into consideration the socio-economic differentiation of the households. Moreover, proper land use plan and management are crucial for enhanced sustainability of wetland resources and other potentials in supporting livelihoods.

Key words: Agriculture, wetland resources, land use, rural livelihood, Songwe River basin.

INTRODUCTION

In many sub-Saharan African (SSA) countries, agriculture is the main source of livelihood to most of the rural communities (Majule and Omolo, 2008). However, agricultural production is constrained by several factors including scarcity of arable land, declining soil fertility and environmental changes particularly climate. The need to address some of these constraints as well as increasing market demands of agricultural products has compelled communities to increase utilization of wetlands for agriculture (Majule and Mwalyosi, 2005; Lyimo, 2005). Wetlands in Tanzania are among the world's most biologically productive ecosystems and are rich in

species diversity (Mwakaje, 2009). It play significant role in supporting livelihoods through provision of a variety of goods and services to diverse users. For example in Tanzania some of the wetlands have been used for production of crops such as large scale rice production and vegetables, direct resource extractions and good source of pasture for livestock production especially during the dry season (Lyimo, 2005; Majule and Mwalyosi, 2005; Mwakaje, 2009). Small-scale fisheries in the wetlands are source of food security, employment, and generate additional income to rural communities living in such areas.

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This study examined wetland resource utilization patterns and their implications to rural livelihoods in Songwe River Basin (SRB). Wetlands are defined by the Ramsar Convention of 1971 as "areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six meters" (Davis, 1994). Wetlands in the SRB contains natural resources such as land, forest, water, wildlife and other biodiversity, which provide a wide range of goods and services such as, food, income, medicine and recreation to the adjacent communities. Such goods and services are crucial in supporting rural livelihoods. However, socio-economic and natural factors have increased pressure on the wetland resources leading to changes in land use, consequently threatening wetland resource sustainability (Majule and Mwalyosi, 2005; Majule and Kalonga, 2009). Unsustainable land use practices such as cultivation in river banks and marginal lands, extensive clearing of vegetation and uncontrolled use of agrochemicals, usually result in land degradation, water pollution, declining soil fertility and loss of biodiversity that consequently affect the livelihoods of local communities and their environment. As demand of arable land increases with limited access to extra land, changes in agricultural land use have been towards intensification. This entails use of more input such as labour and fertilizer/manure to increase land productivity and expansion of cultivation to marginal areas or change the livelihood portfolio to non-farm income activities (Boserup, 1965; Netting and Stone, 1993; Majule and Mwalyosi, 2005).

In the exploitation of the wetlands resources various households pursue different livelihood strategies as conditioned by various socio-economic and natural factors (Lema and Majule, 2009). Livelihood strategies frequently vary among households and individuals depending on the ownership of livelihood assets, which to a large extent reflect the flexibility and capability of optimizing livelihood (Ellis, 1998; Majule and Kalonga, 2009). Households with more livelihood assets can utilize opportunities such as market to produce highly marketable crops such as rice and keep livestock (Lyimo, 2005, Yanda et al., 2005). Households with limited assets may depend more on natural resource -based livelihood. Such differences in the utilization of wetland resources may contribute differently to income and food security as well as to the environment.

Due to the importance of the wetlands ecosystems to rural livelihoods the sustainability of wetlands resources needs to be ensured through understanding current utilization patterns and major driving force. Assessment of the level of dependence on wetland resources by different socio-economic groups also need to be made. This will contribute among others in informing policy intervention. The overall objective of this study was to

investigate the contribution of wetland resource on community livelihoods with reference to agriculture.

MATERIALS AND METHODS

Description of the study area

Songwe River basin covers an area of approximately 4,214 km². This area includes Kyela, Ileje, Mbozi and Mbeya Districts in Tanzania and Karonga and Chitipa Districts in Malawi. About 54.6% of the area is located in Tanzania and 45.4% in Malawi. It has an estimated human population of 288,000, with the highest population density in Kyela (254 persons/km²) and the lowest in Mbozi district (43 persons/km²) (NORPLAN, 2003). The basin has been subdivided into 3 zones, the lower, middle and upper basin (Yanda et al., 2004). This study concentrated on the lower basin on the Tanzania side, covering the floodplain in Kyela District (Figure 1).

The sample population was obtained from two villages namely Katumbasongwe and Mpunguti villages situated in Katumbasongwe ward in the southern part of Kyela District, about 18 km from Kyela Town. The area comprises two major rivers, namely, Songwe and Nsesi Stream, both pouring their water into Lake Nyasa.

Data collection methods

Documentary search

Secondary data on socio-economic and physical aspects relevant to the study area were obtained from various sources, both published and unpublished records, including reports obtained within and outside the Kyela District headquarters.

Satellite image interpretation

In this study image interpretation from Landsat TM taken in 1991 and 2001, at the scale of 1:80,000, was done. According to Lillesand and Kiefer (2000), this is a medium-range scale which is widely used to map vegetation cover and agricultural land use. The main purpose of satellite image interpretation was to come up with general land cover/land use maps so as to gain an insight into the extent of land use/cover changes in relation to wetland resource utilization. Through image interpretation land use/cover maps of the study area for the 1991 and 2001 were produced. A comparison of the two land use maps was made to establish the extent of land use/cover changes.

Participatory methods

Participatory methods including focus group discussion, key informants interviews at district and village level guided by checklists were used. This was aimed at capturing livelihood diversity, type of wetland resources and other uses. The focus group discussions comprised of 12 representatives from each sub-village in both villages. The level of their dependence on the wetland resources and major socio-economic groups in the study areas were also discussed. Also household categorization into different socio-economic groups in the study villages was undertaken based on the concept of wealth and poverty as understood by the villagers, as well as interpretation made by the authors during interviews. Such socio-economic groups reflect diversity in endowment of livelihood assets as well as resource utilization patterns by the local community.

Field observations were made in accessible areas of the wetland

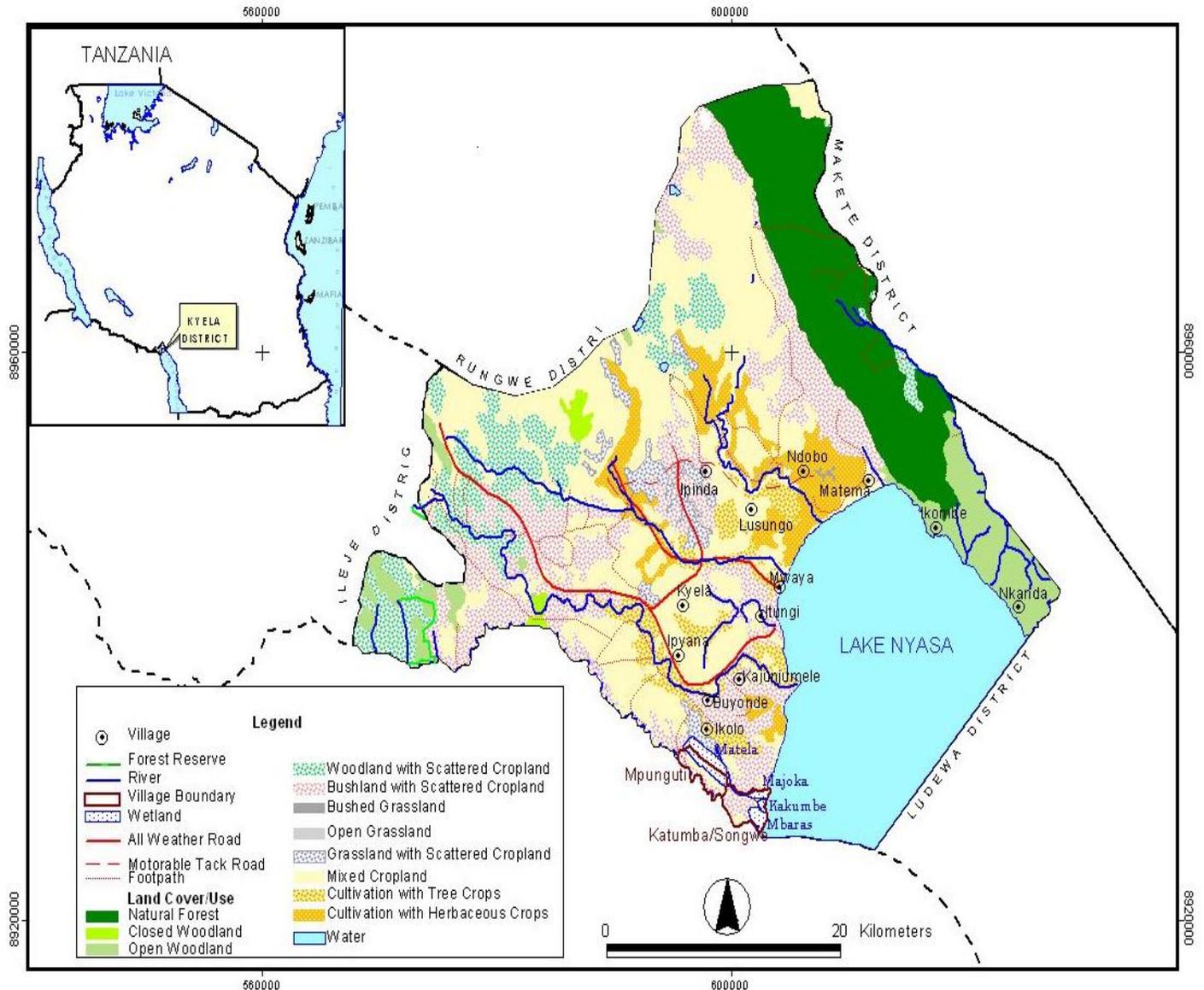


Figure 1. Location of Kyela district in Tanzania.

such as Majoka, Kakumbe and Mbalasi in Katumba Songwe village. Also Matela floodplain in Mpunguti village was visited and photographs were taken in subsequent areas covering features of interest to the study.

Household surveys

A sample size of 10% of all households in each village was randomly selected for interviews using a structured questionnaire. Questionnaires were administered to 44 and 60 respondents from Mpunguti and Katumbasongwe villages respectively.

Data analysis

The data collected were analyzed both qualitatively and quantitatively. The Statistical Package for Social Sciences Program

(SPSS) software version 10 for Windows was used for data coding and for descriptive statistics. Descriptive statistics included frequency and percentages of the sample population. Qualitative data analysis was done through assessment of narratives of the focus group discussion and evidence from field observations.

RESULTS AND DISCUSSION

Land cover/ land use changes and resource utilization patterns

Changes in the land cover/land use types in the study villages included bush-land, grassland, permanent swamps and cultivated land. The cultivated land mainly consists of rice production in the lowland areas. The

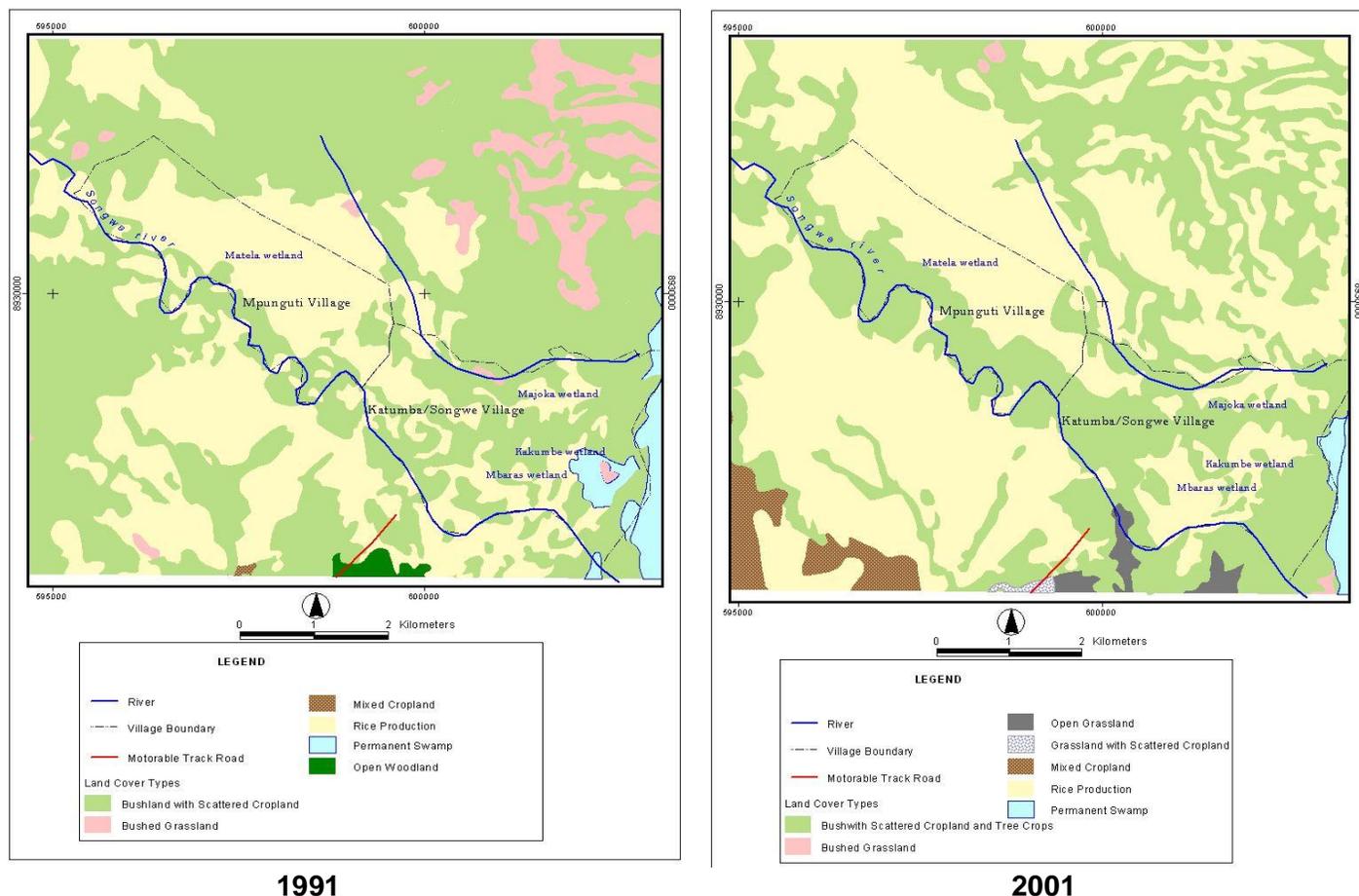


Figure 2. Land use/land cover maps of the study villages in 1991 and 2001.

upland crops included maize, banana and tree crops, and are to a large extent also found in areas with settlements. Analysis of land use changes in the study area has shown that there has been an overall increase in land under rice production in both villages (Figure 2).

Figure 2 shows that agricultural land and settlements has increased at the expense of other land use types from 59.5% in 1991 to 66.5% in 2001 in Katumbasongwe and from 31.6% in 1991 to 42.3% in 2001 in Mpunguti village. Based on the land use maps of 2001 it was observed that rice cultivation especially in Mpunguti village has expanded mainly to the north parts in Matela wetland. Due to increasing land scarcity for rice production households especially in Mpunguti has been compelled to cultivate land outside their village. Such land was not formally under cultivation. Focus group discussions revealed that increased demand of land for rice production has largely contributed to the observed changes. Such changes have significant effects on socio-economic activities and livelihoods of the local people. Increased market demand for rice has compelled farmers to expand their agricultural land as well as intensification to generate more income and food (Lyimo, 2005).

Nevertheless, agricultural expansion within such ecological systems proceeds at the expenses of other important land uses. This has resulted into undermining other sources of livelihoods to the communities and loss of biodiversity. For instance, according to key informants, conversions of permanent swamps into rice cultivation were reported to have caused loss of about four fish species namely, *Barbus* spp. (Swahili, Sila), *Labeo* spp. (Swahili, Ningu), *Rhamphocromis* spp. (Swahili, Ndilwale) and *Opsalidium microcephalus* (Swahili, Mbelele), as well as a reduction in macrophytes. Furthermore, other activities that were traditionally undertaken in this area such as hunting were greatly affected.

Most people in Mpunguti village were reported to cultivate rice in Matela wetland outside their village (Figure 2). This is because a large part of the study villages are under high pressure to crop production as well as from settlements. The overall process of land use changes in Songwe River basin has been towards agricultural intensification and expansion where land is available, which is associated with commercialised rice cultivation.

Table 1. Population trends in the study area.

Village	Year			Growth rate (%)	
	1978	1988	2002	1978-1988	1988-2002
Katumbasongwe	2222	2266	2667	0.2	1.6
Mpunguti	1438	1576	2001	0.9	2.4
Average growth rate				0.6	2.0

Source: URT (1978, 1988, 2003).

Population dynamics and wetland resource utilization

Findings from the study have shown that from 1978 to 2002 the study area is experiencing increasing population size as well as population growth rates (Table 1). High population has contributed to the increased demand of land for food production, leading to land expansion and intensification.

During the inter-census periods 1978 – 1988 and 1988-2002 the population growth rate has increased from 0.2 to 1.6% and 0.9 to 2.4% in Katumbasongwe and Mpunguti village respectively, though the growth rate was less than the national growth rate of 2.9 (URT, 2003). High population has contributed to the increased demand of land for food production as well as other domestic needs.

This has impact on the extent of wetland resource utilisation as well as the sustainability of the wetland ecosystems. There is a strong relationship between population growth and land use changes (Malthus, 1960; Boserup, 1965; Nettings, 1993). Population dynamics normally exert pressure on environmental resources as a result of human being striving to meet their basic needs. For instance, Kangalawe and Liwenga (2005) observed in Kilombero wetlands that over the last two decades the use of wetlands for agriculture has increased because of increasing population and the resultant need to produce more food. However, the main concern was deforestation and the trampling of soils by increasing numbers of livestock. Also, Palela (2000) noted a reduction in area coverage of the swamp in Msimbazi wetland from 5.71 km² in 1975 to 2.90 km² in 1992 due to establishment of settlements.

The study has also shown that most of the natural vegetation has been cleared, while permanent swamps no longer exist in the study area due to over-exploitation of the resources through human activity. Similar observations were also reported by NORPLAN (2003) which show that the lower plain of Songwe River has been intensively cultivated over the years and that over 95% is used for crop cultivation. This problem is magnified by the customary land tenure system operating in the study area. Customary ownership of land which exists encourages continued land fragmentation.

Due to the presence of diverse sources of livelihood in the wetlands, only few people reported to depend on

single source to support their needs. Figure 3 shows various sources of livelihood in the study area.

The sources of livelihood in the study villages varied spatially depending on the location of the village and accessibility to wetland resources. However, crop production and livestock keeping are the main sources of livelihood as the majority of the respondents are engaged in these activities (Figure 3). It was noted that more people in Mpunguti village are engaged in crop production and livestock keeping than those in Katumbasongwe village. This is probably due to the fact that households in Mpunguti village have access to a large arable land, and a high percentage of them are keeping cattle than those in Katumbasongwe village. Non-farm activities include fishing, handcraft, local beer brewing and selling, kiosks making and selling palm oil (Figure 4).

It was also noted that there are more households in Katumbasongwe village involved in handcraft activities than in Mpunguti village (Figure 4). This is due to closeness of Katumba songwe to Lake Nyasa and Nsesi stream which provides macrophytes as well as easy access to market. The macrophytes are utilized by local communities in making local carpets (*'mikeka'* in Swahili) and fish traps (*'migono'*, in Swahili) which contribute to household incomes.

Wetland resource utilization patterns

Major land uses in the studied villages include crop production (mainly rice cultivation), settlement and livestock grazing, especially during dry season. Other uses are fishing, macrophyte harvesting for handcraft activities and water for domestic activities. Rice is mainly cultivated along Lake Nyasa in the wetlands, and upland crops such as maize, cassava, sweet potatoes, banana and cocoa are cultivated on homestead farms in Katumbasongwe. Settlements are concentrated along Songwe River for easy access to water for domestic purposes as well as availability of fertile land along the river. Rice in Mpunguti village is cultivated in Matela (Nyakyusa) (seasonal wetlands) located away from Lake Nyasa as well as Songwe River.

The extent of exploitation of wetland resources greatly depends on the nature of the household strategies and

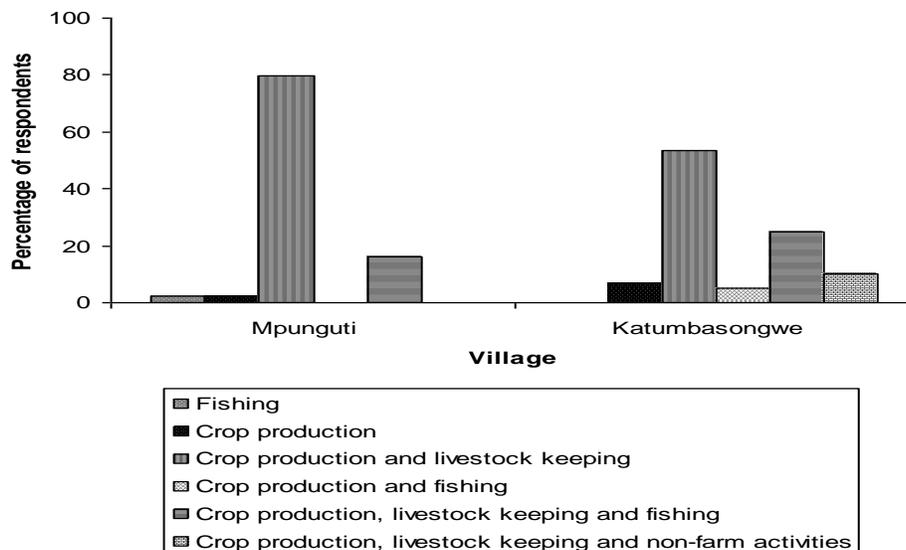


Figure 3. Major sources of livelihood in the study villages.

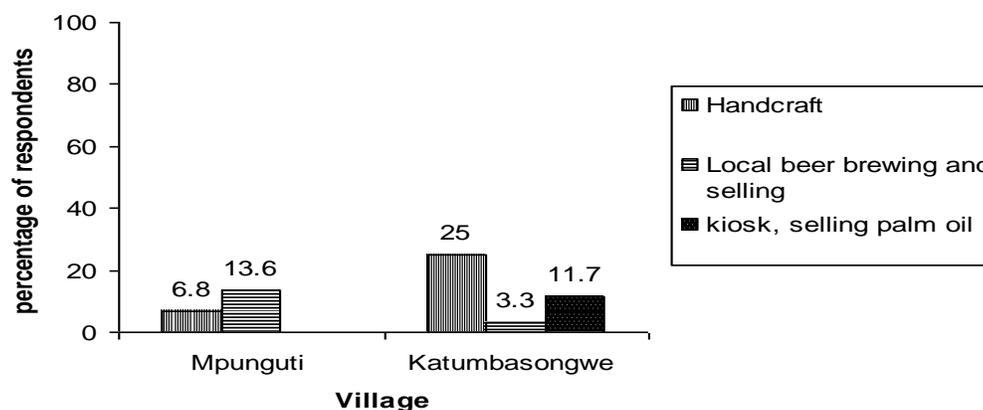


Figure 4. Non-farm sources of livelihood in the study villages.

the ownership of the livelihood assets. Households in the study villages can be characterized into three main socio-economic groups (Table 2).

Table 2 shows that the respective wealth groups are characterised by similar levels of resource endowment across the studied villages. Through focus group discussion it was revealed that the extents of involvement in the wetland utilisation vary considerably from one socio-economic group to another given their differences in the level of resource endowment and flexibility in resource mobilization.

The *well-off* group having access to more assets and high flexibility in mobilisation of resources, owns and cultivates the largest and productive land mainly land for rice production. In contrast to other groups, the *well-off* is very successful in exploiting the existing market opportunities and the ecological potential through

commercialisation of rice production. Most of the *well-off* households using their accumulation strategies secure high income from crop sales mainly rice and significant income from business and rent of assets such as ox-plough

Households in the *middle wealth* group represent the majority of households in the study villages (Table 2). Such group is endowed with few resources/ assets and not very flexible in mobilising and allocating the agricultural resources compared to the *well-off* households. The *middle wealth* group households cultivate average farm sizes for rice as compared to the former group. They are not exclusive subsistence farmers, as they produce crops mainly for their own consumption and also engage to a limited extent in the production for the market. Most of them are not very successful as compared to the *well-off* group in terms of

Table 2. Socio-economic groups in Katumbasongwe and Mpunguti Villages.

Group	Social characteristics	Percentage	
		K/songwe	Mpunguti
The well-off (WLO) 'Ntajiri/Nkabi'	Own > 5 cattle, own > 3-5 acres of land for rice production, have house roofed with corrugated iron sheets. Own motor bike and/ or bicycles, have surplus food, own more than one pair of oxen (<i>Kambaku</i>) and plough. Can hire a tractor for land cultivation, use fertilizers and hire labourers. Rents out farm land and ox-ploughs to other socio-economic groups and because of financial stability are involved in other non farm business. They have food security throughout the year after harvest	20	22.8
The middle wealth group (MWG) 'Hali ya kawaida'	Own 1 - 5 cattle, and some own 2-3 pigs. Own 1.5 - 2.5 acres of land, few cultivate rice, majority has a house made of mud bricks and roofed with grass, own a bicycle, sometimes can hire labour when necessary, but most of the time depend on family labour and some possess a pair of oxen and plough (<i>Kambaku</i>), they are involved in handcraft have food security for 8 months after harvest	49.2	54.4
The low wealth group (LWG) 'Ndondo'	Have no cattle but a few chickens, farm size below 1 acre, do not cultivate rice, have a mud house roofed with grass, often work as casual labourers and use hand hoe, have food security for less than 3 months after harvest	30.8	22.8

Table 3. Major crops cultivated in the SRB.

Village	Farm Location	% Respondents	
		Rice	Maize
Katumbasongwe	Wetland only	90.0	36.7
	Upland only	4.6	31.7
	Both	3.3	8.3
	Not cultivating rice or maize	2.1	23.3
	Total	100	100
Mpunguti	Wetland only	90.9	63.6
	Upland only	2.3	13.6
	Both	6.8	15.9
	Not cultivating rice or maize	0.0	6.9
	Total	100	100

optimizing gains from the changing marketing conditions and other livelihood in the studied villages. Diversification to off-farm activities involves selling of local beer, fishing, and handcraft and to the lesser extent working as hired casual labour.

The poor group represents 30.8 and 22.8% of the population in Katumba songwe and Mpunguti villages respectively, Most of the households in the *poor* group are constrained in terms of having access to fewer resources/ assets compared to the former wealth groups (Table 2). The nature of such resources makes them less flexible, which in turn restricts them from pursuing certain strategies. For example, the *poor group* are often unable to exploit existing opportunities to optimize gains from wetland resources. To a large extent households in this group are unable to meet their household consumption needs from farming, thus are increasingly driven to off-

farm based livelihood strategies such as selling casual labour and fishing .

Wetland cultivation and its contribution to household food and incomes

Agricultural production is the major economic activity in the two villages contributing to food security and income generation. The results indicate that rice production is undertaken by majority of the respondents in both villages as indicated in Table 3.

Wetland resources in Songwe Basin which includes Majoka, Matela, Mbalasi and Kakumbe wetlands, have vital role in ensuring food security in the study area and Kyela district in general. The study shows that 81.7 and 85.6% of the sample population in Katumbasongwe and

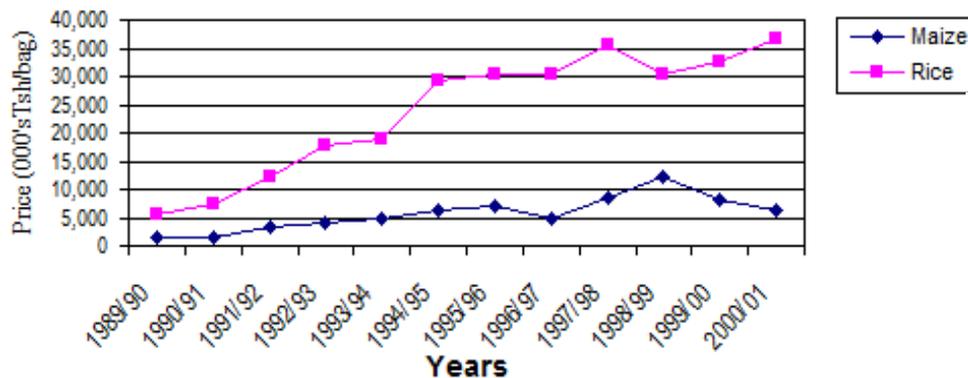


Figure 5. Wholesale Prices of Maize and Rice in Mbeya Town. Source: MAFS (2003).

Mpunguti village respectively depended largely on wetland resources for their livelihoods.

Crop production ranked first among wetland-related activities followed by fishing, livestock keeping and handicrafts activities in both villages. This indicates that the livelihoods of people in the study area mainly rely on cultivation in the wetlands. Similar observations on the role of wetlands in supporting the livelihoods of households were reported from other wetlands in the southern highlands (Majule and Mwalyosi, 2005). However, high demand of wetland resources coupled with increasing human and livestock populations in the study villages is threatening the well-being of the wetland environment. Focus group discussion revealed the disappearance of some wild animals in SRB.

Maize and other crops like beans, groundnuts and sweat potatoes are grown in the wetland on a small scale immediately after harvesting rice. This is aimed to take the advantage of moisture residue available in the soil as the area start experiencing drought conditions. Through focus group discussions in the villages it was revealed that cocoa is mainly grown in the uplands because it is not adapted to water-logged conditions. Such crops is supporting livelihood of only a few people as compared to rice production. Findings from this study also revealed that the wetlands contribute most to both food and cash income from agriculture. Similar results have been revealed from other parts with similar ecological conditions (Kangalawe and Liwenga, 2005; Yanda et al., 2005; Kulindwa et al., 2006).

Results from the study villages show that a portion of rice, maize and other crops such as beans and groundnuts are sold in Kyela market. However, among the crops rice is highly marketable with high demands in urban centres such as Mbeya and Dar es Salaam where they fetch high price compared to crops such as maize. Prices of maize and rice from Mbeya Town, main market for rice were used to reflect changes in the wholesale prices for the two crops in the study area (Figure 5)

The wholesale prices of both crops have increased over time. However, assuming that the marginal cost of

production has remained constant for both crops, the wholesale price of rice has increased substantially compared to maize. Such a situation has made rice production more attractive to farmers especially those who can meet production costs.

In the study villages price of crops vary depending on the type of crop and on the season of the year. For instance, during the harvesting season one tin (18 kg) of unshelled rice is sold at Tshs 2,500/= to 6,000/¹= depending on the supply of the product. Middlemen are the main buyers of the agricultural products in Kyela.

Table 4 provides a summary of estimated annual income from rice and maize produced in the wetland. The prices depend on the market price as suggested by the respondents in the study villages.

The table show the well-off socio-economic group, benefited more in terms of their earnings from crops cultivated in the wetlands due to high endowment of assets.. Such group is able to mobilize adequate resources in terms of money, labour, land and agricultural inputs at the right time to optimize crop yield. For instance, the well-off group earns over 500,000 and 1,000,000 Tsh per year in Katumbasongwe and Mpunguti villages respectively (Table 4). On the other hand the well-off socio-economic group in Katumbasongwe earns less than that of Mpunguti (Table 4). The variation in income accrued from rice production among other factors may be attributed to difference in endowment of livelihood assets such as land for rice farm, financial capital to purchase farm inputs and use of improved farm management practices. People in Mpunguti village have access to large farm sizes and are a bit better-off than those in Katumbasongwe village.

The LWG have been earning little from rice production mainly below Tshs.100,000 per household, for various reasons, including possession of very small plots in the wetlands, lack of financial capacity to buy farm inputs such as fertilizers and pesticides as well as inability to hire additional labour to manage their plots. Also because

¹ 1 US \$ =Tsh. 1200

Table 4. Income generated from sales of rice and maize main crops in the study area.

Villages	Socio-economic groups	Estimated Income per season (Tsh)
Katumbasongwe	The LWG	<100,000
	Medium group	100,000 to 500,000
	Well-off	Above 500,000
Mpunguti	The LWG	<100,000
	Medium group	100,000 to 1,000,000
	Well-off	Above 1,000,000

of their poverty they spend much of their time as cheap labour working for the well-off socio-economic group during cropping season, consequently paying little attention to their own farms. This calls for the need to improve micro credit services to empower this group in terms of finance so that they are able to manage their farms better to increase their incomes and ensure food security for their families. The currently provided micro credit through Savings and Credit Cooperative Societies (SACCOs) service according to them is favouring only the well-off socio-economic group who have the ability to pay the debt even before harvesting.

Livestock production and its contribution to livelihoods in the SRB

The study showed that 95 and 88% of the sample population keep livestock in Mpunguti and Katumbasongwe villages respectively, which comprise cattle, pigs and chicken. The number of livestock kept varies depending on the type of livestock and the financial well-being of an individual household. However, it was found out that the largest herd in the study area had only 45 cattle. The livestock are mainly used for food (milk and meat), provision of draught power, sources of revenue through sales of live animals and animal products. About 91.0 and 94.5% of the respondents in Mpunguti and Katumbasongwe village respectively use ox plough (*Kambaku*) during land preparation. It was revealed that few livestock keepers sell their animals, especially cattle, due to the reason that such animals provides main source of animal power for ploughing and other farm activities. It was found out that only 27 and 40% of the livestock keepers in Mpunguti and Katumbasongwe villages respectively have sold cattle in the past two years. Such differences between the two villages could be attributed to various reasons, one being lack of grazing areas in Katumbasongwe village. It was revealed that most of the livestock keeper belongs to the well off group with few households from the medium wealth group. Households in the LWG are mainly involved in keeping small stock such as chicken which do not need high capital investment. Income obtained from the sale of these animals is considerably lower than

those obtained from the sale of cattle and pigs. It was observed that keeping livestock such as cattle requires high initial capital to purchase the animals as well as maintaining them, some thing which not many people can afford especially the LWG.

Contribution of fishing to the livelihoods of the community in the SRB

Fishing is mostly done in Songwe River where there are lower fish catches compared to Lake Nyasa. About 47.4% of the households mostly from Katumbasongwe village earn above 100,000 Tshs per year (Figure 6). Fishermen from this village fish in Lake Nyasa as well as Songwe River. Focus group discussion revealed that the fish obtained from Lake Nyasa are normally bigger and in large quantity, thus fetching a good price. This may be one of the reasons why some fishermen from Katumbasongwe village earned more than 500,000 Tsh per year (Figure 6).

Fishing from Lake Nyasa, Songwe River and seasonal ponds has made a significant contribution to the income of the people who engage in fishing activities in the study area. The fishermen have integrated their fishing activities with agriculture such as crop and livestock enterprises. The peak fishing season is between late March and early May each year. This period coincide with heavy rains in the SRB. During such time most of the area is flooded, creating good fish habitat as well as conducive environment for fishing.

According to the fishermen there has been a low fish catch in recent years, attributed among other reasons to the destruction of breeding sites due to agricultural activities especially in areas where Songwe River enters Lake Nyasa. Other reasons mentioned were increased siltation in Lake Nyasa due to soil brought in by Songwe River from the upper catchments. Reduced catch can also be due to lack of good fishing gears since most of the fishermen are using local/ traditional fishing gears.

Contribution of handicraft activities to the community livelihoods

Figure 7 shows that respondents in Katumbasongwe

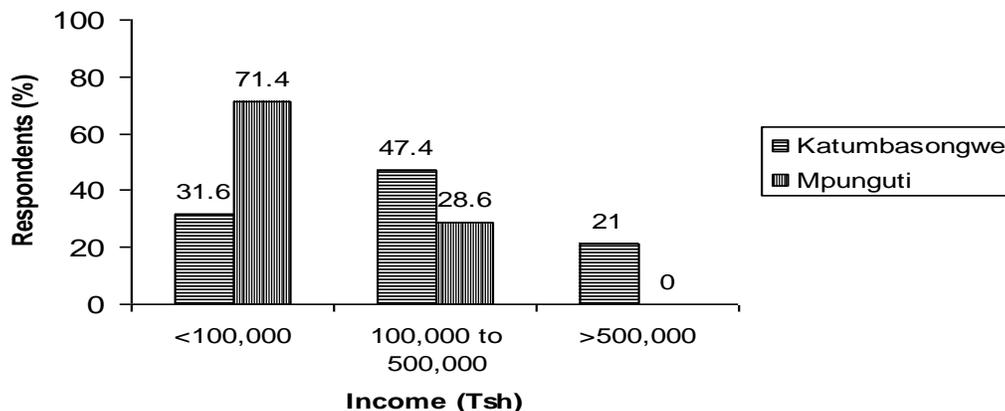


Figure 6. Annual incomes from fish sales in the SRB.

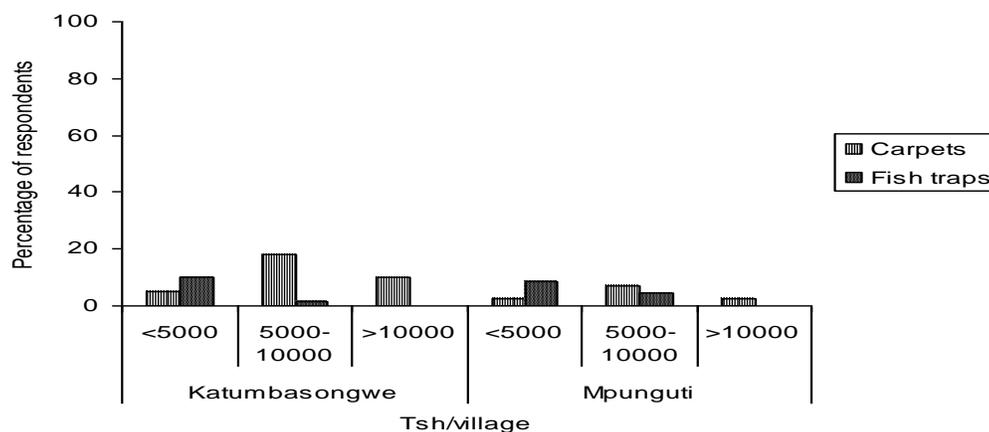


Figure 7. Market Value of Handcraft Products from the Wetlands in the SRB.

village earned more than those in Mpunguti village in relation to handcraft activities. Handcraft activities benefit the people surrounding these wetlands through incomes accrued from sales of hand made products. Carpets made of *Cyperus spp* play a vital role during traditional ceremonies, such as funerals and weddings. Also the *Cyperus spp* is used in making fish traps ('*migono* in swahili') which is commonly used in the study area. The contribution of handcrafts in terms of income depends on the quality, type and size of the final products. Local carpets (*mikeka/kilago* in Swahili) generate more income for the local people than fish traps '*migono*'. Carpets could be sold for more than 10,000 Tsh, as compared with fish traps which were reported to generate no more than 10,000 Tsh per unit.

The survey revealed that the two villages benefited differently from the income generated from handcraft activities. About 18.3% of the sample population in Katumbasongwe reported to sell their macrophyte products (carpets) for between Tshs 5000 and 10000 as compared to 9.2% of Mpunguti village. The study

revealed that this difference is attributed to excessive vegetation clearance in Mpunguti village, which has resulted in the loss of macrophytes used for handcraft activities.

Handcraft activities were reported to be carried out mostly by the poor socio-economic groups. This implies that degradation of the wetland resources such as macrophytes may have negatively affects the well-being of this group. Sustainable management of these wetland resources can be seen as a prerequisite for helping the poor community around the wetlands to tackle income poverty.

Conclusion

The wetlands in SRB comprises various natural resources which make a significant contribution to livelihoods including income, food and employment of the local community. Most of the community depends on arable land for agriculture especially rice production, and

pasture for livestock grazing. Small-scale fisheries in the wetlands are source of food security, employment, and generate additional income to the rural communities living in such areas. However, the wetlands have experienced spatial and temporal change in land use patterns with most of it being converted into agriculture at the expense of other land use/ cover types. This has been among other factors due to an increase in population pressure as well as market demand particularly for rice. The nature and extent of wetland resource utilization in the SRB vary considerably from one socio-economic group to another depending on the flexibility and access to the livelihood assets. The Well-off households with more access to resources including livestock, high income, ox-ploughs and large productive farm size are intensively involved in commercial rice production and have expanded their agricultural land frontier. The Intermediate wealth group unlike the well-off group they have few resources such as small land holdings, and low incomes. In contrast to the former group, they are less flexible in terms of access to agricultural resources including productive rice farm and labour. The LWG are resource constrained with very limited access to assets and have few livelihood options open to them compared to the former groups. The group is largely involved in small scale fishing, labour selling and weaving activities to supplements the low incomes from agriculture. Given the current resource utilisation patterns, provision of support to the agricultural production systems is important in enhancing agricultural productivity as well as sustainability of the wetlands resources in the SRB.

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