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NGAPEMBA “CONSERVATION AREA” PLANNING: SOCIO- ECONOMIC ASSESSMENT

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CONTENTS

ACRONYMS & ABBREVIATIONS.....	5
ACKNOWLEDGEMENTS	5
EXECUTIVE SUMMARY	6
1 BACKGROUND	11
2 METHODOLOGY	11
2.1 STUDY AREA	11
3 PEOPLE AND SETTLEMENT.....	12
4 LAND	13
5 NATURAL RESOURCES.....	15
6 LIVELIHOODS	17
7 FARMING.....	18
8 LIVESTOCK PRODUCTION.....	19
9 FISHING	22
10 WILDLIFE	25
11 CONCLUSIONS	27
12 RECOMMENDATIONS.....	28
13 ANNEXES	29
ANNEX 1: METHODOLOGY	29
1. NGAPEMBA PRA EXERCISES.....	30
2. NGAPEMBA KEY INFORMANT INTERVIEWS (KIIS).....	37
ANNEX 2: PEOPLE AND LAND - FELISTER MOMBO.....	43
1. VILLAGE PROFILES.....	43
2. MANAGEMENT OF LAND.....	45
3. DISCUSSION	48
ANNEX 3: FARMING AND LIVESTOCK - QAMBEMEDA NYANGHURA	50
1. FARMING	50
2. PASTORALISM	54
3. MAIN FINDINGS AND DISCUSSION	58
4. RECOMMENDATIONS	61
ANNEX 4. LIVELIHOODS AND FISHING – BEATUS TEMU	62
1. LIVELIHOODS	62
2. FISHING ACTIVITIES.....	66
3. RECOMMENDATIONS	81
4. SKETCH MAPS OF FISHERIES RESOURCES	81
ANNEX 5: NATURAL RESOURCES AND WILDLIFE – SAYUNI MARIKI.....	85
1. NATURAL RESOURCES.....	85
2. WILDLIFE.....	99
3. DISCUSSION AND RECOMMENDATIONS.....	108
4. SKETCH MAPS OF NATURAL RESOURCES.....	109

Figures

Map 1. Study area.	12
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Tables

Table 1. Key findings of the study.	6
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ACRONYMS & ABBREVIATIONS

BMU	Beach Management Unit
BTC	Belgian Technical Cooperation
GCA	Game Controlled Area
HH	Household
HWC	Human Wildlife Conflict
IMP	Integrated Management Plan
KGCA	Kilombero Game Controlled Area
KII	Key Informant Interview
KILORWEMP	Kilombero and Lower Rufiji Wetlands Ecosystem Management Project
KNS	Kilombero North Safaris
KV	Kilombero Valley
KVRS	Kilombero Valley Ramsar Site
KVTC	Kilombero Valley Teak Company
LTSP	Land Tenure Support Programme
LUP	Land Use Plan
MNRT	Ministry of Natural Resources and Tourism
PRA	Participatory Rapid Appraisal
RIW	Relative Importance Weighting
TANAPA	Tanzania National Parks
TAWIRI	Tanzania Wildlife Research Institute
TZS	Tanzanian Shilling
VEO	Village Executive Officer
VLUP	Village Land Use Plan
WMA	Wildlife Management Area

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EXECUTIVE SUMMARY

This report presents the findings of a socioeconomic survey of four villages surrounding Ngapemba wetland. It has been prepared under the framework of and as a contribution to the KILORWEMP Project (Kilombero and Lower Rufiji Wetlands Management Project), currently being implemented as a collaborative effort between Belgian Technical Cooperation (BTC) and the Tanzania Ministry of Natural Resources and Tourism (MNRT) with financial support from Belgian Aid and the European Union. The overall goal of KILORWEMP is to promote the sustainable management of the wetlands ecosystem of the Kilombero Valley and Lower Rufiji.

The report is based on a rapid PRA study of Tanganyika, Ipinde, Iduindembo and Utengule Villages, including key informant interviews (KIIs) with village leaders and other resource use specialists, carried out during January 2018. Key findings are presented in Table 1.

Table 1. Key findings of the study.

Sector	Main findings
People and settlement	<p>All villages have experienced rapid population growth, fuelled in part by in-migration, in particular the relatively recent influx of Sukumas, who have principally come in search of good land for farming and who are estimated to now make up about 30% of the overall population.</p> <p>Population density, and thus land pressure, is highest for Iduindembo, followed by Utengule, then Ipinde, and lowest for Tanganyika.</p> <p>Infrastructure in all villages is in a bad state; Utengule is best developed, while Tanganyika is most remote and suffers from the extremely poor state of its access road.</p>
Land	<p>Tanganyika has no land use plan; the other three villages do have existing LUPs but due to uncertainties relating to boundaries have not yet been covered and updated under the ongoing Land Tenure Support Programme.</p> <p>There is a lack of clarity concerning the status of land within the KNS hunting block; village and district staff claim that there is no “open land” here, and that the village boundaries extend to the Mnyera River, such that the hunting block is situated on village land. This is the principal conflict relating to land in the study area.</p> <p>Land is managed and allocated by the village government, other than for Tanganyika, where land is allocated informally through traditional rules.</p> <p>Land is becoming increasingly scarce across all villages, particularly for Iduindembo, driven by population growth which is fuelled in part by in-migration, and this is predicted to continue. In future, more land will be required for housing and farms, such that the remaining land for grazing and forests will continue to shrink, and this is expected to lead to an increase in land conflicts.</p>
Natural resources	<p>Land, forests and water are the key natural resources across all villages.</p> <p>Forests occur among farms in settled areas, and particularly within the KNS hunting block. Tanganyika is particularly well endowed with forest resources, while Iduindembo has virtually no remaining forests outside of the KNS.</p> <p>Tanganyika comprises particularly broken and hilly terrain with narrow intervening valley areas; Ipinde is intermediate; while Iduindembo and particularly Utengule comprise gentler terrain with more expansive lowland areas.</p> <p>The availability of natural resources is perceived to have declined greatly over the last 20 years, and this trend is expected to continue. Key drivers of change include population growth, habitat decline due to the conversion of forests and wetlands to farms, and increasing demand for natural resources.</p>

Sector	Main findings
Livelihoods	<p>Farming is by far the most important livelihood activity in all villages.</p> <p>Livestock production is the second most important livelihood activity; for Iduindembo and Utengule livestock production is dominated by cattle, goats and sheep; Ipinde has just a few cattle and these are absent from Tanganyika, such that chickens are the most important animals in these villages.</p> <p>Fishing is common in Iduindembo, Utengule and Tanganyika, but not for Ipinde (due to restrictions against fishing within the KNS area).</p>
Farming	<p>Farming is practiced by all households across all villages.</p> <p>Most farmers cultivate less than 10 acres, but there is a minority of households who cultivate larger areas (10-30% of households, and who are usually Sukumas).</p> <p>The use of draft animals for ploughing is increasing rapidly, including among small farmers (other than Tanganyika where there are no cattle and the hilly terrain is not conducive to the use of animals for ploughing); this enables the cultivation of larger areas and is fuelling growth in the number of cattle producers and thus cattle populations.</p> <p>Expansion of fields is being further fuelled by a growing shift in attitude from subsistence production towards a more commercial approach to farming.</p> <p>Other than Tanganyika, people no longer practice shifting cultivation (due to land limitations) and there has been a move away from multi-cropping to mono-cropping.</p> <p>All villages have a mixed farming system whereby crops are grown in upland areas during the rainy season and throughout the year in the intervening lowland areas.</p> <p>The main food crops are rice and maize, and together with sesame these are also the main cash crops.</p> <p>Most crops are sold in the villages to traders, although some farmers take their produce to Mlimba for storage so as to take advantage of higher prices that prevail later in the season.</p> <p>The main constraints to farming concern access to support services such as finance, inputs, storage facilities, markets and extension services; additional constraints include crop diseases and, especially for Tanganyika, losses to wildlife.</p> <p>Farming is recognized as causing significant environmental impacts in the form of land conversion, deforestation and desertification, as well as siltation, reduced water flows and pollution of water sources (due to the use of herbicides).</p> <p>Land pressure is already leading to a decline in the size of individual fields (other than for Tanganyika), and decreased yields per unit area, due to continuous cultivation in the same fields and a resulting loss of soil fertility and increase in crop diseases.</p> <p>In the face of increasing land pressure, land conflicts are predicted to increase across all villages, particularly with the KNS, but also among farmers concerning farm boundaries.</p>

Sector	Main findings
Livestock production	<p>Chickens are kept by virtually all households in all villages; Ipinde has a few cattle, and for Utengule and Iduindembo the dominant livestock are cattle, sheep and goats.</p> <p>The bulk of livestock producers in Utengule and Iduindembo (80%) are small pastoralists (<10 animals); 15% are medium pastoralists (10-50 or 100 animals) and 5% are large pastoralists (with >100 animals).</p> <p>Pastoralists from Utengule and Iduindembo use common grazing areas and water points for cattle (formerly these were one village); grazing being mainly in the uplands in Iduindembo during the rainy season and predominantly in the lowlands in Utengule during the dry season.</p> <p>The main livestock products are live animals, meat and milk, and cultivation services.</p> <p>Village governments do have rules concerning restrictions on numbers of animals per household, but are not able to enforce these. Restrictions against grazing around Ngapemba wetland are effective, due to the protection provided by KNS and the Ngapemba BMU (Beach Management Unit).</p> <p>A shortage of grazing areas is the principal challenge facing pastoralists in Utengule and particularly Iduindembo. For Tanganyika and Ipinde, the main challenge is poultry diseases (Newcastle disease), coupled with the absence of veterinary support and difficulties in accessing veterinary products.</p> <p>The principal livestock related conflict for Iduindembo concerns restrictions against being able to graze within the KNS area; for Utengule it concerns farmers and the incursion of cattle into fields.</p> <p>Other than Tanganyika, where the terrain is marginal for cattle, the numbers of small pastoralists and cattle populations are predicted to continue increasing, driven by population growth and increasing demand for cattle for draft animals.</p> <p>The combination of human population growth and increased demand for land for fields is predicted to result in reductions in grazing areas and increased difficulties in accessing water sources; this in turn is expected to result in increasing levels of conflict among pastoralists, with farmers and with the KNS.</p>

Sector	Main findings
Fishing	<p>Fishing is mainly carried out by people from Utengule, Iduindembo and Tanganyika villages; Ipinde has very few fishermen.</p> <p>The fishing community is dominated by Wangoni, Wabena and Wandamba peoples.</p> <p>Across the four villages the fishing community is estimated to comprise 50% fishermen who stay permanently in camps; 40% who stay seasonally in camps and 10% who stay in villages.</p> <p>Gill netting is the predominant fishing method used, followed by the use of hooks and bait.</p> <p>Fishing is mainly carried out in rivers and wetlands. Ngapemba wetland is the main fishing area for Utengule and Iduindembo villages, and the Mnyera River for Tanganyika village.</p> <p>KNS restrict people from fishing in parts of the Ruhidji and Mnyera Rivers, and this is a principal cause of conflict, particularly with Ipinde and Tanganyika villages.</p> <p>In order to fish, or trade in fish, it is necessary to have a license, which is obtained from the Fisheries Officer based in Mlimba. The fisheries officer is also responsible for policing and protection of fish resources, but lacks the capacity to do this effectively.</p> <p>The Ngapemba BMU, although not yet fully constituted, due to its constant presence in the field has played a key role towards improved management of fishing activities in Ngapemba.</p> <p>Anyone is allowed to fish within Ngapemba, as long as they have a license and as long as they follow the rules imposed by the BMU (they are not required to be members of the BMU). Offenders are reported to the Utengule village government where they are given a warning or fine.</p> <p>Village residents consider the BMU to be a positive development because it assisted them to gain access to Ngapemba (fishing was formerly prohibited there); it protects Ngapemba from illegal fishing activities and from incursions by livestock; it provides loan support to members who are sick and require health services; and it has promised to build a local office and shop where fishermen will be able to access fishing materials.</p> <p>The principal challenge to fishing activities, and source of conflict, is restrictions imposed by KNS on fishing within other wetlands and rivers within the hunting block area, including excessively harsh treatment for any offenders caught there. Additional constraints include the encroachment of weeds within Ngapemba and the destruction of nets by hippos and crocodiles.</p> <p>For Utengule and Iduindembo the number of fishermen was reported to be increasing and to be leading to a decline in fish availability and catches; for Tanganyika, due to protection provided by KNS, the number and size of fish in the Mnyera River was reported to be increasing.</p>

Sector	Main findings
Wildlife	<p>For all villages, most wildlife species were reported to be found in the KNS hunting block. Some smaller species are found in remnant forest patches near farms, such as baboons, wild pigs and cane rats.</p> <p>Tanganyika seems to have more wildlife than the other villages, probably due to the larger extent of undisturbed wildlife habitat in this village.</p> <p>Illegal use of wildlife for meat and income was reported for all villages.</p> <p>Utengule, Ipinde and Tanganyika, but not Iduindembo, have received some monies related to the use of the hunting block by KNS.</p> <p>Villagers perceive the benefits derived from KNS as being very small, unpredictable and lacking in transparency at all levels of management.</p> <p>Crop raiding is the main form of Human Wildlife Conflict (HWC) for Tanganyika, Ipinde and Utengule, and is particularly severe for Tanganyika; the main species involved are baboons, monkeys and rats.</p> <p>For Iduindembo, the main form of HWC is the loss of livestock to lions.</p> <p>Across all villages, wildlife populations of all species have declined markedly over the last 20 years, and this is expected to continue.</p> <p>The main drivers of change are human population growth and the expansion of farms resulting in loss of habitat for wildlife, coupled with increased levels of poaching.</p> <p>The frequency of eating bush meat has also declined, since wildlife is no longer readily available and because of enhanced protection measures by KNS in the hunting block.</p>

Based on these findings it is recommended that:

1. The issue relating to the boundary of the hunting block and how this relates to village boundaries needs to be resolved and the boundary better marked in the field.
2. There is a need to improve communication and to develop a more positive relationship between KNS and the surrounding villages.
3. There is a need to improve the mechanism for sharing benefits from the hunting block with adjacent villages, particularly to increase transparency at all levels of management.
4. The hunting block is critical to future conservation of Ngapemba and the surrounding areas; this should be formalised through development of a WMA.
5. There is a need to provide training and support to strengthen village governments and their management of natural resources, including education on efficient and effective land uses and sustainable land management, and towards enabling development and better enforcement of byelaws.
6. The Ngapemba BMU is already playing a positive role towards the sound management of Ngapemba wetland; there is need to further support the BMU both to complete formal establishment as well as to strengthen management capacity.
7. In the face of rapidly growing land pressures, it is important to develop a sound land use plan for each village, including establishment of land entitling (right of occupancy).
8. With farming being the main livelihood in these villages, support should be provided towards improving farm management, particularly toward promoting intensification of production.

1 BACKGROUND

The Kilombero and Lower Rufiji Wetlands Management Project, or KILORWEMP, comprises a collaborative effort between Belgian Technical Cooperation (BTC) and the Tanzania Ministry of Natural Resources and Tourism (MNRT), which is currently being implemented with financial support from Belgian Aid and the European Union. The overall goal of KILORWEMP is to promote the sustainable management of the wetlands ecosystem of the Kilombero Valley and Lower Rufiji. As part of this programme, KILORWEMP is providing technical support to planning initiatives, including development of an Integrated Management Plan (IMP) for the Kilombero Valley Ramsar Site (KVRs).

During the previous phase the project carried out a scoping exercise for the IMP. As part of the present phase, in support of the envisaged IMP planning process, Ambero Consulting have been contracted to carry out a series of studies to appraise and design site specific measures for ecosystem management or rehabilitation, including for Ngapemba wetland and for the southern Ruipa Wildlife Corridor.

This present report presents the findings of a socioeconomic survey of four villages surrounding Ngapemba wetland. Principal findings are presented in the main body of the report with supporting detailed data being included in accompanying annexes (Annex 1-5).

2 METHODOLOGY

The study was carried out by a team of five consultants comprising a research team from Sokoine University of Agriculture, Morogoro consisting of Dr. Felister Mombo, Qambemeda Nyanghura, Beatus Temu and Sayuni Mariki, plus Rob Cunliffe, an external expert.

Field work was carried out from January 11-23, 2018. The study targeted the four villages of Tanganyika, Ipinde, Utengule and Iduindembo. The team based in Mlimba, and from there travelled to and from the study villages on a daily basis. Despite difficulties posed by heavy rains, coupled with the poor state of local roads, the team managed to successfully complete their programme. Two days were spent in each village: one, collecting information through a variety of PRA exercises and the other through carrying out Key Informant Interviews (KIIs) with village leaders and other resource use experts. Further details of the methodology are included in Annex 1.

2.1 STUDY AREA

The four study villages form a continuous block of land situated to the south of Mlimba and straddling the Mnyera River, with Tanganyika stretching south to the Ruhidji River and with Ipinde, Utengule and Iduindembo stretching north up to the Mpanga River (Map 1).

Iduindembo was until recently a hamlet of Utengule and was only excised and registered as a separate village in 2014. We were not able to obtain a village boundary for Iduindembo. However, community sketch maps consistently show Iduindembo to be surrounded on three sides by Utengule, other than to the southeast where it extends towards the “open land” area.

The status of the “open land” remains uncertain. The District Lands Officer, Ifakara, stated that there is no open land in this region, and that the village boundaries of Utengule and Iduindembo extend to the Mnyera River. This view is echoed by communities, although not consistently. In two villages (Iduindembo and Ipinde) informants stated that there was once land that did not belong to their village (i.e. was general land) and that this was incorporated into the hunting block together with part of the village land. This is an area of major contention between the villages and Kilombero North Safaris (KNS), particularly regarding the location of the boundary of the KNS area with respect to village land, and the related issue of distribution of benefits from KNS to adjacent villages.

Ngapemba wetland is located within Utengule Village and the smaller wetland area Ndolo within Iduindembo Village.

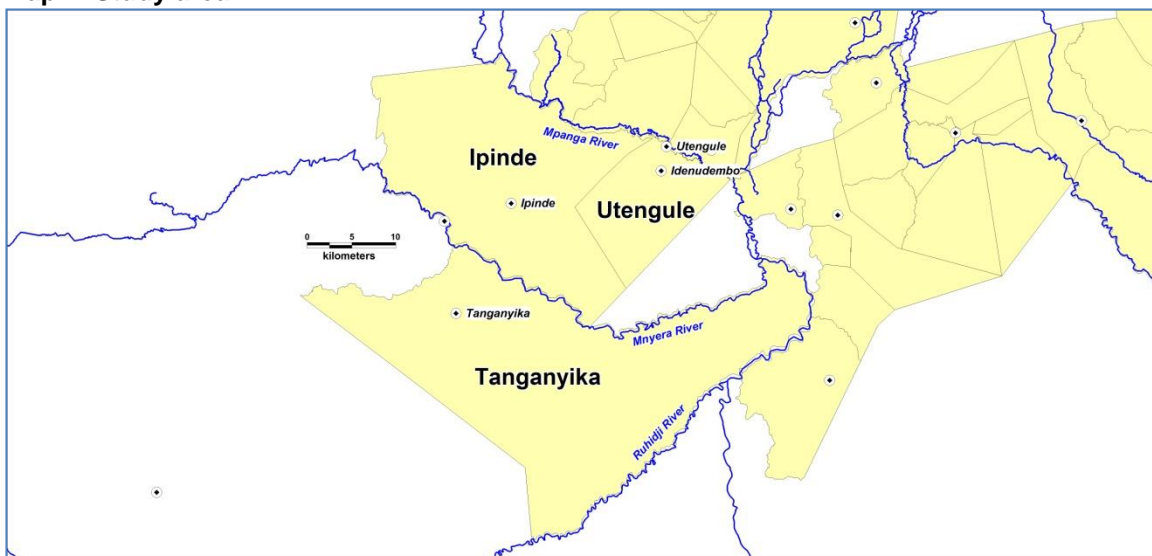
The four study villages show a distinct social and ecological gradient. Tanganyika is the most remote, least developed and least densely populated village, followed by Ipinde (located en route to Tanganyika) and then Utengule and Iduindembo.

From an ecological perspective, Tanganyika comprises the most marginal broken terrain, principally composed of hills with limited intervening narrow valley areas; Ipinde is intermediate in nature, and Utengule/Iduindembo comprise somewhat gentler and more favourable terrain with much wider lowland areas.

Tanganyika remains best endowed with natural resources (largest proportion of remaining intact forest areas), followed by Ipinde, then Utengule and Iduindembo. Land pressure shows the reverse pattern being particularly severe in Iduindembo, less so in Utengule, less so in Ipinde and lowest in Tanganyika.

From a livelihood perspective, crop production is the key livelihood activity across all four villages. Iduindembo and Utengule have substantial cattle populations; Ipinde has very few cattle and in Tanganyika there are none. Fishing is relatively important in Iduindembo and Utengule villages, marginal in Tanganyika and virtually absent from Ipinde (being prohibited in the lower reaches of Mnyera River by KNS).

Map 1. Study area.



3 PEOPLE AND SETTLEMENT

History of settlement. Utengule is the oldest village, being first settled in about 1900 by Wandamba people who moved there for fishing and were followed shortly after by Wabena migrants who were predominantly small farmers. Tanganyika and Ipinde were first settled by Wabena in the 1950s, reportedly attracted by good hunting and good land for farming, respectively. Ipinde started as a hamlet of Tanganyika and subsequently came to be recognized as a separate village. All three villages were formalised under operation “Sogeza” during 1974. Iduindembo was first settled by Wabena in 1974; at that time it comprised a hamlet of Utengule, and was only registered as a separate village in 2014 (under rather unclear circumstances).

Ethnic groups and migration. The estimated ethnic composition over all four villages is roughly Wabena 60%, Sukuma 30% and other groups 10% (including Wangoni, Wandamba and Wahehe). Wabena are dominant in all four villages, followed by Sukuma for Ipinde, Utengule and Iduindembo, and for Tanganyika, Wangoni.

The in-migration by Sukumas has been relatively recent and rapid, starting around the mid 1990’s and still continuing, with most migrants coming in search of fertile land for growing crops. Sukumas now account for about 30% of the overall population for Utengule and Iduindembo, 13% for Ipinde and <10% for Tanganyika. Current rates of migration are highest for Utengule and Ipinde and lower for Iduindembo and Tanganyika. For

Iduindembo, further opportunities for in-migration are now limited as all available land is already occupied and there is no additional land set aside for future use. In Tanganyika, the landscape is predominantly broken and hilly and most of the small intervening lowlands are already under cultivation, such that the remaining land is not attractive to potential migrants. Migration has been a strong contributor towards the growing scarcity of land across all four villages.

Population and land pressure. The current population for Ipinde is 4,500, for Tanganyika 4,000, for Iduindembo 2,600 and for Utengule 2,200 (based on village records). Land area shows a reverse pattern, being smallest for Iduindembo, followed by Utengule, and with Ipinde and particularly Tanganyika being substantially larger (roughly 3x and 5x the combined area of Iduindembo/Utengule respectively). The resulting population density, and thus land pressure, is lowest for Tanganyika, followed by Ipinde, then Utengule, and highest for Iduindembo.

Village development. Existing developments include roads, primary schools, health dispensaries, electricity, cell communications, village offices, police posts and water wells. Utengule is the best developed village (having a road, primary school, health dispensary, electricity and cell communication), although everything is in bad condition. Ipinde is similar, but the school does not have enough classes, and there is only a mission dispensary not a government one (where medicines are cheaper). Tanganyika has a dispensary and good school, however there is no power and communications are poor, and the terrible access road is the main problem.

Future development is required to strengthen infrastructure as everything is in poor condition. People also want more extension workers, as people never come to here, in part due to difficult access. They also want a lawyer to help them interpret the land law, as they have access to written materials but are not able to interpret these.

Village governance. The main institutions relevant to village governance are village governments, schools, health centres, religious institutions, entrepreneurship groups and the hunting company (KNS). The Village Government includes the General Assembly, the Village Council and various committees, Village Chairman (elected), Village Executive Officer (appointed) and hamlet leaders. The most important and influential institutions are the Village Council, schools, health centres, entrepreneurship groups and religious organizations.

Access to natural resources such as land, rivers, fishing grounds forests and wildlife are controlled by different institutions, which include the Village Councils, the District Council and their respective committees or offices.

4 LAND

Land categories and land use. Land categories are common across all villages. In accordance with the Village Land Act No. 14 of 1999, the main land types are occupied land in the form settlements (household plots, also institutions, commercial use and burial areas), farm land, reserved land in the form of forests and wetlands, grazing land, and land set aside for future use.

The three villages of Ipinde, Utengule and Iduindembo each have an existing village land use plan (VLUP), although these are in need of updating. In Tanganyika the VLUP is completely non-existent.

Including areas currently under management by KNS, three of the villages are dominated by reserved land (forests and wetlands) as follows: Tanganyika (80%), Iduindembo (60%) and Utengule (50%), whereas farms are the largest land category for Ipinde (35%). Among the three villages with land use plans, the area of land set aside for future use varies from 15% for Ipinde, to 5% for Utengule to nil for Iduindembo, reflecting increasing levels of land scarcity.

Land occupancy/ownership. Land ownership and management differ depending on land categories: Farms and household plots are privately occupied and managed by the household members. For privately owned land (settlements and farm lands), the main owners of the rights are men. Management activities are divided

between men and women. For example, in crop farming men do slashing to clear the fields, while women and children do planting and weeding, and all members contribute towards harvesting. This was common across all four villages.

Access to land. Land acquisition and access to natural resources is the same across all four villages. The village government is responsible for allocating land for settlements (for use as household plots, home gardens and grave yards), for fields, for the grazing of livestock (free access by livestock keepers), and for deciding on the allocation of lands reserved for future use. Access to household plots and farms can also be achieved through inheritance and purchase. For natural areas such as rivers, wetlands and forests, use of resources such as fish, timber, poles, firewood and charcoal is regulated through permits, in some cases issued by the Village Government, in others by the District Council.

Land management. In all four villages, the land is managed by the Village Government. Within the Village Government, the main body responsible for land management is the Village Council and its constituent Land Committee. The procedure to acquire land is that applicants send their applications for the use of land to the Village Government; these are assessed by the Land Committee and Village Council, and successful applicants are recommended to the Village General Assembly for final approval. The General Assembly is the highest decision making body for land allocation and no land is allocated without their prior approval. This process of land management is common to all three villages, other than Tanganyika Village where these rules are not in operation. In Tanganyika the land is allocated informally following traditional rules and mainly through inheritances and in few cases purchase from individual owners.

Land conflicts. Land conflicts are common in all four villages, principally concerning the boundary with KNS and encroachment across this (99% of overall importance score). The intensity of this conflict is highest in Iduindembo and lowest in Tanganyika (KNS is bearable there). There is no clear explanation as to how the hunting block was established, where the boundary should be, and what incentives should be provided to constituent and surrounding villages. The villagers are of the perception that the hunting block is established on village land, and therefore they demand adequate compensation for forgoing potential benefits they could derive through use of the land for alternative purposes. Utengule has received some payment almost every year, Ipinde and Tanganyika once, and Iduindembo never (since establishment in 2014); and even in Utengule there is considerable confusion as to what the payments relate to. In general there is a lack of transparency as to the provision and management of such incentives.

Another related conflict is with the District Council, particularly in Iduindembo where community members would like to see a map to show the establishment of the hunting block, and the extent of overlap or otherwise with village land.

Additional conflicts, of lesser importance, occur between farmers and also with livestock keepers. Such conflicts about lands, especially those between villagers, are usually settled in the village. The main village organ for conflict resolution is the Village Land Council; if the matter cannot be resolved it is transferred to the higher Ward Land Council for settlement; and if that fails the case is taken to the court of law, division of Land, for judgement.

People who transgress rules are usually warned or fined at village level. The magnitude of the fine depends on the fault committed, but normally ranges from TZS 20,000 to TZS 50,000. Those who are taken to the ward level can be recommended to the court for jailing or are sometimes fined.

Trends. Trends relating to land availability and use were consistent across all four villages. Land is perceived as becoming increasingly scarce and this is predicted to continue. Due to growing populations, fuelled in part by migration, demand for land is expected to continue to grow rapidly and, with increased land being required for settlements and farms, access to land will become increasingly difficult. As additional land is converted to farms and settlements, so remaining land for grazing and forests will diminish and the frequency of land conflicts is predicted to escalate dramatically. In Iduindembo, there were reported to already be many people who want to farm but lack the land to do so.

5 NATURAL RESOURCES

Occurrence and use of natural resources. Land (including farms) was considered the most important natural resource across all four villages, accounting for 84% of the overall Relative Importance Weighting (RIW), followed by forests (9%); water (including rivers, swamps and dams, 4%); fish (2%); livestock (2%) and grazing land (1% - Iduindembo and Utengule).

Other commonly used resources include firewood, charcoal, timber, traditional medicines, wild fruits, wild vegetables, mushrooms, wildlife, fish, honey, bamboo, grass (*milulu*), palm leaves, reeds (*malala*), sedges (*mitete*) and sand.

Forests occur among fields and settled areas within villages and, particularly, within the KNS hunting block. Tanganyika is better endowed with forests as compared to the other villages. For Iduindembo, remaining forests are largely confined to the KNS area, whilst Utengule and Ipinde have intermediate levels of forest cover. Tanganyika also has more permanent rivers (Mnyera, Nyame, Lukawe, Mfuji, Muwe and Mganga) as compared to the other villages (Mnyera, Mpanga and Ruhidji).

In all villages, forests and trees in individual plots are used for timber, poles, logs, traditional medicine, firewood and charcoal. In all villages, timber, logs and poles are used by villagers for construction and are also sold to outsiders, except in Iduindembo (due to the absence of forests). Due to the abundance of trees in Tanganyika, the timber business is larger there as compared to Ipinde and Utengule villages. Wood is also used for making furniture and other household items, and as firewood for cooking and for burning bricks.

Charcoal production is conducted in all villages on a limited scale, for cooking and selling to the government staff working in these villages. In Utengule some charcoal is also sold outside the village to Ngalmila, Mpanga and Mlimba.

Honey production is largest in Tanganyika Village followed by Ipinde, then Utengule. Iduindembo does not do any beekeeping; they get only a little honey that is harvested from tree trunks. More than 80% of honey produced in Tanganyika, 70% in Ipinde and 10% in Utengule, is sold outside these villages, while the remainder is used within villages. The wax is sold to local Roman Catholic Missions.

Tanganyika and Ipinde have *Milulu* grass that grows in marshes and undisturbed wetland areas, while Utengule and Iduindembo have reeds (*Malala*) that are found in lowlands/valley areas as well as in the KNS hunting block (where it can be harvested with a permit). These are used to make mats and baskets. All villages have three types of bamboo: wild bamboo that is used for building and making traditional weapons; European bamboo (big and yellow in colour) this is used as poles for building, and *ulanzi* bamboo that is used to make local beer. Wild fruits, vegetables and mushrooms are used for food and sales, especially mushrooms.

Most wildlife is confined to the KNS hunting block. In all villages, wildlife is hunted for meat and for selling. The most preferred species for meat are red duiker, dik-dik, wild pigs, warthogs, cane rats, hedgehog, puku, buffaloes, hippos, bushbuck, sable antelopes, baboon, and elephants. In Tanganyika, crocodiles, lions and leopards are hunted for skins, mainly for selling. Some families also keep guineafowl.

Marketing of natural resources. In all villages some natural resources are sold, although this varies with availability. Trade occurs in timber, honey, charcoal, reeds, bamboo poles, *ulanzi*, sand, mushrooms, wild meat and fish. Timber and honey production are highest in Tanganyika, where forests are most abundant, intermediate for Ipinde, then Utengule, and are virtually absent from Iduindembo where forests are scarce. Much of the trade occurs within each village, or with members of neighbouring villages. Some resources, such as timber and honey, are sold further afield in Mlimba, Ifakara and even taken outside the district to Morogoro and Dar es Salaam. For example, most of the charcoal produced in Tanganyika, Ipinde and Iduindembo is sold within the village, whereas for Utengule Village about 80% is sold outside the village (to Ngalmila, Mpanga and Mlimba). The price for a full sack of charcoal is 10,000 TZS in Tanganyika and 15,000 TZS in Iduindembo, this reflecting the greater isolation of Tanganyika (more distant and the particularly poor state of the access road).

Management of natural resources. In all villages there are regulations and bylaws that govern access to timber, wildlife and fish resources as well as management of forests and water resources. In general, there are no regulations governing access to natural resources, such as water, wild fruits, vegetables, mushrooms, tubers, bamboo, grass, reeds, sedges and sand, although no resources can be harvested from within the KNS area without a permit.

Regarding timber, no permit is required for the harvesting of poles and small trees for building purposes, but for any cutting of big trees e.g. for making boats or for selling timber, a permit must be sought. The procedure to access indigenous tree species for timber and logs is as follows: i) the applicant sends his/her request to the hamlet leader, ii) the hamlet leader forwards the request to the Village Executive Officer (VEO), iii) the VEO writes a letter of request to the Division Forest Officer, iv) before the permit is offered, the Division Forest Office confirms the tree to be harvested, and v) a permit is offered. Some villagers claimed that these long procedures have discouraged many people from entering the timber business. For all villages no permission is needed to harvest exotic tree species.

Concerning the management of forest and water resources, there are environmental regulations and laws which are enforced by the village government, Division Forest Officer and District Forest Officer. Within each village, the Village Environmental Committee is responsible for overseeing the management of the environment, including forest and water resources. They apprehend people cutting trees illegally and destroying water sources. Offenders are typically fined and if they are unwilling to pay the fine are taken to court, although this kind of case rarely occurs. Some key informants stated that the Village Environmental Committees sometimes fail to perform their activities properly in that some village leaders allocate farms and settlements to people in water sources.

Regulations concerning access to fish and wildlife resources are discussed in the respective sections dealing with these aspects in more detail.

Conflicts over natural resources. The major conflict concerning natural resources, for all villages, concerned restrictions against access and use of resources within the KNS hunting block. For Utengule and Iduindembo villages, the conflict is mainly due to the absence of a clear boundary between the villages and KNS. For Tanganyika, the source of conflict concerns access to fish resources within the KNS hunting block. KNS argue that when people used to come into their area for fishing some of them would also poach wildlife. Villagers stated that they had been told by KNS to form a fishing group, and that they would be allowed to fish within the hunting block from February to June (during the low hunting season). But the villagers argue that this period is not satisfactory to them as it is during the rainy season; that it is not possible to get many fish because there will be a lot of water in the rivers at this time of the year; that it is difficult to process fish at this time because of the rains and high humidity; and that there are few customers for fish at this time of the year as people have not yet harvested and sold their crops, so have limited available money. For Ipinde village, conflict with KNS relates both to the boundary and access to fish resources.

Except for Ipinde, the three other villages all have boundary conflicts with neighbouring villages. Also, all villages had issues with farm boundaries among themselves. Other conflicts were between farmers and pastoralists, and between pastoralists and fishermen (Utengule Village).

Major constraints concerning access to natural resources were: lack of rights to sell land; restrictions against encroaching into the KNS area such that it is not possible to increase access to land for farming and grazing (Ipinde and Iduindembo) and, for Utengule, similar restrictions against encroachment into Ndefi Forest; restrictions on access to fishing areas within the KNS area (Tanganyika and Ipinde); difficulties in obtaining permits for commercial exploitation of timber; and growth of weeds in Ngapemba which reduces the area available for fishing.

Degradation of natural resources. The main causes of degradation were reported to be cultivation around water sources (springs, rivers and swamps) for rice production; uncontrolled cutting of trees/clearing of land for

fields, and for Utengule uncontrolled grazing of livestock, particularly around Ngapemba wetland. Other less important forms of degradation include forest fires, charcoal production, the use of illegal fishing methods and poaching of wildlife.

Resulting impacts include the drying of water sources; decreased water flows; impaired water quality; destruction of forests and reduced forest resources; reduced wildlife habitat and decreases in wildlife populations; destruction of crops by livestock, and reduced fish populations.

Suggested solutions to curb these problems were that environmental regulations and laws should be better enforced, coupled with improved environmental education. It was also suggested that people adopt modern farming technologies in order to achieve more intensive production and thus reduce the need to farm large areas.

Trends in natural resources. In all four villages, the availability of most natural resources, including land, water, wildlife, forests, fish, forest fruits and vegetables and reeds were perceived to have declined markedly over the last 20 years and were expected to continue doing so over the coming years. Important perceived drivers of change include increases in population due to natural growth and migration; increased clearing of land for farming (partly driven by increased commercialization leading to the farming of larger areas) and settlements; loss of habitat due to cultivation and grazing in wetlands; and increased demand for and utilization of natural resources such as timber, fish and wildlife.

Production of honey and bamboo were perceived to have increased over the last 20 years and were predicted to continue doing so, as many people have started keeping bees and farming bamboo for business purposes.

6 LIVELIHOODS

Crop production or farming is the principal livelihood activity across all four villages, being carried out by all households and accounting for over 90% of the overall importance weighting in each village.

Animal production is the second most important livelihood activity although the nature of this varies between villages. In Tanganyika, there are no cattle, such that the main household animals are chickens; the same applies to Ipinde where there are just a very few cattle. However, for Iduindembo and to a lesser extent Utengule, cattle are the dominant form of livestock. This is discussed in more detail in Section 8.

Other activities that are relatively common or important in one or more villages include running a small business (i.e. a store selling household items such as soap, salt, sugar etc., all villages); brewing beer (Ipinde and Iduindembo, and likely all villages); fishing (Iduindembo, Tanganyika and Utengule, but not Ipinde); bee keeping (particularly Tanganyika, but also Ipinde and Utengule), and construction of houses (Ipinde and Utengule, and likely all villages).

Additional less frequent or important activities include pit sawing, carpentry, electrical repairs, hair dressing, weaving, sewing, providing transport, processing grain and fish farming in ponds.

Seasonality of activities. Crop farming is carried out in both lowlands and uplands terrain. In lowland areas crop farming is carried out throughout the year since these areas are always moist even during the dry season. Upland cultivation is mainly carried out during the rainy season from November to May.

Fishing in rivers and wetlands is carried out throughout the year (other than for Ipinde where no fishing is done). Additional fishing is done in flood plain areas (mainly Utengule and Iduindembo), especially during December to January when water starts entering the flood plain and at which time especially *kambale* (catfish) are caught.

Beer brewing is carried out throughout the year, although different types are produced during different seasons. Beer brewed from bamboo juice (*ulanzi* beer) is mainly available from January to June, since at this time bamboo shoots are abundant and because of the rain have plentiful juice which can be extracted to make the

beer. On the other hand beer brewed from maize and finger millet (*komani* beer) is mainly available from July to December. *Komani* beer is mainly made for selling, whereas *ulanzi* beer is mainly produced for household consumption.

Other economic activities, including livestock keeping, beekeeping and house construction, are carried out throughout the year.

7 FARMING

Types of farmers and farming system. Farming is practiced by all households across all villages. All villagers reported the presence of different types of farmers, based on the size of fields. In general, the majority were small farmers who cultivate less than 10 acres, whilst those who cultivated more than 10 acres were considered to be medium or large farmers. Large farmers were estimated to account for between 11-30% of households across the four study villages. Most of the large farmers were reported to be Sukuma immigrants.

The use of draft animals for ploughing is increasing rapidly, including among small farmers. This is particularly the case for Utengule and Iduindembo where the terrain is gentler. In Tanganyika, cultivation with hand hoes is the sole farming method, as there are no cattle and the hilly terrain is unsuited to the use of cattle for ploughing. Ipinde is intermediate; there are few cattle at present but some farmers hire cattle from neighbouring farmers in Utengule or Iduindembo villages. In Utengule and Iduindembo there are also a few tractors.

Previously, people used to practice shifting cultivation, but now this is done by only a few farmers in Tanganyika, where land is more readily available than the other villages. Also there has been a shift away from multi cropping to growing a single crop in a field.

All villages have a mixed farming system in which upland areas are used in the rainy season whilst the intervening valley or lowland areas hold moisture and are cultivated throughout the year. The main crops grown in upland areas include maize, rice, millet, cassava and groundnuts. Lowlands are used mainly for rice production during the rainy season, while in the dry season a variety of other crops are grown there.

Types of crops. Rice and maize are the two main crops. Rice is grown by all households in all villages; the same applies to maize other than for Tanganyika where maize is produced by only 50% of households.

The main food crops are rice, maize, bananas, potatoes, cassava, millet and beans. Sesame, rice and maize are the priority cash crops. Additional crops include sorghum, sweet potatoes, groundnuts, roundnuts, pigeonpeas, cowpeas, green peas, chickpeas, sunflower and vegetables.

Crop inputs and yields. Common crop inputs across the four villages include hand hoes, herbicides, seeds and pesticides. Draft animals and tractors are additional inputs used in Utengule and Iduindembo villages, and partly in Ipinde village.

According to KII's, crop productivity has generally increased in all villages. Reasons for this include more effective management of farms (Tanganyika, Utengule and Iduindembo village); a change in motive from subsistence to more commercial production (Ipinde village); a decrease in crop raiding by wildlife (Iduindembo village); and the adoption of new technologies such as the use of draft animals and herbicides (Iduindembo village).

Crop storage and marketing. Sesame is the only crop sold directly from farms, although a few farmers in Ipinde village pack it in bags and send it to Dar es Salaam for selling. Rice and maize are packed in large bags, approximately 100 - 150 kg in weight. Generally, those with small harvests store their crops at homes for household consumption and seeds for the coming farming season. Otherwise, there are a few small warehouses in Utengule, Iduindembo and Ipinde Villages (usually owned by Sukumas), whilst a few farmers transport their crops to Mlimba for storage for 5-6 months, at an average price of 1,000 TZS per bag. The

reason for doing this is to take advantage of higher prices that prevail later in the season. However, the majority of farmers sell their surplus crops in their respective villages, mainly to middlemen.

Challenges to crop production. Key challenges faced by farmers include high losses of crops to wildlife (Tanganyika); difficulties in accessing markets, including the poor state of access roads (Ipinde and Iduindembo, also Tanganyika); and losses to crop diseases (Utengule). Other issues include the lack of or inadequate extension support; difficulties in accessing crop inputs; lack of finance particularly during the rainy season to support farming activities; impacts of climate change; destruction of crops by livestock and poor storage facilities for crops.

Rules relating to farming. There are no guidelines or rules regarding the management of individual farms, such that farmers are generally free to do what they want on their own farms. There are a few guidelines regarding where people may farm, such as prohibiting people from farming along rivers. Enforcement of such regulations varies, being fairly effective for Utengule and largely ineffective for Tanganyika.

Impacts of farming. Farmers in all villages seem to understand the impacts of unregulated farming to the environment. Resulting negative impacts include deforestation and desertification due to the widespread cutting of trees; reduced water flow in rivers due to clearing of forests in catchment areas; siltation of rivers and wetlands due to farming close to water sources; and pollution of water through the application of herbicides.

Trends and future of farming activities. The number of farmers is predicted to continue to grow due to population growth, fuelled in part by immigration. Other factors fuelling the expansion of farming include a change in attitude whereby farming is increasingly being seen as the prime source of employment and income, plus the adoption of new technologies such as the use of cattle and tractors for ploughing and herbicides for controlling weeds.

Land availability is perceived to be decreasing across all villages, driven by population growth and resulting increased demand for land for all activities, including for housing, farming and the grazing of livestock.

Increased land pressure is seen as leading to decreasing size of individual farms, except for Tanganyika where land is still relatively abundant.

Crop productivity per unit area was reported to be decreasing, due to the continual use of the same fields every year and a resulting decline in soil fertility, coupled with increases in crop diseases.

In the face of increasing land pressure the number of land conflicts is predicted to continue to increase across all villages.

Conflicts relating to farmers. The main forms of conflict concerning farmers were with KNS (encroachment into the KNS area – Iduindembo, Ipinde and also Tanganyika); among farmers themselves (disputes over farm boundaries - Tanganyika); with pastoralists (destruction of crops by livestock – Utengule and to a much lesser extent Iduindembo and Ipinde); and with national forests (encroachment into designated forest areas – Utengule).

The conflict with KNS was largely attributed to the lack of clarity concerning the boundary between the village and the hunting block. For Ipinde, respondents claimed that although the boundary was known it is disputed, as previously it was extended so as to annex part of the village land.

8 LIVESTOCK PRODUCTION

Types of livestock and pastoralists. Chickens are kept by almost all households in all villages and are the most common form of livestock. Other animals include ducks, pigs, dogs, cats, goats, sheep and cattle. Cattle, goats and sheep are not kept in Tanganyika village, are few in Ipinde and abundant in Iduindembo and Utengule villages.

All villages have some pastoralists except Tanganyika village. The number of pastoralists was largest in Iduindembo village, followed by Utengule village, with just a few in Ipinde village (<20 households).

Based on numbers of livestock per household, three types of pastoralists were recognised in Iduindembo and Utengule villages: small, medium and large, although the definitions of these were not consistent (small <10 or <12 animals; medium 10-50 or 12-100; and large >50 or >100). In both villages the bulk of pastoralists are small producers (about 80%), followed by medium producers (about 15%), with a small number of large producers (about 5%). Ipinde has only small livestock producers.

Grazing areas and watering points. Cattle from Iduindembo and Utengule graze and take water in the same places. These two villages are adjacent to each other, with Iduindembo being a hamlet of Utengule until 2014. After division, most of the uplands were allocated to Iduindembo whilst the bulk of the lowlands remained with Utengule. During the rainy season most cattle graze in the uplands in Iduindembo village and during the dry season in the lowlands in Utengule village. During the dry season pastoralists take their cattle to water in the Mpanga and Mbuli Rivers; during the rainy season there are many small water sources scattered across the landscape. For Ipinde, the few cattle are all grazed and take water around farmlands inside the village.

Grazing areas are very limited in Iduindembo and Utengule villages. For Iduindembo, it was reported but not verified, that there is a group of eight large pastoralists known as "*Ngaliketi*" who came early to this village and who now restrict non-group members from grazing in the existing settled grazing areas within the village. It was also reported that previously cattle were able to graze around Ngapemba wetland, but this is now prohibited.

Livestock diseases. For Tanganyika and Ipinde, Newcastle disease, which results in the death of chickens, is the most significant animal disease. For Iduindembo and Utengule, cattle diseases were considered to be most important, including trypanosomiasis, contagious *bovine* pleuropneumonia, foot and mouth disease, east coast fever, rinderpest and cowpox. Some pastoralists apply preventative measures in the form of spraying and vaccination against trypanosomiasis. Most large pastoralists are knowledgeable about different diseases and often treat their cattle themselves; most small pastoralists have less experience and therefore often rely on consultations with a veterinary officer or else by an experienced large pastoralist.

Marketing of cattle and services. No buying or selling of cattle was reported in Tanganyika village. In Ipinde village, pastoralists are still of a small scale, therefore they only buy draft cattle. Both buying and selling was commonly noted among large pastoralists in Iduindembo and Utengule villages. The main markets for cattle are auctions, particularly those held at Utengule, Iduindembo, Ngelimila, Kyela and Makirika. Limited numbers of transactions also take place within the villages; either between community members themselves or to middlemen who come to the villages from centres such as Ifakara, Dar es Salaam and Songea.

Cattle prices vary with supply and demand and are higher during the dry season and lower during the wet season. During the rainy season, pastoralists have no alternative source of income and so are forced to sell cattle to meet household needs, including farming expenses. This leads to an abundance of cattle on the market, but which coincides with challenges of access by buyers due to poor roads, hence prices are lower. During the dry season access is easier, leading to increased demand, but many pastoralists can now also sell crops, so the supply to market is lower, leading to higher prices.

The use of cultivation services in the form of cattle for ploughing was reported from Ipinde, Utengule and Iduindembo villages. The service providers may come from the same village or an adjacent village. The services costs an average price of 30,000 TZS to 50,000 TZS per acre, depending on the location of the field (high terrain, flooded areas etc) and status of the field (a new field or one that has already cultivated before).

Cattle milk and beef were reported to be traded at Utengule village. The main centre for milk trade is inside the village, while beef is mainly sold outside the village at Mlimba town. The main buyers of milk are food vendors and households, and for beef are butchers.

Rules relating to livestock production. Some rules do exist concerning the management of cattle in Utengule and Iduindembo villages. These include limiting the number of cattle per household (8 or less for small pastoralists and less than 106 for large pastoralists); that free ranging cattle should be kept out of settled areas; that cattle should not trespass into fields; and that cattle should not be grazed around water catchment areas and Ngapemba wetland.

Although these rules were set by the villagers themselves, through the village assembly, their enforcement has been challenging. For example, it has not been possible to enforce limitations on livestock numbers, as large pastoralists typically have extended families such that cattle can be distributed among family members, so overcoming this limitation.

Restrictions on grazing in Ngapemba wetland have been relatively effective. This is largely due to the presence of the Ngapemba BMU (Beach Management Unit), who are quick to report offenders to the Utengule village government, and which imposes fines on offenders.

Challenges faced by livestock producers. The principal challenge faced by livestock keepers in Utengule and Ipinde is the shortage of grazing areas for cattle. For Tanganyika and Ipinde, poultry diseases were noted as being the most important challenge, supplemented in Ipinde by poor access, lack of a veterinary officer, and lack of a market.

Other challenges of low importance for Utengule and Iduindembo included conflicts between pastoralists and farmers; absence of dipping facilities; difficulties in accessing and high expense of veterinary products; low market prices for livestock and an absence of markets for livestock products such as milk and skins.

Conflicts relating to livestock producers. The two major conflicts identified were, for Utengule, between pastoralists and farmers, concerning the destruction of crops by livestock and, for Iduindembo, with KNS regarding the boundary between the village and the hunting block. The shortage of grazing within Iduindembo is particularly acute, and villagers claim that a considerable area is included within the hunting block and from which they are restricted from grazing.

Other minor conflicts were noted between pastoralists themselves, concerning competition for scarce grazing resources, and with fishermen concerning the destruction by cattle of river banks, fish breeding sites and fish baits.

Trends in cattle production. Other than Tanganyika, where participants noted that the hilly terrain plus the presence of certain poisonous plant species rendered the area unsuitable for cattle production, for the other three villages the number of small pastoralists was predicted to keep increasing, and the same for large pastoralists in Utengule and Iduindembo. The underlying causes for this are population growth and increasing demand for cattle for farming purposes.

Increasing numbers of cattle owners is seen as leading to increased cattle populations in Ipinde, Utengule and Iduindembo. In the face of growing human populations and increased demand for land for all purposes, including housing and farms, grazing areas are expected to become more confined, and access to water will also be impacted due to escalating deforestation and unregulated farming along rivers.

In the face of increasing scarcity of grazing and difficulties in accessing water, conflicts with farmers are predicted to increase, as well as conflicts among pastoralists (due to increased competition for increasingly scarce grazing resources).

Intensifying land use is seen as leading to further reductions in wildlife such that conflict with wildlife is expected to decrease (other than in Tanganyika). Conflict with wildlife authorities, specifically the hunting block, is expected to increase for Tanganyika, Ipinde and Iduindembo, but to remain constant for Utengule.

9 FISHING

History of fishing activities. Combining all four study villages, the Wangoni made up the largest portion of fishermen, followed by Wabena and Wandamba. Other less frequent fishermen included Wahehe, Wanyakyusa and Wagogo. The Wandamba and Wabena are older residents of this area, while the Wangoni, who came from the Songea Region, are more recent immigrants. Wangoni and Wabena came to the villages primarily for the purpose of doing crop farming, but once they found that there were productive fishing grounds in the villages, such as Ngapemba wetland, they then started fishing.

Types of fishermen. There are three categories of fishermen: permanent fishermen who stay in fish camps all year round; seasonal fishermen who stay in fish camps seasonally; and village fishermen who do only occasional fishing mainly for food and do not stay in fish camps but in their households in their respective villages. Collectively, the fishing community was estimated to comprise about 50% permanent fishermen, 40% seasonal fishermen and 10% village fishermen.

Fishing is mainly done by men, both elderly men and youths. Women and children do also fish but mainly in swamp areas and flood plains that are close to the villages, particularly for Utengule and Iduindembo villages. For Tanganyika and Ipinde villages there are no wetlands that women and children can easily access for such fishing.

Methods of fishing. Gill netting is the most important method of fishing for all four villages (85% of Relative Importance Weighting or RIW), followed by the use of fishing hooks (14%). Other much less important methods include the use of mosquito nets; fish traps of various sorts (*dema*, *ndanga* and *lilimbo*) and fishing in shallow waters in floodplains when flood water is rising or falling (*lipupwe*).

Fishing grounds and fishing camps. Fishing is carried out in rivers (Mnyera, Luhuji, Nyame, Mfugi, Ilembe seasonal river, Mwala, Mpanga, Kitogota, Mbuli and Hambe), wetlands or swamps (Ngapemba, Ndolo, Yogovelwa, Mende, Ugaganga, Itumba, Lwilwi, Kilausi, Nduku, Idukulu and Masikini) and opportunistically in valley bottoms in farming areas. Ngapemba wetland is the main fishing area for fishermen from Utengule and Iduindembo. People from Ipinde do very little fishing. For Tanganyika the Mnyera River is the most important fishing ground, although this is mainly illegal as the most productive portion is within the hunting block and KNS do not allow fishing there. Fishing camps include Kisingo, Idukulu, Nduku, Kisaki, Kiulausi in Tanganyika; Miwangani, Matema, Ishekelo and Kitogota for both Utengule and Iduindembo and Msisi, only Iduindembo. Some of these are located on wetlands others on rivers.

Access to fish resources. In order to access fish or to trade in fish it is necessary to first obtain a license. Fishing licenses are issued by the Fisheries Officer (Mlimba Division) who is based in Mlimba. In addition to issuing licenses, the fisheries officer is responsible for protection (patrolling and issuing fines for the use of illegal and destructive fishing methods), and education (raising awareness on the use of proper fishing methods).

For Ngapemba wetland there is a Beach Management Unit (BMU) which plays a strong role towards protection of Ngapemba, facilitated by their constant presence in the area and therefore ability to note any illegal doers or offenders. However, the BMU is not yet legally constituted. As such it lacks legal powers to punish offenders and who are instead reported to the Utengule village government. In addition to exercising its legal powers to punish offenders, the main role of the village government in terms of fisheries is to oversee fisheries in the village (including Ngapemba), to collect levies from fish traders taking fish outside the village and to resolve any conflicts involving fishermen or fisheries in the village.

KNS also plays an important role in terms of accessing fishing resources, through forbidding fishing in parts of the Mnyera and Ruhidji Rivers that are located within the hunting block. In addition they contribute to the protection of Ngapemba wetland through checking to see if fishermen have fishing licenses. Village respondents alleged that those who do not have licenses are often subject to humiliating beatings, and their equipment and catch is confiscated.

Main fish species. The main fish species reported were *kambale* (catfish), *perege* (Tilapia or bream), *kitoga* (bagrid catfish), *njege* (tigerfish), *ndungu* (*Distichodus petersii*), *mbala* (moon fish) and *ndipi* (mormyids), all of which are medium to large fish.

The most important fish in terms of abundance are *kambale* (96%) followed by *perege* (3%). In terms of food *perege* was rated as most important (57%) followed by *kambale* (43%), whilst in terms of selling, *perege* was rated as most important (40%) followed by *ndungu* (25%), *kitoga* (23%) and *kambale* (8%).

Marketing of fish. Most fish (90%) is sold in the fishing camps. Only a small amount is processed, mainly by smoking (90%), or else by frying, and this happens mainly in the villages. Fish sold fresh in the fish camps usually goes to nearby villages, or to Mlimba or Mpanga. Some fish does go further out to Iringa, Songea and Njombe, but this is in processed form. This means that at least 90% of the fish catch is being consumed within Kilombero District.

In general, the prices of fish in fish camps and villages are lower during the rainy season (January-May and up to July), when fish catches are higher and access is poor, and higher during the dry season, from August to November, when water levels and fish availability decrease and access is easier.

Prices of fish in Tanganyika were unusual in that they were higher for fresh than processed fish, as fresh fish are considered to be more delicious than processed ones (this reflects a market distortion resulting from poor access). Also fish from Tanganyika fetched a higher price in Njombe during the tea harvesting period between January and May, since at that time people in Njombe have more money to buy fish.

Management of fishing activities. Anyone is allowed to fish as long as they have a fishing license, including fishermen from villages outside of where the fishing ground is situated. Regarding Ngapemba, where there is a BMU in place, people who are not registered with the BMU can still fish there as long as they have a license and they agree to follow the BMU bylaws. The BMU bylaws require fishermen:

- To have a fishing license
- To avoid carrying out any illegal fishing activities, such as the use of poison, the use of illegal fishing nets i.e. fishing nets with mesh size less than 3.5 inches, or fishing methods that destroy fish breeding sites (e.g. *pumunda* fishing method whereby *makongo* grass patches, where fish hide and breed, are covered with small mesh nets, then the grass is cut by the fishermen and the net is then pulled out to collect all fish hiding in the *makongo* grass).

These regulations also apply to fishing areas outside the BMU; however, there is less enforcement of the rules in other areas as compared to within the BMU area. The BMU has some additional rules including:

- It is prohibited to fight or use abusive language whilst within the fishing camp,
- It is a requirement that any new fishermen coming to the camp should first report to the BMU management before they start to fish. The management will advise them to register to become BMU members, but even if they decline to register they will still be allowed to fish as long as they agree to follow the BMU bylaws
- Attending meetings organized by BMU management.

The reason why there is better enforcement of rules in the BMU, as compared to elsewhere, is that the BMU leaders and members are always within the fishing ground and so are quick to notice anyone who is infringing the rules. However, outside the BMU, protection is the responsibility of the fisheries officer, who is seldom present in any one area, such that fishermen are usually free to do what they want. Respondents estimated that 80% of the fishermen within the BMU follow the regulations, whereas outside the BMU only 10% follow regulations. It was also claimed that the number of offenders in the BMU area is decreasing, because of consistent enforcement of the rules, such that many potential offenders choose to shift to other areas outside of the BMU management; while outside the BMU the number of offenders is increasing mainly because of a lack of any alternative employment opportunities.

Within the BMU, offenders are required to pay fines ranging from TZS 50,000 to TZS 100,000, and receive a warning not to repeat the offence. Outside the BMU the fisheries officer collects fines from offenders usually ranging from TZS 50,000 to TZS 200,000 and, if the case involves an illegal fishing activity, the fisheries officer will confiscate the fishing gear.

Fish traders must pay an additional levy to the Utengule village government, usually between TZS 2,000 to TZS 5,000, when transporting fish from Ngapemba (or elsewhere) to outside the village, in this case outside Utengule village to Mpanga, Mlimba, Songea, Njombe or Iringa.

Ngapemba BMU. The Ngapemba BMU has a management composed of individuals from villages around or nearby Ngapemba wetland and who fish in the wetland. The current BMU management has 15 members who come from Utengule, Iduindembo and Mpanga villages; the current chairperson is from Mpanga village. There are presently about 60 fishermen in Ngapemba fish camp already registered under the Ngapemba BMU (equivalent to about 80% of all fishermen in the Ngapemba swamp). To become an active member of the BMU, a fisherman has to pay an initial registration fee of TZS 10,000, and thereafter an annual fee of TZS 5,000. At present only a few members (15-20%) have paid these fees.

People of Iduindembo and Utengule considered the Ngapemba BMU to be a positive development, for the following reasons:

- Firstly, formation of the BMU helped them to gain access to Ngapemba (although even before BMU was in place we were already given the swamp – firstly it was given to the hunting company due to destruction by livestock and then later the village and district leaders had many meetings with KNS, and people were then allocated rights to the swamp and then started the BMU).
- Secondly, the BMU gives better protection to Ngapemba swamp, as the BMU can impose fines on those who carry out illegal fishing activities. This is done through the Utengule Village government and the BMU retains 30% of the fines. So in Ngapemba there is no illegal fishing. This is different from other areas such as Mpanga River which is under the control of the fisheries officer, but who is seldom there so people are free to do what they want.
- Thirdly, it provides loan support for the treatment of members if they are sick or have an accident to get to hospital, although later the money must be returned.
- Fourthly, it has promised fishermen that it will build a BMU office and shop at Ngapemba where fishermen will be able to buy and thus easily access fishing gear.

In summary it seems that the BMU is a good thing but as yet cannot work on its own, it must rely on the village authority and fishing authority until it is fully established.

Challenges faced by fishermen. The major challenge facing fishermen from Tanganyika and Ipinde are the restrictions imposed by KNS on fishing within certain areas, including the Mnyera River and Ndolo, Mende and Iyogovelwa wetlands. The impact is particularly severe during the dry season when typically a large part (40%) of Ngapemba wetland (which is the main fishing ground) dries out. Respondents from Ipinde also complained about harsh treatment received from KNS staff, particularly for those caught fishing at Ngapemba without a license.

For Utengule the main challenge identified was the encroachment of weeds into the Ngapemba wetland making it difficult to fish in those areas and, for Iduindembo, the destruction of nets by crocodiles and hippos.

Other minor challenges included the dangers posed by flood waters; threats of attack by hippos and crocodiles; theft of fishing nets; difficulty of obtaining and poor state of fishing gear; use of illegal and destructive fishing techniques; incursions by cattle into and resulting impacts to fishing grounds; poor roads and access to markets, and the lack of training and extension services.

Conflicts relating to fishermen. The key conflict is with the KNS, since many other wetland areas, in addition to Ngapemba, are under their control. The highest conflict was reported for Iduindembo and Utengule, where Ndolo, Mende and Iyogovelwa wetlands are located but are under the control of KNS. Fishermen complained

that they were beaten heavily if caught fishing in the KNS hunting area, their equipment and catch confiscated and fines imposed. It was reported that the KNS guards sometimes do the same at Ngapemba swamp if they find anyone fishing there without a license. Villagers in Iduindembo also complained that despite the restrictions, some KNS guards take bribes from fishermen, including fishermen from areas such as Mlimba, and allow them to come and fish in Ndolo wetland at night.

Potential solutions suggested by villagers included to allow fishing in the wetlands under KNS control during their off-season (i.e. December to June); or to be given access to fish in Ndolo or Mende wetlands; also for the BMU to establish better relationships and cooperation with the KNS management, village authorities and district fisheries authorities such that the BMU control could be extended to the other wetland areas and fishing grounds currently under the KNS.

Trends in fishing activities. In terms of perceived past and future trends, substantially different results were obtained for Tanganyika and Ipinde villages as compared to Utengule and Iduindembo villages. Since the Mkapa era (year 2000), for Tanganyika and Ipinde, the numbers of fishermen have decreased due to restrictions imposed by KNS and this is expected to continue, whilst for the other two villages the number is increasing due to population growth and a growing need for employment, and also because people are now free to fish in Ngapemba wetland.

Fish catches and availability for food and sale were reported to be decreasing for Iduindembo and Utengule (in Ngapemba) due to population growth and increasing number of fishermen, as well as climate change. In Tanganyika, due to restrictions by KNS on access to the Mnyera River, people reported that there are now more and larger fish as compared to before, and fishermen in Tanganyika are even using larger mesh sizes than before. The implication is that although conflicts have been high in the villages with fishing grounds under hunting block management, the fishing grounds have been highly protected and therefore seem to have more fish than in fishing grounds under community control such as in Ngapemba swamp.

10 WILDLIFE

Occurrence of wildlife. A wide variety of wildlife was reported to occur in the study villages, including large animals such as elephants and buffalo; large predators such as lions, leopards and hyaena; aquatic species such as hippo, crocodiles and turtles (*kasa*); antelope such as eland (*mbunju*), sable (*ngalapi/palahala*), waterbuck (*kuro-ngaputa*), hartebeest (*kongoni*), impala, puku (*sheshe*) and bushbuck (*mbawala*), as well as smaller species of dik-dik and red duikers (*funo*); wild pig and warthog; baboons (*nyani*), black monkeys (*kima*) and vervet monkeys (*ngedere*); as well as aardvark (*mkwanda*), hares, cane rat (*ndezi-kungusi*) and hedgehogs.

Baboons were the most common species for Tanganyika and Utengule, and puku for Ipinde and Iduindembo. Other species considered to be relatively abundant in one or more villages (5% or more of relative importance in one or more villages) were: crocodiles, cane rats, vervet monkeys, dik-dik, buffalo, wild pig and hippo.

In all villages, most wildlife species were reported to be found in the KNS hunting block. In villages that still have some forests (Tanganyika, Ipinde and Utengule) some wildlife species are also found in these areas. Some wildlife species are found nearby water sources or inside water (hippos and crocodiles). Some crop raiding species are found nearby farms/in farm areas (e.g. cane rats), while some are found in forest patches/bushes nearby farms (e.g. wild pigs and baboons). Tanganyika seems to have more wildlife than the other villages, apparently due to the larger extent of undisturbed wildlife habitat the village still has as compared to the rest.

Management and use of wildlife. Wildlife resources are managed by the central government through the District Council (District Game Officer). The main institutions responsible for managing wildlife in the area are KNS who manage and protect the area within the hunting block, and the Ifakara District Council (District Game Officer) who issues hunting permits to residents, provides technical advice to villagers, demarcates boundaries and educates villagers on wildlife matters. However, villagers at Utengule claimed the KNS does not allow them

to hunt even when they have a district permit. As such, the villages effectively have no legal access to wildlife and do not formally participate in the management of wildlife.

However, all villages access wildlife illegally from farms and forests, including from within the KNS area. This is used as a source of meat and income, through sales of meat within the villages. There have been some incidences of people being caught and beaten while hunting wildlife in the KNS hunting block. For instance in 2016 four villagers from Ipinde Village were caught hunting in the hunting block and were beaten. It was also acknowledged that without the protection provided by the KNS all wildlife would rapidly be depleted from the area.

The villages of Tanganyika, Ipinde and Utengule have received some wildlife-based income and support from KNS. In Tanganyika KNS has supported construction of the school (classrooms), the village government office, the dispensary and bridges, and has provided desks for the school and sporting equipment. For Ipinde, KNS has supported the renovation of teachers' house and the village government office, and also compensated 6 million TZS to each household whose houses were mistakenly burnt near the KNS in 2013. Utengule Village has received 7.4 million TZS, of which 2 million was used to build a doctors house. Iduindembo has not received any support from KNS, partly because it is a new village.

The villagers perceived the support received from KNS as being very small, unpredictable, and lacking in transparency at all levels, particularly as to what amounts of benefits they should receive, and concerning the flow of money from KNS to the district level and then back to the village.

Human wildlife conflict. Crop raiding was the major form of Human-Wildlife Conflict (HWC) for Tanganyika, Ipinde and Utengule villages. Farmers in Tanganyika stated that if they do not guard their crops they will not reap anything, but if careful guarding is done they can manage to harvest 60-90% of the crops. For Iduindembo, where livestock are most abundant and important, predation was identified as being the major form of HWC (followed by crop raiding). Only Tanganyika reported incidences of wildlife killing and injuring people.

Baboons were scored as being the most important crop raiding species in Tanganyika, Ipinde and Utengule villages and, for Iduindembo, rats. Tanganyika village is affected by three types of primates (baboons, black monkeys and vervet monkeys), apparently due to the abundance of forests which provide a conducive environment for wildlife to thrive. Other species considered to be relatively important were cane rats (Iduindembo) and hippo and buffalo (both Utengule), and of minor importance wild pigs, elephants, warthogs and hares.

Lions were reported to be responsible for the majority of losses of large livestock, and to a much lesser extent crocodiles, leopards and hyena. Baboons are the major predators of chickens and ducks, and vervet monkeys sometimes steal eggs.

The main mitigation measures for crop raiding for all villages, were guarding (using dogs, stones, fires and noises), using iron snares (primates), digging pits (wild pigs) and constructing fences. Farmers in Tanganyika, and to a much lesser extent Ipinde and Utengule, devote a lot of time to guarding their crops against wildlife. For Tanganyika farmers claimed to spend every night in their farms during the growing season, such that they have little time for other household activities. Some farmers employ guards for this purpose.

To protect people and children from dangerous animals in particular crocodiles, the villagers construct bridges, use boats and build protective fences in the rivers where people fetch water. To preventing livestock predation, the villagers protect their livestock during the day and put livestock in stockades at night.

Threats to wildlife and resulting trends. The major threats to wildlife were seen to be encroachment into and continued reduction of wildlife habitat, coupled with continued poaching. Other less important perceived threats were forest fires and growth of cattle populations.

The perceived trend in all villages is that wildlife populations of all species have declined greatly over the past 20 years and will continue to do so. This was ascribed to more people and more clearing of forests for farms, leading to decreased habitat for wildlife, coupled with an increase in poaching. The extent of human wildlife conflicts was also perceived to have increased, partly because many people are farming nearby wildlife habitats. The frequency of eating bush meat has decreased, because wildlife species are not easily available and because KNS has intensified protection of wildlife within its area.

Currently there are no measures in place to conserve wildlife in any of the study villages. In order to enhance conservation, all villages proposed setting aside an area for conservation of forests, wildlife and the environment in general, as a way of saving the current situation, together with provision of environmental education (including on family planning, good farming practices and wise use of land, job creation for youths so as to discourage them from poaching, construction techniques using blocks rather than wood and cooking with energy saving stoves and gas rather than wood, so as to reduce deforestation). Other measures proposed were i) to stop all activities that are destructive to the environment such as illegal hunting and forest clearing, ii) the current environmental laws and regulation should be implemented properly by village governments so as to enhance sustainable conservation of resources, and iii) to continue protecting wildlife resources, including the introduction of participatory patrols between villagers, district and KNS.

11 CONCLUSIONS

The four study villages are predominantly farming villages; the area is productive, in part because the lowland areas retain sufficient moisture to enable year-round cultivation, and farming is the main livelihood activity practiced by virtually everyone.

Demand for land for farming is escalating rapidly, driven by rapid population growth, fuelled in part by immigration particularly of Sukuma farmers (rather than pastoralists), together with growing commercialization and increasing use of cattle for ploughing which enables the cultivation of larger areas.

As more farmers seek to use cattle for ploughing, so more small farmers are starting to keep cattle, such that cattle populations and demand for land for grazing are growing.

Intensive crop farming has already caused marked detrimental impacts to the environment; including a massive reduction of forests, wildlife and biodiversity, reduced water flows, siltation and pollution of water sources, as well as an increase in natural resource related conflicts. Current trends indicate that this situation can only be expected to get worse and that there is an urgent need for intervention.

The major conflict is with KNS, particularly concerning the placement and marking of the boundary between the villages and KNS, and uncertainty as to the extent to which the hunting block is established on village land or not. Also, the relationships between the villages and KNS are not very positive, partly because there seems to be inadequate communication with KNS.

Village members believe that the hunting block is located on village land, but that the benefits they receive from this are very little, are lacking in transparency, and are insufficient to compensate for foregone alternative uses such as for grazing of livestock or for farms.

The hunting block is vital to the protection of wildlife, forests and fish resources. Most of the remaining forests and wildlife are located within the hunting block, and without the protection of KNS it is probable that larger wildlife would rapidly be eliminated from this area.

Ngapemba wetland is the most important fishing area. Together with KNS, the Ngapemba BMU is perceived to be playing a strongly positive role towards its sound management and protection, helped by their constant presence in the field.

Village members and governments appear to recognize and to be generally supportive of the need to improve management and conservation of natural resources, but need support to achieve this in the form of education and capacity development.

In terms of future conservation options for the hunting block, any alienation of the hunting block from the villages is likely to result in an escalation of existing land and natural resource conflicts. As such, it would seem more appropriate and beneficial to pursue development of a Wildlife Management Area, which would not require any alienation of the land, as opposed to a Game Controlled Area which would do so. This would serve to enhance ownership, responsibility and management rights for the villages.

12 RECOMMENDATIONS

1. The issue relating to the boundary of the hunting block and how this relates to village boundaries needs to be resolved and the boundary better marked in the field.
2. There is a need to improve communication and to develop a more positive relationship between KNS and the surrounding villages.
3. There is a need to improve the mechanism for sharing benefits from the hunting block with adjacent villages, particularly to increase transparency at all levels of management.
4. The hunting block is critical to the future conservation of Ngapemba and the surrounding areas; this should be formalised through development of a WMA.
5. There is a need to provide training and support to strengthen village governments and their management of natural resources, including education on efficient and effective land uses and sustainable land management, and towards enabling development and better enforcement of byelaws.
6. The Ngapemba BMU is already playing a positive role towards the sound management of Ngapemba wetland; there is need to further support the BMU both to complete formal establishment as well as to strengthen its management capacity.
7. In the face of rapidly growing land pressures, it is important to develop a sound land use plan for each village, including establishment of land entitling (right of occupancy).
8. With farming being the main livelihood in these villages, support should be provided towards improving farm management, particularly toward promoting intensification of production.

13 ANNEXES

ANNEX 1: METHODOLOGY

The study was carried out by a team of five consultants comprising a research team from Sokoine University of Agriculture, Morogoro consisting of Dr. Felister Mombo, Qambemeda Nyanghura, Beatus Temu and Sayuni Mariki, plus Rob Cunliffe, an external expert.

Field work was carried out from January 11-23, 2018. The study targeted the four villages of Tanganyika, Ipinde, Utengule and Iduindembo, these being the four closest villages to Ngapemba wetland within Ifakara District. The team based in Mlimba, and from there travelled to and from the study villages on a daily basis. Despite difficulties posed by heavy rains, coupled with the poor state of local roads, the team managed to successfully complete their programme. Two days were spent in each village: one, collecting information through a variety of PRA exercises and the other through carrying out Key Informant Interviews (KIIs) with village leaders and other resource use experts. Details of the field schedule are shown in Table 1.1.

Table 1.1. Schedule of field activities

Date	Activity
Jan 11	Travel Dar es Salaam to Morogoro, initial planning meeting
Jan 12	Travel Morogoro to Mlimba
Jan 13	Utengule PRA
Jan 14	Mlimba revising and updating methodology
Jan 15	Tanganyika KIIs
Jan 16	Tanganyika PRA
Jan 17	Ipinde KIIs
Jan 18	Ipinde PRA
Jan 19	Utengule KIIs
Jan 20	Iduindembo PRA
Jan 21	Iduindembo KIIs
Jan 22	Travel to Ifakara, review of main findings and wrap up
Jan 23	Travel out from Ifakara

An advance team comprising representatives of the Ifakara District Government, MNRT and KILORWEMP, travelled to and met with the respective village governments in each village in order to explain the objective of the assessment and how it fitted into the overall KILORWEMP programme, and to seek their assistance in identifying participants for the PRA and KII exercises.

For both the PRA and KII exercises the collection of information was organized under four common themes, each under the control of a facilitator, as follows:

- Village profile and land (Dr. Felister Mombo)
- Crop and livestock production (Mr. Qambemeda Nyanghura)
- Livelihoods and fishing activities (Mr. Beatus Temu)
- Natural resources and wildlife (Mrs. Sayuni Mariki)

Details of the specific PRA exercises and of the structure of the KIIs are provided in the following two sections below.

PRA and KII participants were selected to include village leaders plus a selection of individuals with sound knowledge of the main livelihood sectors, whilst also ensuring a degree of gender balance.

PRAs Land Participants for PRAS were xx men and xx women range per village

KIIs No of PRA participants, sometime individuals, sometimes group

Discussions were carried out in the language in which participants were most comfortable, with results being recorded in Swahili, for the PRA exercises on flip charts and for the KIIs in notebooks, and in some cases also

on voice recorders. At the start of the PRA exercises, participants were split into four groups of about 8-10 participants each. Once all the groups had completed their enquiries, they reassembled as a combined group for a summary presentation, discussion and validation of the main findings. This also provided opportunity for participants to ask questions and seek clarification about the study. Participants were provided with a token payment of 5,000 TZS for their time and, for the PRA participants, also some refreshments (cool drink and biscuits).

1. NGAPEMBA PRA EXERCISES

GROUP 1: PRA EXERCISES FOR PEOPLE, LAND AND DEVELOPMENT EXPECTATIONS

1. PEOPLE

1.1 History of settlement

Who were the first people to settle here?

When did people first come to settle here?

What were the reasons for coming to this village?

Which tribes are now represented in the village, and when did these come?

How did other tribes come here?

What procedures were followed to come to this village?

Is new settlement still continuing within this village?

Is the area still available for new settlements in the village?

Record as notes

1.2 Governance of village and natural resources

Which institutions exist within the village and/or are important to the management of the village? *(Possible structures include village, ward and district government; schools, religious organizations, CBOs, NGOs, private companies)*

Spidergram – institutions - open scoring (importance)

1.3 Access to land and natural resources

Who controls access to land, farms, pastures, fishing, forest and wildlife resources and how does one gain access to these resources?

Resource	Institution	Procedures for access

1.4 Existing development and future priorities

1.4a What types of development/infrastructure already exist within the village?

Spidergram – existing developments - open scoring (importance)

1.4b What are the main development needs for the village?

Spidergram – development priorities - open scoring (importance)

1.5 Possible conservation measures

What conservation measures would you propose as a community to the Ngapemba wetlands?

Spidergram – Conservation measure priorities - open scoring (importance)

Conservation measure	Impact

2. LAND - (Land use, ownership, access, land rights, permits, conflicts and trends)

2.1 Forms of land use

What are the main forms of land uses in your village?

Spidergram – forms of land use – closed scoring (numbers of hh, overall land area)

2.2 Land categories

What are the land categories in the village? *(Law on village land = Communal land (forests, grazing lands,), occupied land (settlement areas, farms, business), and future land).*

Spidergram – land categories – closed scoring (overall land area)

2.3 Land ownership

Who owns and manages the land?

Main land uses	Ownership	Management

2.4 Access to land

What are the ways of accessing land (purchasing, hiring, inheritance, given by authority, informal)? What rights are attached to the ownership? Who is the issuing authority?

Main land uses	Ways of accessing land	Rights attached to land ownership	Issuing authority

2.5 Land conflicts

Are there any land conflicts in the village (*Different types of conflicts*)? Where do these occur (types of land)? Actors (*Who is involved on either side*)? What are the main causes? (*Why is there a conflict? What are the root causes?*) What are possible solutions to these conflicts?

Type of conflict	Type of land	Actors	Causes	Possible solutions

Scoring of main types of land conflicts (open scoring)

2.6 Trends

What have been the main changes in land allocation and ownership over time? (*Number of land owners, Size of farms, forests, grazing areas, land conflicts*)

Factor	Past score (Mkapa era 2000)	Present score 2018	Future score 2030	Explanation/why do you expect these changes
Size of settlements		100		
Size of farms		100		
Size of grazing areas		100		
Size of conserved areas		100		
Access to land for settlement		100		
Access to land for farms		100		
Access to land for grazing		100		
Number of Land Conflicts		100		

2.7 Other issues

Any other burning issues concerning life in general in this village

Record as notes

GROUP 2: PRA EXERCISES FOR FARMING AND LIVESTOCK

3. FARMING

3.1 Types of farmers

Are there different types of farmers in the village (*sizes of farms and groups*)? If so, how frequent are the different types?

Spidergram – types of farmers scores as percentages of hhs

3.2 Types of crops

What types of crops are produced in the village?

Which are the five most important crops for food? Which are the five most important crops for selling?

Spidergram – crops scores as percentages of hhs growing (out of 10 hh) and for main crops open scoring (importance for food and for selling)

3.3 Marketing of crops

Where are crops sold (within village and other villages/centres)?

Spidergram – locations of crop sales, closed scoring (% or out of 10) on volumes of sales)

3.4 Challenges to crop production

What challenges do you face in your farming activities?

Spidergram – challenges, open scoring (importance)

3.5 Conflicts relating to farmers

Do farmers experience any conflicts amongst themselves or with any other types of land users?

Spidergram – conflicts open scoring (frequency of occurrence)

3.6 Trends in farming activities?

Have there been any changes in farming activities and resources over time?

Factor	Past score (Mkapa era 2000)	Present score 2018	Future score 2030	Explanation/why do you expect these changes
Number of farmers		100		
Size of farms		100		
Crop productivity				
Number of Land Conflicts		100		

4. LIVESTOCK PRODUCTION

4.1 Types of livestock keepers

Are there different types or groups of livestock keepers in this village (tribes of pastoralists and others)?

Notes/descriptions of different types of keepers?

Spidergram –open scoring - numbers of animals

4.2 Grazing areas and watering points

Where do you graze and water your animals at different times of the year (seasonal/annual patterns and extent of livestock movements) and why?

Time in months	Places for grazing (inside or outside village)	Places for watering (inside or outside village)	Why this place and time

Sketch map to show location of grazing and watering areas in relation to village, farms and main natural features

4.3 Livestock sales (where, who are the buyers, seasonal variations)

What livestock products and services are marketed? (Where sold, who are the main buyers, main times, explanations?)

Products and services	Location	Main buyers	Months	Explanation

4.4 Challenges faced by livestock producers

What are the main challenges faced by pastoralists?

Spidergram – challenges – open scoring (importance)

4.5 Conflicts

4.5a Do pastoralists experience any forms of conflict amongst themselves or other groups within or outside of the village?

Spidergram – types of conflicts– open scoring (importance)

4.5b where do conflicts occur? Who is involved? What are the causes, and what are possible solutions for these conflicts?

Conflict	Location	Actors	Causes	Possible solutions

4.6 Trends

What have been the main changes in pastoral activities and resources over time? (number of large pastoralists, number of small pastoralists, cattle populations, size of grazing areas, access to water, conflicts with wildlife, conflicts with wildlife management authority, conflicts with other pastoralists, conflicts with farmers)

Factor	Past score (Mkapa era 2000)	Present score 2016	Future score 2030	Explanation/Why these changes
Number of large pastoralists		100		

GROUP 3: PRA EXERCISES FOR LIVELIHOODS AND FISHING

5. LIVELIHOODS

5.1 Types of livelihood activities

What socioeconomic activities are carried out in the village? List the five main activities (*E.g. crop farming, keeping livestock, fishing, running a small business, selling beer, selling charcoal, selling firewood, selling timber, selling blocks, selling honey, piecework, formal employment, providing transport, building, carpentry, mechanics, sewing, hair salon, other technicians, etc*)

Which are the five most important ones?

Spidergram – main activities - open scoring (importance) and percentages of hhs

5.2 Locations and seasonal patterns of main activities

When and where the socio-economic activities performed and what are the reasons for this?

Main Activities	Location	When (J,F,M,A,M,J,J,A,S,O,N,D)	Reasons (as to why this area and period)

6. FISHING

6.1 Methods of fishing

Do people use different methods of fishing? if Yes, what are the **five main methods/gears of fishing** (fishing gears e.g. Hooks, nets, mosquito nets, Ndatula etc)

Spidergram - methods of fishing – open scoring (importance) and closed scoring (% of households)

6.2 Locations of fishing grounds, fishing camps and selling points

Where do people catch and sell fish?

Sketch map of fishing grounds and selling points (*Showing village, rivers, fishing camps, fishing grounds and sales points, etc*) Note which locations are within or outside the village and also which are most important.

6.3 Access to fishing resources

6.3a Who controls access to fishing resources and how does one gain access to fishing resources? (Is everyone free to fish anywhere?)

Institution	Local representation	Role

6.3b Are there any cultural/traditional controls to accessing fishing resources? (Is everyone free to fish anywhere based on your cultural organisation?)

Cultural control/organisation/setup	Local representation	Role

6.4 Types of fish

What are the **five main types of fish** for this village? How abundant are these? How important are these for consumption and selling?

Spidergram – fish species – open scoring (abundance; importance for food; importance for sales)

Fish species	Abundance	Importance for food	Importance for selling

6.5 Marketing

How do people from this village market fish and why?

Means of marketing fish	Reasons for that marketing means

6.6 Difficulties

What difficulties do people face in fishing activities?

Spidergram – difficulties – open scoring (importance)

6.7 Conflicts

6.7a Do fishermen experience any conflicts among themselves or with any other groups within the village?

Spidergram – conflicts – open scoring (importance)

6.7b Where do conflicts occur? Who is involved? What are the causes, and what are possible solutions for these conflicts?

Conflict	Location	Actors	Causes	Possible solutions

6.8 Trends

What have been the main changes in fishing activities and resources over time? (*nos of fishers, proportion of hh fishing, groups involved, types of gear, mesh sizes, catches, size of fish caught, sales, how often to eat fish, no of fish species eaten, number of fish species sold, water, etc*)

Factor	Past score Mkapa era 2000	Present score 2018	Future score 2030	Explanation
No of fishers		100		
Proportion of hhs fishing		100		
No of fishermen permanent in camps		100		
No of fishermen seasonal in camps		100		
No of fishermen in villages		100		
Types of fishing gears		100		
Sizes of meshes used		100		
Volume of catches		100		
Size of fish caught		100		
Volume of sales		100		
How often eat fish		100		
Numbers of conflicts		100		

GROUP 4: PRA EXERCISES FOR NATURAL RESOURCES AND WILDLIFE

7. NATURAL RESOURCES

7.1 Identification of main natural resources

Which natural resources are important for your livelihoods? (*E.g. land, fields, pastures, forests, rivers, dams, fish, livestock, wildlife, bees, reeds/malala, reeds/ukindo, palm leaves, thatching grass etc*).

Spidergram – resources - open scoring (importance)

7.2 Occurrence/locations

Where do these resources occur?

Sketch map (showing whole village, roads, rivers, settled area, fields, forest areas, grazing areas, and any other important natural features).

7.3 Difficulties

4.5a What difficulties or constraints do you face in terms of accessing main resources (land, water, fields, pastures, water, fish)?

Spidergram – difficulties - open scoring (importance)

7.4 Degradation of resources

7.4a What types of degradation of natural resources occur in the village?

Spidergram – types of degradation - open scoring (importance)

7.4b Where does degradation occur? What are the causes and impacts and possible solutions?

Types of degradation	Location/extent	Causes	Impacts	Possible solutions

7.5 Conflicts over natural resources

Does the village experience any conflicts relating to the management and use of natural resources? What is the relative importance and frequency of such conflicts? (*Examples include between farmers (farm boundaries), farmers and pastoralists, village boundaries, land grabbing (loss of land), villagers and government/village administration, conflict with KVRs*)

Spidergram – types of conflicts - open scoring (importance and frequency)

7.6 Resource trends

Have levels of natural resources in this village changed over time? (*no of people, area of farms, area of forests, numbers of livestock, grazing areas, water resources, numbers of fish, abundance of wildlife*)

Resource	Past score Mkapa era 2000	Present score 2018	Future score 2030	Explanation
		Constant		

8. WILDLIFE RESOURCES

8.1 Key wildlife species

What are the main wildlife species found in this area?

Spidergram – wildlife species – open scoring (abundance and importance)

8.2 Locations

Where does wildlife mainly occur?

Sketch map showing main wildlife areas (*Showing village, rivers, fishing camps, etc*). Note which locations are within or outside the village and also which are most important.

8.3 Access to wildlife resources

Who controls access to wildlife resources and how does one gain access to wildlife resources? (Is everyone free to hunt anywhere?)

Institution	Local representation	Role in management of wildlife

8.4 Major threats facing wildlife

8.4a What are the major threats facing wildlife species in the area?

Spidergram – threats – open scoring (importance)

8.4b What are the causes of the problem threat? Which species are affected? What are possible solutions?

Main threats	Cause/source of threat	Species most affected	Possible solutions to reduce threats

8.5 Conflicts

8.5a Do people in this village experience any forms of conflicts relating to wildlife?

Spidergram – conflicts – open scoring (importance)

8.5b Which wildlife species are responsible for conflicts? Where do the conflicts occur? What are the causes and possible solutions for these conflicts?

Conflict/responsible species	Location	Causes	Possible Solutions

8.6 Measures to conserve wildlife/natural resources

What measures (traditional or modern) are in place to conserve wildlife? Where do these occur? Who is responsible?

Measures to conserve wildlife	Areas/species targeted	Who is responsible

8.7 Possible new conservation measures

Can you propose new measures that you perceive can conserve wildlife and environment?

8.8 Benefits from wildlife

What are the benefits accrued from the wildlife and wildlife resources (informal or formal)?

Type of benefit	Who benefits (individuals, household, community)	Formal or informal	Importance

8.9 Trends

What have been the main changes in wildlife resources and wildlife activities over time? (nos of fishers, proportion of hh fishing, groups involved, types of gear, mesh sizes, catches, size of fish caught, sales, how often to eat fish, no of fish species eaten, number of fish species sold, water, etc)

Factor	Past score Mkapa era 2000	Present score 2018	Future score 2030	Explanation
Abundance of wildlife species 1		100		
Abundance of wildlife species 2		100		
Number of people		100		
Area of settlement and farms		100		
Area available for wildlife		100		
Levels of conflict with wildlife 1		100		
Levels of conflict with wildlife 2		100		
Proportion of households hunting		100		
How often eat bushmeat		100		

2. NGAPEMBA KEY INFORMANT INTERVIEWS (KIIS)

GROUP 1: KII QUESTIONS FOR VILLAGE PROFILE AND LAND (Questions for village leaders/elders)

1. Village Profile

- 1.1 What is the total population in the village?
- 1.2 What is the total number of households in the village?
- 1.3 What ethnic groups are living in the village?
- 1.4 Which livelihood groups are dominant in the village government (pastoralists, fishermen, farmers)?
- 1.5 What is the number (actual or %) of each ethnic group present in the village?
- 1.6 What is the total area of this village?
- 1.7 Are new migrant families coming to settle in the village? If so, why are they coming to here?
- 1.8 Do you have records on numbers of livestock keepers and numbers of livestock in the village?
- 1.9 Do you have any system of classifying livestock keepers into different groups?

2. Village Governance

- 2.1 What is the structure of your village government?
- 2.2 What institutions do you have and which ones are very close and influential to the village government?

Institution	Roles	Closeness and influence Not close Close + Moderate close ++ Very close +++

- 2.3 What private institutions exist in this village and how do they relate with village governance?

Private Institution	Roles	Relationship	Explanation

3. Management of Land

- 3.1 Does the village have a land use plan? If so can we see this?
- 3.2 How is land managed in this village i.e. structure of decisions makers and procedure for acquiring land?
- 3.3 How many land proprietors are registered in the village?
- 3.4 In what forms are land appropriated by individual households and what types/forms are in communal?
- 3.5 Of the total land size (area) available in the village what are the sizes of the land forms/types present in the village e.g. cultivated land, settlement land, grazing, reserved, wetlands etc?
- 3.6 Does the village have sufficient land and water resources for the present population?
- 3.7 Are there any rules relating to keeping specific land types and securing access to communal land e.g. grazing or water in the village?
- 3.8 If so, who is responsible for implementing these rules?
- 3.9 If not, should there be any rules, and who should be responsible for these?
- 3.10 Beside the formal rules are there forms of traditional regulations? What are these rules in specific for?
- 3.11 Are rules enforced? For different groups of land users, what percentages of households are not following the rules?
- 3.12 What happens to people who do not follow the rules?
- 3.13 Do land users pay any taxes and, if so, how much and to whom?
- 3.14 Does the village and/or district governments provide any support to land users on how to use land and if so in what ways?
- 3.15 What are the main threats regarding future land use in the village?
- 3.16 What could be done to strengthen the management of land in the village?

4. Conflicts with Land and Water Resources

- 4.1 Are there any conflicts concerning access to land and water in the village?
- 4.2 If so, who is responsible for settling the conflicts?

- 4.3 What groups of land users come into conflicts in most of the time?
- 4.4 What causes such conflicts?
- 4.5 How are such conflicts resolved?
- 4.6 What is being done to trouble makers in case they are identified and who do you perceive are these trouble makers? Why?

5. Future of Land Management

- 5.1 How have things changed over time for the better or worse as far as land management is concerned and what are the reasons behind?
- 5.2 How do you see the future of land management in this village?
- 5.3 In 10 years time do you expect there to be no more future land for various uses in the village and why?
- 5.4 What could be done to improve land management in the village/Kilombero Valley?
- 5.5 What are the main threats to the future land users in the village/Kilombero Valley?
- 5.6 Do you have any other issues to explain concerning the issues we have discussed?

GROUP 2: KII QUESTIONS FOR PASTORALISTS AND FARMERS

PASTORALISTS

- 1.1 Are you a native of this area? If no, when did you arrive? Where were you coming from?
- 1.2 What types of livestock are common in the village?
- 1.3 What is the relative abundance of the main livestock species?
- 1.4 How do you group or classify or differentiate livestock keepers into groups in this village?
- 1.5 How many herds of cattle do most large livestock keepers have? Are they in the same village or different?
On average, what is the size of single herd?
- 1.6 Where do you mostly graze your livestock in different seasons? Is the situation the same for both small and large pastoralists? Do people use any grazing areas outside of the village?
- 1.7 Where do you mostly take your livestock for water in different seasons? Is the situation the same for both small and large pastoralists?
- 1.8 Are current grazing and water resources in the village adequate?
- 1.9 What are the common diseases for your livestock?
- 1.10 How do you treat your livestock when they are sick? Is there any prevention measure you applied to your livestock against diseases? Mention if Yes
- 1.11 Where do you sell your livestock? Who are the common buyers?
- 1.12 How do the number, size, sex and prices of cattle vary with seasons? Explain the reasons of variation.

	Number of cattle sold (High, Moderate, Low)		Price per cattle (TZS)		Number of cattle sold (High, Moderate, Low)		Price per cattle (TZS)	
	M	F	M	F	M	F	M	F
Big cattle								
Medium cattle								
Small cattle								

- 1.13 Are there any rules, bylaws or regulation related to management of livestock in your village? Who enforces that rules? How are they enforced? /What happens to people who disobey the rules? How strict are they? What proportion/percentage of small/large livestock keepers does not follow the rules?
- 1.14 Does the number of offenders increasing, remained constant or decreasing? Explain
- 1.15 What are the main conflicts related to pastoralists in your village? What are the causes of these conflicts? How are such conflicts being resolved? Is the number of conflicts increasing or decreasing and why?
- 1.16 What are the main challenges faced by livestock producers in your village?
- 1.17 What is your opinion on the future of pastoralism in your village?

FARMERS

- 2.1 What are the main crops which are cultivated?
- 2.2 Where do you mostly do your cultivation activities in the village? Does this vary for different crops?
- 2.3 Has the culture of cultivation changed over time? If, yes how has it changed from the past and what are the reasons? Does this differ between natives and migrants?
- 2.4 Is anyone allowed to just cultivate anywhere or any are there any rules, bylaws or regulations related to farming activities in your village? How strict are they? Who enforces that rules? How are they enforced?
- 2.5 Does the number of offenders increasing, remained constant or decreasing? Explain
- 2.6 Is land for cultivation still available in the village?
- 2.7 What are the main inputs for farming and how has the use of these changed over time? And why have these changed?
- 2.8 What are the common diseases which affects crops in the village?
- 2.9 What measures are used to treat crops? Are the measures effective?
- 2.10 Is there assistance you get from the extension officer?
- 2.11 Have crop yields changed over time? If so, what are the reasons?
- 2.12 How do you store your crops?
- 2.13 Where do you sell your crops? Who are the main buyers, how does the type and price of the crop vary with seasons?
- 2.14 What are the main farmers' related conflicts exists in your village? What are the causes of these conflicts? How are such conflicts being resolved? Is the number of conflicts increasing or decreasing and why?
- 2.15 What are the main challenges or constraints faced by farmers in your villages?
- 2.16 Do farming activities result in any negative impacts to the environment (soil and water?)
- 2.17 What is your opinion on the future of farming activities in your village?

GROUP 3: NGAPEMBA KII QUESTIONS FOR FISHERMEN

1.0 History of Migration and Settlement

- 1.1 When did fishermen come to live here?
- 1.2 Where did they come from?
- 1.3 Which ethnic groups are the fishermen composed of, and what are their proportions (overall fishermen)?
- 1.4 What were the drivers to leave other areas and to come here (how did they arrive here)?

2.0 Fishermen (Types of Fishermen, Seasonality, Types of Gear)

- 2.1 Do people in this village engage in any fishing activities? Which fisheries activities are being undertaken (i.e. fish catch, fish processing, fish trading and fish consumption)?
- 2.2 Who does fishing? What are the different types/groups of fishermen? And what are their proportions?
- 2.3 Are fishermen undertaking seasonal/temporary or permanent fishing activities? If yes, which fishermen undertake such activities? Does this vary between ethnic groups?
- 2.4 Do fishermen in this village use different fishing methods/gears? Which fishing methods/gears are the most important?
- 2.5 What proportion of fishermen are/are not registered under the BMU?

3.0 Fishing Grounds

- 3.1 Which are the main fishing grounds? Which are more important, rivers, swamps and lakes?
- 3.2 Of these which are included within the BMU or outside?
- 3.3 How do you access fishing grounds and does this vary inside and outside of the BMU?
- 3.4 Are there any fishing grounds you cannot access? If so, what are the reasons?

4.0 Fish Species

- 4.1 Which are the main five fish species obtained from rivers and swamps/lakes for food and selling?
- 4.2 How abundant are these? Does their abundance vary seasonally?

5.0 Marketing of Fish

- 5.1 How is fish processing usually done?

- 5.2 In what form is fish usually sold, fresh or processed (percentages in camps, in villages and outside villages)?
- 5.3 Which are the main selling points in the village?
- 5.4 Which are the main fish markets outside of the village?
- 5.5 What is the price of a fresh and processed fish in camps, in villages and outside villages? Do the prices vary seasonally?

6.0 Governance

- 6.1 Is anyone free to fish anywhere or are there any regulations controlling fishing activities in the village?
- 6.2 If so, who enforces the rules?
- 6.3 Do rules vary inside and outside of the BMU?
- 6.4 What proportion of fishermen follow or do not follow regulations?
- 6.5 What happens to those fishermen who disobey?
- 6.6 Is the number of offenders increasing, remained constant or decreasing? Explain
- 6.7 Do people pay fines? On what offences are fines issued? What levels of fines are implemented?
- 6.8 Are there taxes/ levies on fisheries activities? Who pay taxes/levies and how?

7.0 Conflicts and Future of Fishing Activities

- 7.1 What are the main conflicts relating to fishing activities in the village?
- 7.2 What are the causes of these conflicts?
- 7.3 How are such conflicts being resolved?
- 7.4 Are the number of conflicts increasing or decreasing and why?
- 7.5 What are the main challenges faced by fishermen in the village?
- 7.6 What are the main threats to the future of fisheries in the village?
- 7.7 Which development needs do you need for fisheries in this village?
- 7.8 What are your future expectations regarding fisheries in the village?

GROUP 4: KII QUESTIONS FOR NATURAL RESOURCES AND WILDLIFE

1. Occurrence and Use of Natural Resources

- 1.1 Where do main natural resources used by most people in the village occur?

Forests	
Wildlife	
Water	
Reeds & sedges	
Clay	
Fruits (wild) and vegetables	

- 1.2 Who are the users of natural resources (forests, wildlife, water, reeds and sedges, clay, fruits and vegetables?)

Forests	timber,			
	firewood,			
	Charcoal			
	herbs,			
Wildlife	Meat			

	Skin			
	Live animals			
Water				
Bees	Honey& wax			
Reeds & sedges				
Clay				
Fruits (wild) and vegetables				

1.3 How do you get access to these resources?

Forests		
Wildlife		
Water		
Reeds & sedges		
Bees/Honey & wax		
Clay		
Fruits (wild) and vegetables		

2.0 Trends in Natural Resources

2.1 Changes over time?

Forests				
Wildlife				
Water				
Reeds & sedges				
Bees/Honey & wax				
Clay				
Fruits (wild) and vegetables				
Poaching				

2.2 Which species are most poached?

3. Management

3.1 What are the existing regulations to access and use of the specific natural resources i.e. Wildlife, Forests, bees, reeds & sedges, wild fruits and vegetables?

3.2 Who enforces the rules?

3.3 What happens to the offenders?

4. Marketing of Natural Resource Products (wild meat, skin, timber, charcoal, firewood, honey, wild fruits and vegetables)

4.1 Is there an established market for the mentioned resources?

4.2 Where are the markets located?

4.3 Who are the consumers of the resources?

4.4 What are the proportions of the natural resources that are marketed and consumed?

5. Human wildlife Conflicts and Conflicts Relating to the Use of Natural Resources

- 5.1 What are the common types of conflicts occurring over the natural resources i.e. wildlife, forests etc in the village?
- 5.2 What are the groups involved in the conflicts?
- 5.3 What are the causes of these conflicts?
- 5.4 How frequent are the conflicts occurring?
- 5.5 Who are involved in resolving the conflicts? Are they effective?
- 5.6 In case of human wildlife conflicts which species are involved?

6. Benefits and Costs of Natural Resources

- 6.1 What benefits do you receive from the mentioned natural resources?
- 6.2 How do the benefits impact your welfare?
- 6.3 What costs do you incur in relation to the mentioned natural resources?
- 6.4 What are the causes of the mentioned costs?
- 6.5 Who mostly bears the costs?
- 6.6 Are there consolations for the costs incurred?

7. Future Expectations

- 7.1 What are your expectations to the future availability of the natural resources in the village?
- 7.2 How would you want the resources to be managed to enhance sustainability?
- 7.3 What is your general opinion towards what we discussed today?

ANNEX 2: PEOPLE AND LAND - FELISTER MOMBO

1. VILLAGE PROFILES

1.1 History of settlement

The four villages have different histories of settlement (Table 2.1). In Tanganyika village, the first people to settle were Mzee Balali and Mbwanda from the Bena tribe in the 1950's. They were attracted by good hunting. Other tribes that followed later, and for agricultural purposes, were: Hehe (1974), Wangoni (1960) and Wangindu (1990's). In Ipinde village the first family to settle was Ahmad Yagawa in the 1950's, followed by Omary Lihame all from Lupembe Njombe; they came here looking for fertile agricultural land. Utengule village was first settled by Wandamba in the 1900's, for fishing, under the leadership of Chief Ngalmila Moto. Wandamba's were followed by Benamanga (1900's, under the leadership of Chief Mtengela Kiwanga), Bena, Wangoni and Sukuma (mid 1990's). Iduindembo was first settled by Bena people from Mwala, was established in 1974 under operation "sogeza", and was registered in 2014 following the splitting of the village from Utengule. People are still migrating to these villages, despite the scarcity of land for some purposes such as grazing for livestock.

1.2 Village data

The villages have different ethnic groups, with different sources of livelihoods and different sized populations (Table 2.1). Ipinde is the most populated village with a population of 4,528 people, followed by Tanganyika which has 4,045 people; Iduindembo (2,600) and Utengule (2,167) are the least populated. Prior to their recent separation (2014) these were a single village, with Iduindembo comprising a hamlet of Utengule. Livelihood activities are similar across the four villages. Crop farming is the principal activity, followed by livestock keeping, fishing and others, the relative importance of which vary from village to village.

Table 2.1 Basic data for study villages

Factor	Tanganyika	Ipinde	Utengule	Iduindembo
Date of establishment	1950	1950	1900	1974
No of households	360	759	434	165
No of people	4045	4528	2167 (M=1193, F=974)	2600 (M=1200, F=1400)
Land use plan	Yes	Yes	Yes	Yes
No of livestock keepers	No records	No records	No records	No records
No of livestock	Pigs, no cattle	27 cattle (possibly 60-70)	No records	1008 cattle (6 pastoralists)
Land size	57,000 ha	App. 50,000 ha	14,780 ha	Not surveyed
Ethnic groups	Bena (80%) Ngoni (10%) Others (10%)	Bena (75%) Sukuma (13%) Nyakyusa (5%) Wandamba (1%) Waha (4%)	Bena (60%) Sukuma (30%) Others (10%)	Bena (60%) Sukuma (31%) Wandamba (5%) Others (4%)

1.3 Village governance

The government structure is much the same for all the villages (Figure 2.1), although the understanding of how the government operates varied amongst the villages leaders. In Utengule village the perception of the new leaders is that the village General Assembly (GA) is supposed to be the highest authority, whereas the former Village Chairperson perceived this differently, stating that the GA is not supposed to be part of the executive structure though it is the final body in decision making in the village. In the three remaining villages there were slightly different perceptions as to where the GA should be placed, but all in all the power to make decisions is understood to be vested in the GA in all villages.

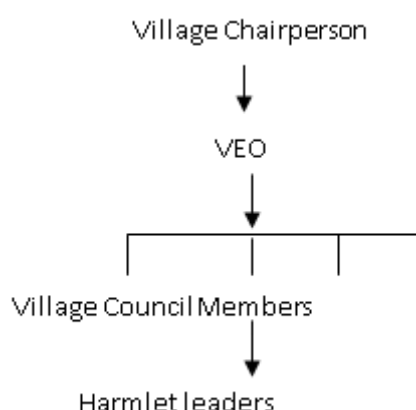


Fig. 2.1 Structure of village governance

The common institutions in all villages were the Village Government, schools, health center, religious institutions, entrepreneurship groups and the hunting company (KNS). Others organizations that were found in one or two of the villages were Green Resources (GRL) and telecommunication companies. The roles of the village government leaders are summarized in Table 2.2.

Table 2.2 Roles of village leaders

Title	Role
Village Council	Review and approve income and expenditure of all village income
Village Chairman	Chair village meetings
Village Executive Officer (VEO)	Advisor to the village Keep records Prepare income and expenditure statements Coordinate village development projects
Hamlet leaders	Coordinate all activities of hamlets

The level of influence and importance of institutions to the village governance are shown in Table 2.3. According to the PRA results, the most important and influential bodies are the Village Council, schools, entrepreneurship groups, hospitals, religious organizations, KNS and market places.

Table 2.3 Presence and influence of institutions

Institutions	Tanganyika	Ipinde	Utengule	Iduindembo
Village government	+++	+++	+++	+++
Schools	+++	+++	++	+++
Health centres	++	+++	++	++
Religious organizations	++	+	+	+
Entrepreneurship groups	+++	++	+++	++
Kilombero North Safaris	Not close at all	Not close	0 a little bit coming up	We need to replace them if possible
Green Resources Ltd	NA	+	NA	NA

Kilombero North Safari was considered to have a weak relationship with all villages. They are blamed for encroaching on village boundaries, mistreating village members, and prohibiting access to fishing grounds in some villages, specifically Ipinde and Iduindembo.

1.4 Governance of natural resources

There are different natural resources in the villages such as land, fishing grounds, rivers, forests, wildlife and swamps. Access to these resources is mediated by different institutions including the Village Council, District Council and the Forest Committee. Procedures of access to different natural resources vary based on resource categories. Access to grazing land and open areas is free, while residential and farm land are accessed mainly through inheritance, purchase from individual owners and allocation by the village government. Access to

wildlife is prohibited at village level, but access permits are granted by higher government authorities mainly the District Council officials. Access to fishing grounds is restricted; in some villages like Utengule they get permits through the District Fisheries Officer, in other villages like Iduindembo and Ipinde they claim that KNS prohibits access to the fishing grounds. They claim that the company argues that they have the sole right to the swamps and rivers segments that are in the hunting block area.

Some of the villages acknowledge receiving some monetary incentives from KNS. Utengule claims to have received at least two lots of money and once in kind assistance from KNS. The monies they received are of two categories: one which they received from the District Council (the amount which is according to what the law demands that the nearby villages should be given 25% of revenues collected from hunting activities), the other they received directly from KNS, this being the amount paid from sport fishing revenues and which results from an informal agreement the village has with the hunting company to compensate the village for the use of fishing grounds. The same happened for Ipinde village, but the story is different in Tanganyika and Iduindembo which complain that they have never received any incentives from the company. All villages demand greater transparency in the provision of incentives, which they claim is not the case for the time being. They also complained that the company does not avail itself to the villages for discussion on how to manage the common resources, especially fishing grounds which they perceive as belonging to the villages and not to the hunting block.

1.5 Existing developments and future priorities

The commonly mentioned developments were communication infrastructure, electricity, schools, roads, village offices, police stations, water wells, main and street roads and health centres. Those considered to be most important were roads (though in bad condition they are still seasonally accessible), schools, health services and communication facilities.

Priorities for future development varied from one village to another. However, the highest ranked requirements were for the upgrading of roads from seasonal to permanent, since roads are completely inaccessible during the rainy season; improvement of education infrastructure, specifically teachers houses, class rooms and students desks; improvement of health services, specifically increased availability of medical personnel; communication infrastructure (establishment of communication posts); and water supplies, in the form of closed wells and taps.

2. MANAGEMENT OF LAND

2.1 Land categories and land use

Land categories are much the same in all four villages. The main types of land include farm land, reserved land in the form of forests and wetlands, occupied land in form of settlements, and land set aside for future use. These categories follow what is stipulated in the Village Land Act no. 14 of 1999. The three villages of Ipinde, Utengule and Iduindembo all have Village Land Use Plans (VLUP), although these are still under review and not yet completed. In Tanganyika village the VLUP is completely non-existent. For the other villages, where the VLUPs are at different stages of development, the leaders have started allocating land using the existing draft plans and are using already established by-laws.

Table 2.4 Categories of land and their relative extent

Type of Land	Percentage of total area			
	Tanganyika	Ipinde	Utengule	Iduindembo
Farm land	20	35	25	20
Grazing land	-	5	10	5
Forest reserve and wetlands	76	20	50	60
Settlements	4	25	10	15
Future use	Not applicable	15	5	Not available
Total	100	100	100	100

Dominant land use categories differ from one village to another (Table 2.4). In Tanganyika village the dominant land use categories are forest land (75%, much of which is used for bee keeping), farm land (20%), residential area (4%), and water (1%). In Ipinde village the dominant land categories are farms (35%), residential land (25%), forest land (20%), land for future use (15%) and grazing areas (5%). In Utengule village the dominant land use categories are conservation area (50%), farm land (25%), residential areas (10%), grazing areas (10%) and land for future use (5%). In Iduindembo village the dominant land use categories are conservation area (60%), farm land (20%), settlements 15% and grazing land (5%). For Iduindembo, there is no land set

aside for future use, whilst for Tanganyika this was considered to be not applicable as people are free to clear land in the forests wherever they want.

2.2 Land occupancy/ownership

Land ownership and management differ depending on land categories. Farms, plots and houses/settlements are privately occupied and managed by the household members. For privately owned land (settlements and farm lands), the main owners of the rights are men (husbands), whereas females (wives) do many of the management activities. In crop farming all members of the household are engaged in specified activities; men do slashing to clear the fields, women and children do planting and weeding, and everyone participates in harvesting. This was common to all four villages.

Communal lands are mostly grave yards, grazing land, reserved lands where there are forests and water bodies where fishing grounds are found, and land which is set aside for future use.

2.3 Access to land

Land acquisition and access to naturally accrued resources is the same across all four villages (Table 2.5). Access to resources from natural water bodies including rivers, swamps, ponds and forests is through permits allocated by the Village Government or District Council, depending on the type of resource. Land for other activities such as grazing is acquired through allocation by the Village Government to all livestock keepers who access it for free. Other land is acquired through buying, inheritance and encroachment.

Table 2.5 Main methods of access to different types of land

Land category	Ways of access	Rights attached	Issuing authority
Farm land	Inheritance Purchase Allocation	Cultivation	Village Government
Grazing land	Allocation	Grazing	Village Government
Wetlands and forest reserves	Permits	Access Utilization of specified products i.e. fish, poles, fire wood, charcoal	Village Government and District Council
Settlements	Inheritance Purchase	Houses Graveyards Home gardens	Village Government
Future use	No specific use	Allocation	Village Government

2.4 Land management

In all four villages the land is managed by the Village government. The main body/organ of the village Government that executes land management is Village Council and its constituent Land Committee. The procedure is that applicants send their applications for land to the village government; these are assessed by the council whereby the qualified applicants are recommended to the village General Assembly for a final decision. The GA is the highest decision making body for land allocation and no land in the villages is allocated without being decided by the GA. This land management process is common in all three villages, except in Tanganyika village where the rules are not in operation. In Tanganyika, land is allocated informally following traditional rules, mainly through inheritance and in a few cases through purchase from individual owners.

2.5 Land conflicts

The main form of conflict identified for all four villages in both the PRA and KII exercises was that of encroachment by KNS across village boundaries (accounting for 99% of the overall importance). The reasons behind the conflict between villages and KNS is due to a lack of permanent demarcation between villages areas and that of the hunting block that is rented to the company. The villagers are of the perception that the hunting block is established within village land and, therefore, they demand adequate compensation so as to realize tangible benefits in place of forgone rights to their land. The villagers claim that they have never seen a map of the hunting block, and feel that this is important, as they would then be in a better position to understand the extent of the hunting block and the location of the new boundaries following establishment of the hunting block. The hunting block was said to have been established in 2000 and operated by three different companies since then (including the present KNS).

Conflicts about lands, especially those between villagers, are usually settled in the village. The main village organ for conflict settlement is the Village Land Council (Mabaraza ya ardhi); if the matter cannot be resolved there it is transferred to the Ward Land Council for settlement; if that fails it is taken to court of law, Division of Land, for judgement.

Offenders are usually warned or fined at village level. The magnitude of the fine depends on the fault committed but is normally from TZS 20,000 to TZS 50,000. Those who are taken to the ward level can be recommended to the court for jailing or are sometimes fined. In the courts, offenders can be warned, fined, or jailed.

2.6 Trends in land availability

All four villages reported trends of increasing populations, leading to increased demand for (and reduced availability of) land for settlements and farms and grazing purposes; a corresponding decrease in areas set aside for conservation and future use; and a marked escalation in the number of land conflicts. These trends were expected to persist into the future, such that the situation calls for immediate intervention to address this.

Table 2.6 Resource utilization trends

Factor	Before Mkapa	Current Magafuli	Future 2030	Notes
Tanganyika				
Size of settlements	0	100	200	Population increase
Size of grazing area	-	-	-	-
Forest conserved area	1000	100	20	Land expansion for agricultural activities
Availability of residential land	120	100	70	Population increase
Availability of land for agriculture	120	100	70	Population increase
Availability of land for grazing	0	100	105	In future pastoralists may come here
Ipinde				
Size of residential plots	5000	100	1	Population increase
Size of individual farms	10,000	100	0	Population increase
Size of conserved areas	90	100	90	Set land for future use
Availability of residential land	10,000	100	10	Through selling
Availability of land for farming	100,000	100	10	No new land
Availability of land for grazing	0	100	110	Set aside grazing area
Number of land conflicts	0	100	1,000,000	Land scarcity
Utengule				
Size of settlements	75	100	150	Increase of migrants which leads to increase of birth rate
Size of farms	25	100	120	No land remains
Size of grazing areas	5	100	100	Land scarcity
Size of forest conserved areas	100	100	100	Expected to be taken by the villagers
Availability of residential land	1000	100	10	No land remains
Availability of land for farming	1000	100	-ve	No land remains
Availability of land for grazing	NA	100	-ve	Before the land for grazing was available but currently there is no grazing land
Number of land conflicts	10	100	10,000	Increase of land value
Iduindembo				
Size of settlements	2	100	100	Increase of migration which led to population increase
Size of farms	1	100	10,000	Technology Population Increase Increase of land demand

Factor	Before Mkapa	Current Magafuli	Future 2030	Notes
Size of forest conserved areas	100	100	50	Increase of land demand
Availability of residential land	10,000	100	0	Population increase
Availability of land for farming	10,000	100	0	Population increase
Availability of land for grazing	20,000	100	0	No remaining land
Number of land conflicts	0	100	20,000	Increased demand for land

2.7 Future of land management

There are many threats to future land use and management, including:

- Population growth; this is already a problem since no land is left for new allocations for farming
- Grazing (over stocking) will cause many wetland to dry up
- Reserved land will dwindle where by many animals are in danger of going locally extinct
- Conflicts linked to land issues will increase greatly

The following should be implemented to strengthen land management:

- Education on efficient and effective forms of land use
- Provision of right to occupancy (entitling)
- Establishment of strict rules and enforcement
- The district council to provide close support to villages in land management because the leaders are not expert enough to understand laws and management principles which enhances the sustainable management of lands

3. DISCUSSION

In general, the Bena ethnic group is dominant in the four studied villages. Close to the Bena follows the Sukuma ethnic group. Both of these are predominantly crop farmers. However there is great migration occurring from other regions, with most migrants coming in search of fertile land for growing crops. The largest group amongst the migrants is the Sukumas and this is common to all four villages. What is interesting is that the Sukumas are usually not coming with their livestock but rather to get land for cultivation. This is different to many other villages in the Kilombero Districts where Sukuma have generally migrated in search of good grazing land for their livestock. It may be that the Sukumas, due to their big household sizes, are strategizing for land so that they can meet their needs for both food security and pastures for their livestock. In response to the land scarcity which is now being experienced in the whole district, the group might be keeping their cattle somewhere else in other villages in the district; this however was not studied in depth but would be an interesting line of investigation to follow up on.

The study further noted that usually the pattern of migration is from rural to urban areas, but in these villages there are migrants from urban to rural areas and others from rural to rural areas. The intensity of migration was noted to be higher in Ipinde and Utengule as compared to Iduindembo and Tanganyika. In Iduindembo, the potential for migration is now limited due to the fact that the land is all occupied and there is no land set aside for future use. In Tanganyika, the landscape is hilly and there are few lowlands left that are suitable for crop farming, which is revealed to main attraction for the migrants. Migration has a big implication to the growing land scarcity that is expected in the future of all the four villages, due to rapid population growth and associated demand for land.

The study found out that although village governments have formally established structures of governance, there is variation in understanding among the leaders when it comes to how the structure operates. There is confusion between decision making which is normally a political role and execution of the decisions. For the village General Assembly, which is where every villager sits, it is not clear as to where it should be placed in the whole village structure. The confusion was observed to be greater among newly enacted and employed leaders. Therefore, there is a need to train incoming village leaders before they assume village governance roles. This would help avoid the existing confusion, which is contributing to inefficiency and ineffectiveness in land management and contributing to the ongoing degradation of the general environment and natural resources.

The study participants acknowledged that land and natural resource management and use have changed in ways that are both positive and negative as far as the resources are concerned. On the positive side, land has

appreciated in value, to the extent that villagers are now aware of its value and therefore are not easily giving out their rights to land to outsiders. The villagers also consider land as an asset which they can use for poverty alleviation, unlike it was before, and this is expected to increase in the future. Because of increased scarcity the awareness about the need for land management is now on the rise, and many people are demanding for effective land use planning so as to minimize conflicts and mismanagement of the available land.

Land and natural resource management and use are becoming complicated due to population growth and associated increases in demand. The situation will continue to deteriorate unless measures to mitigate the problem are put in place. If there is no proper management, in ten years time land will no longer be available. Land use plans should be completed to guide and strengthen land management otherwise the land is likely to be misused. Land demand is expected to increase even faster than population growth due to the introduction of new technologies (such as mechanized tilling), coupled with the national drive towards industrialization.

ANNEX 3: FARMING AND LIVESTOCK - QAMBEMEDA NYANGHURA

1. FARMING

1.1 Types of farmers and farming systems

Crop farmers were categorized into two or three groups per village, based on the size of their farms as small, medium or large farmers, although the definition of categories varied from one village to another (Table 3.1). Small farmers were defined as those who cultivate <10 acres, other than for Iduindembo (<5 acres). With the exception of Utengule village (>20 acres), other villages defined large farmers as those who cultivated more than 10 acres. Utengule and Iduindembo village had medium scale farmers, defined as those who cultivate 10-20 acres and 5-10 acres respectively. Small scale farmer accounted for 70-89% of all farmers in each village, followed by medium scale farmers (9% to 15%), and large scale farmers (2% in Utengule to 30% for Tanganyika).

Table 3.1 Scale of farmers and their relative frequency (%)

Type of farmers	Tanganyika		Ipinde		Utengule		Iduindembo	
	Definition (acres)	Percent of households	Definition (acres)	Percent of households	Definition (acres)	Percent of households	Definition (acres)	Percent of households
Small farmers	< 10	70	< 10	80	< 10	89	< 5	80
Medium Farmers	-	-	-	-	10 -20	9	5 - 10	15
Large farmers	> 10	30	> 10	20	> 20	2	> 10	5
Total		100		100		100		100

Modes of farming varied across the four villages, with high dependence on the use of cattle for ploughing in Utengule and Iduindembo villages, limited use in Ipinde and nil for Tanganyika village. This pattern correlates with the presence and abundance of draft cattle and also the nature of the terrain. For example, in Tanganyika, where there are no cattle, the terrain is predominantly broken and hilly and cultivation is done by hand hoe by virtually all farmers; similarly for Ipinde the terrain is slightly gentler and there are now a few draft cattle.

Ongoing changes in farming systems were noted in all villages. The general past experience of cultivating multiple crops in one farm has changed to usually a single crop per field. In Tanganyika village, due to the relatively high availability of farm land, some farmers still practice shifting cultivation on a rotation cycle of 7-10 years, whereas in other villages people cultivate continuously in the same fields. Technological advances, particularly the use of draft animals and a few tractors in Utengule and Iduindembo for ploughing, has also contributed to changing systems of farming. The application of these technologies is limited in Tanganyika village and partly Ipinde because of the unfavourable terrain characterized by steep hills interspersed by narrow valleys.

1.2 Crops cultivated

Seventeen crops were reported to be grown in the survey villages (Table 3.2). Rice, maize, sesame, cassava, potatoes, groundnuts and pigeon peas were the common crops cultivated across all villages. All households in all villages grow rice, and also maize except for Tanganyika village where maize is grown by only about 50% of households. Sesame, rice and maize were the priority cash crops; rice, maize, bananas, cassava and sweet potatoes were the main food crops.

1.3 Rules relating to farming

At village level there are no rules governing farming activities; all farmers are free to farm the way they want on their farms. However, there are established procedures for acquiring farm land, including through purchasing land from other villagers through informal negotiations, or through allocation by the village government upon receipt of application and approval by the village assembly. It is only in Utengule village where restrictions against farming along rivers are instituted and offenders are fined by the village government. Similar restrictions against cultivating in catchment forests were reported in Tanganyika village, but there is limited enforcement of this.

Table 3.2 Types of crops cultivated: relative frequency (% of households (hh)) and importance ranking as food crops (FC) and cash crops (CC)

Crop	Tanganyika			Ipinde			Utengule			Iduindembo		
	% hh	FC	CC	% hh	FC	CC	% hh	FC	CC	% hh	FC	CC
Rice	100	1	2	100	1	2	100	1	1	100	1	2
Maize	50	2	3	100	2	3	100	2	2	100	2	3
Banana	80	3	10	60	3	6	40	5	8			
Cassava	40	4	11	100	4	7	40	4	5	50	4	11
Sesame	90	11	1	100	7	1	60	11	3	70	11	1
Sorghum	70	10	4	40	7	8	20	9	10			
Sweet potatoes	20	8	9	50	5	9	60	3	4	50	5	10
Groundnuts	10	9	7	40	7	5	30	8	11	30	8	4
Pigeon peas	10	7	6	50	8	4	40	7	6	30	6	6
Beans	5	5	5									
Chickpeas	30	6	8									
Millet				40	6	11	20	6	9	30	3	8
Cowpeas				30	8	11				20	7	9
Sunflower				30	7	10						
Vegetables							20	10	7			
Green peas										20	10	5
Bambara nuts										20	9	7

1.4 Crop inputs and yields

Seeds, hand hoes, herbicides and pesticides are used across all the study villages. Draft animals and a few tractors are used in Utengule and Iduindembo villages and to a limited extent in Ipinde village.

According to KIIs, crop productivity has generally increased in all villages. Suggested reasons for this included more effective management of farms (Tanganyika, Utengule and Iduindembo); changes in motives for cultivation from subsistence to more commercial production (Ipinde); a decrease in crop raiding by wild animals (Iduindembo village); and an increase in use of draft animals and herbicides (Iduindembo village).

1.5 Crop storage

Seed crops, particularly rice and maize, are packed in bags of approximately 100-150 kg after harvesting. Other crops are packed in bags of varied size and stored in houses. Sesame was the only crop sold directly from the farms; a few farmers also pack sesame in bags and send it directly to Dar es Salaam for selling.

Rice and maize were noted to be the most important crops for both food and cash, and much the same storage approach is used for both. After harvest a small quantity of rice is usually retained and stored in the house in bags for household consumption and for seeds for the coming farming season. A few traditional warehouses (owned by Sukumas) were reported in Utengule, Ipinde, Iduindembo villages. The rest of the harvest is transported and stored at milling machines located in Mlimba for 5 - 6 months, at an average price of 1,000 TZS per bag. Utengule village has small "godown" which is used by a few farmers to store their rice at a price of less than 1,000 TZS per bag, before selling.

1.6 Marketing of crops

The majority of farmers (about 50% - 70%) sell their crops in their respective villages, mainly to middlemen. Other farmers (about 20% - 30%) were reported to sell rice to milling machines at Mlimba where they are stored. A few farmers in Utengule (about 5%) send their rice to Dar es Salaam. Likewise, in Ipinde village about 30% of sesame growers join their crops and sell in bulk to Dar es Salaam. Crop prices vary with the season; generally prices are lower during the dry season and higher during the rainy season. The dry season is the time of harvesting and is characterized by high supply of crops and roads to markets are accessible, such that prices

go down; the opposite is true during the rainy season. For example, the average price of one bag of rice (about 20kg) during the rainy season is 10,000 TZS and during the dry season 5,000 TZS.

1.7 Challenges to crop production

Across the four villages, farmers identified a total of eleven challenges to farming activities (Table 3.3). Crop disease and difficulties in accessing agricultural inputs were common challenges identified in all study villages. Other challenges reported by three villages included the destruction of crop by wild animals; the absence of good markets; lack of transport (poor road access), financial constraints during the rainy season to facilitate farming; and the absence of or few extension officers. Other challenges were reported from only one village.

Table 3.3 Challenges to crop production and their relative importance (%)

Challenge	Tanganyika	Ipinde	Utengule	Iduindembo
Crop diseases	0.4	0.6	64.9	0.0
Difficulties in accessing agricultural inputs	0.1	0.1	0.2	0.1
Destruction of crops by wild animals	85.7	0.2		0.0
Absence of good markets	8.6	66.1		90.0
Lack of transport (poor road access)	4.3	22.0		9.0
Financial constraints during the rainy season to facilitate farming	0.9		0.2	0.0
Absence of or few extension officers		11.0	10.8	0.0
Poor storage facilities after harvesting	0.1			
Destruction of crops by livestock			2.2	
Impacts of climate change			21.6	
Expense of agricultural inputs				0.9
Total	100.1	100.0	99.9	100.0

The absence of good markets was the most important challenge in Iduindembo (90%) and Ipinde (66%) villages, and the second most important challenge in Tanganyika village (9%). Market limitations are linked to a lack of transport and poor roads to access markets (Ipinde 22%, Iduindembo 9% and Tanganyika 4%). For Tanganyika the main challenge was the destruction of crops by wild animals (86%), and for Utengule impacts of crop diseases (65%). Other relatively important limitations were the impacts of climate change (Utengule 22%), and the inadequate presence of extension officers (Ipinde and Utengule, both 11%).

1.8 Conflicts relating to farmers

Conflicts involving farmers were reported to occur among farmers themselves (all villages); with KNS (all villages except Utengule); between farmers and pastoralists (all villages except Tanganyika where there are no cattle), and with national forest reserves (for Ipinde). The most important forms of conflicts were among farmers for Tanganyika (83%); with KNS for Ipinde (86%) and Iduindembo (90%) and, for Utengule, with pastoralists (91%) (Table 3.4).

Table 3.4 Types of conflicts relating to farmers and their relative importance (%)

Conflicts	Tanganyika	Ipinde	Utengule	Iduindembo
Farmers themselves	83.3	8.6	9.1	1.1
Farmers and Kilombero North Safaris	16.7	85.7		89.9
Farmers and pastoralists		4.3	90.9	9.0
Farmers and National Forest reserves		1.4		
Total	100	100	100	100

The main source of conflict between farmers concerns misunderstandings over farm boundaries. The conflict with KNS was attributed to unclear land boundaries between the villages and the hunting block concession area (Iduindembo and Tanganyika) and, for Ipinde village, where the boundary is known, due to the annexing and inclusion of some farm land within the KNS concession area. The community claim that KNS has grabbed some of their land which could be used for farming.

Conflicts between farmers and pastoralists are caused by livestock trespassing into farms and destroying crops. Such disputes are fuelled by the high numbers of livestock, particularly cattle, in Iduindembo and Utengule. Some agro-pastoralists, particularly Sukumas, were reported to have further fuelled conflicts in Utengule village through converting parts of designated grazing areas to farms, such that the remaining grazing areas are now too small and therefore animals are forced to graze among the farms.

1.9 Impacts of farming

Key informants were asked whether farming activities result in any negative impacts to the environment. Important impacts noted by informants included reduced water flows due to farming around catchment forests (Tanganyika and Utengule villages); increased siltation due to farming close to rivers and dams (Iduindembo village); pollution of water sources due to the application of herbicides (Ipinde village); and enhanced deforestation and desertification due to the cutting of trees for new fields (Utengule village). These impacts are probably common across all villages.

1.10 Trends and future of farming activities

Village informants were asked to assess trends from the past (1995) to present and of their expectations for the future through to 2030, for four factors: the number of farms, the size of farms, crop productivity and levels of land conflicts (Table 3.5).

The numbers of farmers were reported to be increasing across all four villages, due to population growth including of immigrants, the fact that farming is increasingly seen to be a key source of employment and income, and due to increasing use of new technologies such as the use of draft cattle for ploughing.

There were mixed perceptions concerning the trends of sizes of farms across the villages. The size of farms was said to be decreasing for Ipinde and Iduindembo (due to population growth and growing demand for land for all uses); increasing in Tanganyika (where there is still sufficient free land to accommodate expansion of farms); and to be remaining constant in Utengule (where land is more limited).

Crop productivity was perceived to be decreasing across all villages, due to cultivating the same land every year with resulting loss of soil fertility and increases in crop diseases.

Land conflicts were perceived to be increasing for all villages in the face of continuing population growth and escalating demand for land for all uses.

Table 3.5 Trends of farming activities

Factor	Tanganyika	Ipinde	Utengule	Iduindembo	Reasons
Number of farmers	Increasing	Increasing	Increasing	Increasing	Increased in population including emigrants Farming is increasingly to be source of employment and income Increase in technology
Size of farms		Decreasing	Constant	Decreasing	Land use demands are increasing (e.g. for conservation, investment, settlements etc Population increase
	Increasing				Still the land bank is positive to accommodate more expansion
Crop productivity	Decreasing	Decreasing	Decreasing	Decreasing	Decrease in soil fertility Increase in crop diseases Cultivation of the same farms every year
Number of land associated conflicts	Increasing	Increasing	Increasing	Increasing	Land demand is increasing Population increases

2. PASTORALISM

2.1 Types of livestock and pastoralists

Chickens were the most common form of livestock, being kept by almost every household in all villages. Other types of livestock included, ducks, pigs, goats, sheep and cattle, plus cats and dogs. Cattle, goats and sheep were absent from Tanganyika village, few in Ipinde and relatively abundant in Utengule and Iduindembo villages.

Table 3.6: Types of pastoralists

Type of farmers	Tanganyika		Ipinde		Utengule		Iduindembo	
	Definition	% of hhs	Definition	% of hhs	Definition	% of hhs	Definition	% of hhs
No cattle	0	100	0	90	0	0	0	0
Small pastoralists	-	-	< 12 cattle	10	< 12 cattle	80	< 10 Cattle	80
Medium pastoralists	-	-	-	-	12 -100 cattle	16	10 -50 cattle	15
Large pastoralists	-	-	-	-	> 100 cattle	4	> 50 cattle	5
Total		100		100		100		100

Three groups of pastoralists (small, medium and large scale pastoralists) were identified for Utengule and Iduindembo villages based on their scale of cattle ownership, although the definition of classes differed between villages (Table 3.6). In Utengule village, large scale pastoralists were defined as those with more than 100 cattle and for Iduindembo more than 50 cattle. Medium scale pastoralists constituted those with 12 - 100 cattle and 10 - 50 cattle in Utengule and Iduindembo villages respectively. Pastoralists with less than 12 cattle were categorized as small scale pastoralists in Utengule and Ipinde village and those with less than 10 cattle for Iduindembo village.

Significant numbers of households in Utengule and Iduindembo villages keep large livestock. In both villages, about 80% of the cattle keeping households constitute small scale pastoralists, 15-16% medium scale pastoralists and the remaining 4-5% are large scale pastoralists. For Ipinde, very few households keep cattle (about 10%, for draft purposes), and these are all small pastoralists with less than 12 animals per household.

2.2 Grazing areas and watering points

Grazing areas and watering points were noted to vary with season and between villages. Cattle from Iduindembo and Utengule were reported to graze and take water in the same places. Uplands areas constitute the main grazing areas during the rainy season and low lands (valleys) during the dry season. These two villages are adjacent to each other and formerly Iduindembo was a hamlet of Utengule until their separation in 2014. The areas used for grazing are those that were previously designated as formal grazing areas under Utengule village. After the division of the villages most of the uplands areas now belonged to Iduindembo and most of the lowlands remained with Utengule village.

During the dry season pastoralists take their cattle to water in the Mpanga and Mbuli Rivers. During the rainy season there are abundant water sources in the form of scattered ponds.

For Ipinde, all cattle are grazed and take water around farm lands inside the village. For Tanganyika there are no cattle and thus no grazing areas or watering points were noted.

2.3 Livestock diseases

Livestock diseases, particularly of cattle, were identified to be an important challenge in Utengule and Iduindembo villages. Common diseases included trypanosomiasis, contagious bovine pleuropneumonia (lung disease), foot and mouth disease, east coast fever, rinderpest ("sotoka") and cowpox ("ndui"). Some pastoralists apply prevention measures but this is limited to spraying and vaccinating against trypanosomiasis. Most of the large pastoralists are knowledgeable about the different diseases and often treat their cattle themselves, while a few consult with a veterinary officer before administering medication. Most small pastoralists have less experience and therefore rely on advice either from the veterinary officer or occasionally from large pastoralists.

2.4 Marketing of livestock and services

No buying or selling of cattle was reported in Tanganyika village. In Ipinde village, pastoralists are still of a small scale, therefore they only buy draft cattle. Buying and selling of animals is common among large pastoralists in Utengule and Iduindembo villages. Most cattle were reported to be sold through auctions, including at Utengule, Iduindembo, Ngalimila, Kyela and Makirika. A limited number of transactions also take place in the villages, either between community members themselves, or in the form of selling to middlemen who often come to the village. Most of the middlemen are from Ifakara, Dar es Salaam and Songea.

Cattle prices vary according to supply and demand. The supply of cattle to the market is higher during the rainy season and lower during the dry season. The prices are higher during the dry season, when the supply is lower, the demand from middlemen is higher, the roads to the market are accessible and pastoralists generally opt to sell harvested crops rather than cattle. On the other hand during rainy season, pastoralists have no alternative source of income and therefore are forced to sell cattle to meet livelihood needs including farming expenses. The resulting high supply of cattle to the market coincides with challenges of inaccessible roads for the middlemen to access markets, hence the lower cattle prices at this time.

The use of cultivation services in the form of cattle for ploughing was reported from Ipinde, Utengule and Iduindembo villages. The service providers may come from the same village or an adjacent village. Ploughing costs an average price of 30,000 to 50,000 TZS per acre depending on the location (high terrain, flooded areas etc) and status of the field (a new field or one that has already cultivated before).

Cattle milk and beef were reported to be traded at Utengule village. The main center for milk trade is inside the village, while beef is mainly sold outside the village principally to Mlimba town. The main buyers of milk are local food vendors and households, and for beef are butchers in Mlimba.

2.5 Rules relating to livestock production

No rules, restrictions or bylaws related to pastoralism were noted in Tanganyika and Ipinde villages. However, a few village bylaws are instituted and enforced in Utengule and Iduindembo villages, including restrictions against grazing around Ngapemba swamp and water catchments areas, and restrictions against cattle trespassing into farm areas. Other restrictions include limiting the free ranging of cattle out of settled areas, and limiting the number of cattle per household (not beyond 106 cattle for large pastoralists and 8 for small pastoralists).

In spite of the fact that most of these rules were set by the villagers through the village assembly, their enforcement has been difficult. For example, it has proved difficult to enforce limitations concerning the sizes of cattle herds, as most of the large pastoralists have extended families including a number of small constituent households within. In this case ownership of what is considered as a large herd can be distributed amongst many members of the family. The restriction against grazing within Ngapemba swamp was noted to be relatively effective. The reason for this is due to the presence of the BMU, the members of which report offenders to the village government (once they see cattle in the swamps) and which then imposes fines on offenders. Fishermen are stimulated to report pastoralists grazing their cattle in the area because cattle cause damage to fishing grounds and fish breeding sites.

2.6 Challenges faced by livestock producers

A total of twelve challenges were reported across the four study villages. Livestock diseases were reported from all four villages, and were rated as being the most important challenge for Tanganyika (99%) and Ipinde (60%) villages (Table 3.7). For Tanganyika and Ipinde villages, where there are no or only few cattle, this related mainly to Newcastle disease of chickens, whereas for the other villages diseases related principally to cattle. Inadequate grazing areas was identified as the most critical challenge facing pastoralists in the two villages of Utengule (82%) and Iduindembo (90%).

Other relatively important constraints include ineffective infrastructure particularly roads (Ipinde 30%) and conflicts between pastoralists and farmers (Utengule 14%). Other challenges such as the absence or limited presence of veterinary officers, expense of veterinary medicines, absence of water points, low livestock market prices, absence of a dipping facility (plunge dip) and difficulties in accessing veterinary medicines were rated as being less important, accounting for less than 10% of the overall relative importance in each village.

Table 3.7 Challenges faced by livestock producers and their relative importance (%)

Challenges	Tanganyika	Ipinde	Utengule	Iduindembo
Livestock diseases	99.0	60.0	2.7	4.5

Challenges	Tanganyika	Ipinde	Utengule	Iduindembo
Absence of or inadequate markets	1.0	2.5		
Absence of or inadequate veterinary officers		7.5	0.9	
Inadequate grazing areas			82.3	90.2
Absence of dipping facility (plunge dip)			0.1	0.1
Absence of water points			0.1	0.0
Ineffective infrastructure (roads)		30.0		
Conflicts between pastoralists and farmers			13.7	
Difficulties in availability of veterinary medicine			0.2	
Low market prices for livestock				0.6
Absence of market for livestock products (milk and skins)				0.0
Expense of veterinary medicines				4.5
Total	100.0	100.0	100.0	100.0

2.7 Conflicts relating to livestock producers

Four types of conflict were noted concerning pastoralists: with farmers (three villages), with KNS and with other pastoralists (both two villages) and with fishermen (Iduindembo). Conflicts with farmers was the most important form of conflict for Ipinde (100%) and for Utengule (89%), whilst for Iduindembo conflict with the KNS was rated as being most important (96%) (Table 3.8).

The cause of conflict between pastoralists and farmers was due to cattle trespassing into farm lands and destroying crops. The cause of conflict with KNS was because the boundary between the villages and the KNS concession area is not clear, and villagers claim that a significant portion of their grazing land has been included within the KNS area, such that the remaining area for grazing within the village is restricted. Iduindembo village has a higher number of pastoralists than Utengule, and this probably explains why the conflict with KNS was given a much higher score in Iduindembo than for Utengule.

Table 3.8 Conflicts relating to livestock producers and their relative importance (%)

Conflicts	Tanganyika	Ipinde	Utengule	Iduindembo
Pastoralists and farmers		100	89.3	3.2
Pastoralists and KNS			8.9	96.2
Pastoralists themselves			1.8	0.2
Pastoralists and fishers				0.4
Total		100.0	100.0	100.0

Conflicts between pastoralists were reported for Utengule and Iduindembo villages, and are due to competition for scarce grazing resources. During the KIIs and PRA exercises in Iduindembo, it was claimed that there is a group of eight large pastoralists, known as "Ngaliketi", who were the first pastoralists to come there, and who now restrict non-group members from grazing their animals within the designated grazing areas.

Though of minor importance, the conflicts between pastoralists and fishermen in Iduindembo was attributed to the destruction by cattle of fishing baits, breeding sites and river banks when they go to water sources/fishing grounds for watering.

2.8 Trends in pastoralism attributes

PRA participants were asked to give their opinions on past and future trends of a number of pastoralism attributes, and specifically to rate how factors have changed from the past (2000) to the present, and what they expect to happen into the future (to 2030).

Results for Tanganyika, where there are no cattle or pastoralists, were understandably quite different from the other three villages (Table 3.9). For these three villages cattle populations were expected to increase due to

increased demand for animals particularly for ploughing (everyone wants to increase their cattle). This was expected to result in an increase in the number of small pastoralists in all villages and large pastoralists in Utengule and Iduindembo (there are no large pastoralists in Ipinde). The size of grazing areas and access to water were both expected to decline, due to ongoing human population growth and associated demand for land for all uses and, for water access, due to unregulated farming activities including escalating cultivation in catchment areas and along rivers. Such activities were expected to lead to a decline in wildlife and thus a decline in conflict between livestock and wildlife. On the other hand, in the face of increasing scarcity of land and grazing resources, conflicts between pastoralists and with farmers and KNS were predicted to increase.

Table 3.9 Trends in pastoralism attributes

Attributes	Tanganyika	Ipinde	Utengule	Iduindembo	Reasons
Number of large pastoralists		-	Increasing	Increasing	Population increase Everyone wants to increase cattle
	Constant				No potential grazing areas due to terrain There are some grasses which are poisonous to livestock
Number of small pastoralists		Increasing	Increasing	Increasing	Increasing livestock demand particularly for farming
	Constant				No potential grazing areas due to terrain There are some grasses which are poisonous to livestock
Cattle population		Increasing	Increasing	Increasing	Increasing livestock demand particularly for farming
	Constant				No potential grazing areas due to terrain There are some grasses which are poisonous to livestock
Size of grazing areas		Decreasing	Decreasing	Decreasing	Population increase Increase in other land use activities Cattle are increasing
	Constant				No potential grazing areas due to terrain There are some grasses which are poisonous to livestock
Access to water	Decreasing	Decreasing	Decreasing	Decreasing	Escalating deforestation within catchments Unregulated farming (along rivers)
Conflict with wildlife		Decreasing	Decreasing	Decreasing	Increase in livelihood activities contributes to decrease in wildlife
	Increased				Number of wildlife are increasing and they cannot be consumed
Conflict with wildlife authority	Increasing	Increasing		Increasing	Community encroachment to conserved areas Increase in land demand
			Decreasing		Decrease in wildlife populations

Attributes	Tanganyika	Ipinde	Utengule	Iduindembo	Reasons
Conflict with pastoralists	-	Increasing	Increasing	Increasing	Competing for scarce grazing land
Conflict with farmers	Increasing	Increasing	Increasing	Increasing	Increase in number of pastoralists and farmers Land is limited Increase in population including emigrants

Tanganyika had no pastoralists and for Ipinde only a few households (less than 20) have between 1-10 cattle each. Respondents from Tanganyika do not anticipate the introduction of any cattle for two reasons: first the hilly terrain is not conducive to cattle or the use of cattle for ploughing and, secondly, there were reported to be some plants which are poisonous to cattle. The increase in conflicts with wildlife in Tanganyika was attributed to an increase in number of problem animals, particularly vervet monkeys.

3. MAIN FINDINGS AND DISCUSSION

Table 3.10 Summary of main findings regarding farming and livestock production

Issues	Main Findings
a. Farming	
Farmers and farming system	All households in the four survey villages practiced farming. Rice and maize are the main food crops and sesame and rice the main cash crops. Large farmers constitute less than 30% of farmers and small farmers are more than 70%. Most large farmers are immigrants (Sukumas) and most natives are small farmers. It is only in Tanganyika where a few farmers still practice shifting cultivation, with a rotational cycle of 7-10 years; this is attributed to the greater availability of land there as compared to the other survey villages. Use of draft animals in farming is increasing, particularly among small farmers. Due to limitations imposed by unfavourable (hilly/upland) terrain and the absence of cattle, hand hoes remain the sole method of cultivation in Tanganyika, and predominantly so in Ipinde village.
Rules governing farming systems, strength of enforcement and impact of farming on the environment	There are no specific rules or guidelines to regulate farming activities on individual farms. There are a few restrictions related to the location of farms, for example, farming along rivers and within catchment areas are restricted in Utengule and Tanganyika villages, respectively. Enforcement of these rules is fairly effective in Utengule village and largely ineffective in Tanganyika. Farmers in all villages seem to understand the impacts of unregulated farming to the environment, in the form of increased deforestation, siltation and water pollution and decreased water flows.
Challenges faced by farmers	Key challenges include losses of crops to wildlife (Tanganyika, 86%), the absence of markets and/or difficulties in accessing markets due to poor roads (Ipinde 88% and Iduindembo 99%), and for Utengule crop diseases (65%) and climate change (22%). Lack of or limited presence of extension officers was identified as an additional constraint for Ipinde and Utengule (both 11%).

Conflicts related to farming	<p>Conflicts between farmers themselves, relating to disputes over farm boundaries occur in all villages and, for Tanganyika, were ranked as being most important (83%).</p> <p>For Ipinde and Iduindembo, conflicts with KNS were rated as being most important (86% and 90% respectively). This was attributed to the boundary between the villages and the concession area being unclear, and to the inclusion of village land and thus potential farm land within the concession area.</p> <p>For Utengule, the major form of conflict was between farmers and pastoralists due to the incursion of cattle to fields and their destruction of crops.</p>
Trends and future perspectives of farming	<p>Farming activities are generally perceived to have increased from the past and are expected to continue increasing in future. The main drivers are population growth, including due to immigration, growing adoption of cattle-based ploughing and increasing dependency on farming as the main source of income and employment for the majority of households.</p> <p>Sizes of farms are expected to decrease with time, due to population growth and increased demand for land for all purposes, except for Tanganyika village where land for cultivation is still relatively plentiful.</p> <p>Crop productivity is expected to decline due to continuous cultivation of the same land, leading to decreased soil fertility and an increase in crop diseases.</p>
<p>Implications of farming activities for conservation</p> <p>Farming was noted to be of high importance to the livelihoods of the communities in all the study villages. It was revealed that the extent of crop farming is growing fast. Incentives for people to engage in farming include that it is the main source employment and income for existing residents, but also the generally positive results attained are attracting many new immigrants to the area.</p> <p>Farming activities, particularly un-regulated ones, combined with ineffective enforcement, is starting to cause negative impacts to the environment. A decrease in water flows, plus increased water pollution, siltation and deforestation are some of the critical challenges which were reported by communities. Intensive cultivation was also associated with the reduction or elimination of wildlife. It is very likely that these impacts will grow and their effects will be evident in the protected areas and ecological sensitive areas such as Ngapemba swamp in the near future.</p> <p>Important conflicts exist between farmers and conservation bodies such as KNS. This was mainly attributed to the boundary between the two not being clear. It was revealed that farmers are very aware of the importance of KNS in terms of conservation, and that some villages have received benefits from KNS through benefit sharing mechanisms (although most villagers were not well informed about this). However, the general perception is that the level of tangible benefits received by communities is not adequate to compensate for the loss of forgone uses for other purposes, and thus justify the continued use of village land for conservation.</p>	
b. Pastoralism	
Presence and types of pastoralists	<p>All villages had pastoralists except Tanganyika village. The number of pastoralists was highest for Iduindembo village, followed by Utengule village, and with just a few small pastoralists in Ipinde village.</p> <p>Large pastoralists are normally defined as those with more than 100 cattle. In Iduindembo village, where grazing pressure is acute, pastoralists with more than 50 cattle are considered as large pastoralists.</p> <p>Small pastoralists constitute more than 80% of the total pastoralists in Iduindembo and Utengule villages (and 100% for Ipinde).</p>

<p>Grazing areas, watering points and rules related to grazing</p>	<p>Grazing areas are very limited in Iduindembo and Utengule villages. Livestock from the two villages graze together in uplands (located in Iduindembo) during the rainy season and in lowlands (located in Utengule) during the dry season.</p> <p>The Mbuli and Mpanga Rivers are key water sources during the dry season; during the rainy season water is readily available from scattered ponds.</p> <p>Few rules, bylaws or regulations for the management of livestock were reported in Utengule and Iduindembo villages.</p> <p>Cattle holdings are supposedly limited to 106 per household for large pastoralists and 8 for small pastoralists, but this has proved difficult to enforce as large pastoralists are able to distribute cattle among family members who are typically numerous.</p> <p>The restriction against grazing livestock in Ngapemba swamp was noted to be relatively effective, due to the presence of the BMU who are quick to report offenders to the village government and which imposes fines to such offenders.</p>
<p>Challenges and conflicts faced by pastoralists</p>	<p>Inadequate grazing areas constitute the most important challenge to pastoralists in Utengule and Iduindembo villages.</p> <p>Cattle diseases reported from Utengule and Iduindembo villages included trypanosomiasis, lung fever disease, foot and mouth disease, east cost fever, rinderpest and cowpox. Diseases of chickens (particularly Newcastle disease) were reported to be the principal challenge to animal keepers in Tanganyika and Ipinde villages.</p> <p>For Utengule and Ipinde, the main form of conflict affecting pastoralists was with farmers, due to cattle straying into fields and destroying crops. The intensity of such conflicts is partly reduced through the presence and effective enforcement of village bylaws.</p> <p>For Iduindembo, the major form of conflict is with KNS, reportedly due to the unclear boundary between the two, but also due to the pressure on grazing resources within the village and the desire to put animals to graze within the KNS concession area.</p>
<p>Trends and future perspectives of livestock production</p>	<p>With the exception of Tanganyika village, the number of pastoralists, cattle populations, conflicts among pastoralist and conflicts with farmers were all considered to have increased in the past and are expected to continue to increase in the future. The underlying reasons include human population increase, including due to immigration, and increasing demand for cattle, particularly for farming, leading to increased competition for land, including for grazing purposes.</p> <p>Increased pressure on land is further expected to lead to decreased sizes of grazing areas and reduced access to water resources.</p>

Implications of livestock production for conservation

Pastoralism is increasing rapidly, partly as a livelihood activity, but more importantly as a vital service and input to farming activities. Interest in keeping cattle started to grow following the in-migration of large agro-pastoralists (Sukumas) who had experience of using cattle for ploughing. Since then the numbers of native cattle owners, particularly of draft animals, are increasing more rapidly than that of large pastoralists, though the bulk of cattle are still held by large pastoralists rather than small pastoralists. On the other hand the human population is growing fast, spurred by new immigrants who are attracted to farming, such that the extent of farms is increasing. While the cattle population is perceived to be increasing, grazing grounds and access to water are decreasing, and this is expected to lead to increased conflicts between pastoralists and other land users in the future.

With regards to the above context, it is evident that conservation efforts are likely to be disregarded as pastoralists seek to turn existing conservation areas into rangelands. However, most of the pastoralists were noted to understand the importance of conservation. The current dispute between pastoralists of Iduindembo and Utengule villages and KNS suggests that the issue is not to disregard the conservation efforts of KNS but rather to set a clear boundary between the village land and KNS. The other point that was stressed, particularly during the PRA, was the issue of benefit sharing schemes, which was claimed to be vague to many villagers and too insignificant to incentivize communities to advocate for and support conservation efforts.

Ngapemba wetland is an important ecological area that is located inside Utengule village. Following the return of part of the wetland to the village, the level of conflict between KNS and the village has been significantly reduced. Currently, the village has the responsibility to conserve the wetland as part of its land and through the use of existing bylaws. Only fishing through the BMU is allowed in the swamp and not any grazing of livestock. The presence of the BMU was noted to strengthen enforcement by ensuring rapid reporting of any illegal grazing to the village government.

4. RECOMMENDATIONS

Although pastoralists and farmers seem to be aware of the need for conservation and of the potential detrimental impacts of their activities, it is vital to actively conserve ecologically sensitive areas including Ngapemba swamp and to strengthen the conservation of hunting block. In order to enhance ownership, responsibility and management rights, it is recommended to establish a WMA, otherwise the flawed perception of land grabbing by KNS may gain ground.

As a part of the wider ecosystem, ecological values outside the conservation area should be protected by regulating their use. This could be done by revising current rules, bylaws and regulations and strengthening their enforcement.

Management of livestock and farming systems need to be revised to take into account limited land resources and other key drivers of change.

To enhance the management and protection of Ngapemba swamp from unregulated livestock grazing and farming, it is suggested to strengthen the existing BMU, including their enforcement capacity, as well as that of the village government.

ANNEX 4. LIVELIHOODS AND FISHING – BEATUS TEMU

1. LIVELIHOODS

1.1 Types of livelihood activities

About twenty livelihood activities were reported to be carried out within the four survey villages (Table 4.1). The main activities were farming, livestock production, fishing, running a small business, beer brewing, beekeeping and house construction. Crop farming was by far the most important activity in all four villages, such that these villages can primarily be considered as farming villages (Table 4.2). Livestock keeping was also important in all four villages, but for Tanganyika, where there are no cattle, sheep or goats, this is related to the keeping of poultry rather than large animals. Poultry is also the main form of livestock for Ipinde, with just a few people keeping cattle, and which are mainly used for ploughing to facilitate crop farming. Fishing was the third most important economic activity in Utengule and Iduindembo villages and the fifth in Tanganyika village, but for Ipinde was the sixteenth. This is because Ipinde has no important area for fishing, as the portion of the Mnyera River located in their village falls under the management of the hunting company (KNS) and fishing is not allowed there.

1.2 Locations and seasonal patterns

Crop farming is carried out in both lowlands and uplands for all the villages (Table 4.3). In lowlands crop farming is carried out throughout the year since these areas are always moist even during the dry season. The dominant crops in all villages are rice and maize. Crops such as rice, maize, millet and cassava are cultivated in both lowlands and uplands during the rainy season (November to May), while during the dry season (June to October), with the exception of rice, all other crops such as maize, millet, cassava and vegetables are cultivated in the lowlands.

Fishing is carried out in rivers and swamps throughout the year, other than for Ipinde village where virtually no fishing is done. Fishing in the flood plain is carried out especially during December to January when water starts entering the flood plain and fish (mainly *kambale* or catfish) is obtained. It is at this time that the *lipupwe* fishing method is applied, whereby people use a machete to hit the fish in shallow waters in flooded farm areas and small water streams, and collect the fish mainly for food. This method of fishing is applied by almost everybody including women, men, children, youth and elders, and particularly in Utengule and Iduindembo villages.

Beer brewing is done throughout the year. It was among the five main livelihood activities in Ipinde and Iduindembo villages. Beer is brewed from bamboo juice extract (*ulanzi* beer) or from a combination of maize and finger millet (*komoni* beer). *Ulanzi* beer is mainly available from January to June, since at this time bamboo is abundant and because of the rain the bamboo shoots have plentiful juice which can be extracted to make the beer. *Komoni* beer is mainly produced from July to December, and more for commercial purposes (for selling), as compared to *ulanzi* which is made by most households in the village and usually for household consumption. For Ipinde and Iduindembo villages about 60% to 70% of the households, respectively, are involved in beer brewing. However, it was revealed in Iduindembo village that the brewing is done in turns, such that at most three households prepare beer per day for selling to the rest of the villagers, then the day after it is the turn of another three households, and so on.

Other economic activities, including livestock keeping, beekeeping and house construction are done throughout the year. Cattle are put to graze mainly in the uplands during the rainy season and in the lowlands during the dry season. The lowlands provide green pastures for cattle even in the dry season because of the moist condition of the soil, while during the rainy season most people have farms in the lowlands such that these areas cannot be used for grazing at this time.

Table 4.1 Types of livelihood activities (1 = yes, 0 = no, not mentioned)

Factor	Tanganyika	Ipinde	Utengule	Iduindembo
Farming	1	1	1	1
Livestock production	1	1	1	1
Fishing	1	1	1	1
Small businesses (i.e. stores selling domestic items e.g. soap, salt, sugar etc.)	1	1	1	1
Brewing beer	1	1	1	1
Carpentry	1	1	1	1

Factor	Tanganyika	Ipinde	Utengule	Iduindembo
Groceries	1	1	1	1
House construction	1	1	1	1
Cereal grain processing	1	1	1	1
Transportation - motorbike (bodaboda)	1	1	1	1
Clothes sewing activities	1	1	1	1
Beekeeping	1	1	0	0
Women hair dressing activities	0	1	1	1
Barbershop activities	0	1	1	0
Electrical technicians activities	0	1	1	0
Sawmilling (pit sawing)	0	1	0	0
Fish pond activities	0	1	0	0
Weaving activities	0	1	0	0
Brick making	0	0	1	0
Charcoal making	0	0	0	1
Total	12	18	15	13

Table 4.2 Main livelihoods activities (relative importance as scores and %, and percent of households involved)

Activity	Tanganyika			Ipinde			Utengule			Iduindembo			Mean
	Importance score	Importance %	% of hhs	Importance score	Importance %	% of hhs	Importance score	Importance %	% of hhs	Importance score	Importance %	% of hhs	Importance %
Crop farming	500,000	90.83	100	48,000	99.88	100	7,500	98.67	100	700,000	99.94	100	97.33
Livestock production	50,000	9.08	100	6	0.01	100	75	0.99	70	400	0.06	50	2.53
Fishing	1	0.00	30				15	0.20	20	20	0.00	50	0.05
Small businesses	500	0.09	60	48	0.10	20	10	0.13	80	2	0.00	30	0.08
Brewing beer				2	0.00	60				1	0.00	70	0.00
Beekeeping	5	0.00	50			0							0.00
House construction				1	0.00	10	1	0.01					0.01
Total	550,500	100.00		48,057	100.00		7,601	100.00		700,423	100.00		100.00

Table 4.3 Locations and seasonal patterns (shaded months) of main livelihood activities

Activity	Location	Seasons												Reasons
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
TANGANYIKA														
Crop farming	Upland													During the rainy season crops such as rice , maize, millet and cassava are cultivated
	Lowland													There is moisture in lowlands and valley bottoms throughout the year, crops such as rice, maize, millet and cassava are cultivated in the rainy season, in the dry season all crop including vegetables are cultivated with the exception of rice
Livestock production	In settlement areas													Chickens are the main form of livestock kept by most households in the village and are available throughout the year
Fishing	River													There is always water in rivers; i.e. perennial rivers
	Swamp													There is water in the swamps during the rainy season
	Floodplain													
Small businesses	Village centre													Throughout the year to meet households requirements for important domestic items
Brewing beer														
Beekeeping														Done throughout the year because bees are always present. Honey harvesting is done after every three months e.g. March, June, September and December
House construction														
IPINDE														
Crop farming	Upland													During the rainy season, crops including maize and rice are planted
	Lowland													There is moisture in lowlands and valley bottoms throughout the year, vegetables are planted during the dry season i.e. July to November
Livestock production	Farm areas close to settlements													It is for the safety or security of the livestock kept by households
Fishing	River													

Activity	Location	Seasons												Reasons
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	Swamp													
	Floodplain													
Small businesses	Village centre													There is always people gathering at the village center
Brewing beer	In settlement areas													Beer brewed from bamboo juice (ulanzi) is mainly from January to June, while beer brewed from maize and sorghum (komoni) is mainly from July to December
Beekeeping														
House construction														There is always settlement requirements in the village
UTENGULE														
Crop farming	Upland													During the rainy season maize cultivation is done
	Lowland													It is always moist, mainly rice cultivation is done in the lowlands and valley bottoms
Livestock production	Upland													Lowlands and or valley bottom are flooded at this time so pasture cannot be accessed
	Lowland													No adequate pasture for livestock in the upland areas
Fishing	River													There is always water in rivers; i.e. perennial rivers such as Mnyera, Mpanga, Kitogota and Mbuli Rivers
	Swamp i.e.													There is always water in the large swamps i.e. Ngapemba swamp
	Floodplain													Water enters into the rivers and floodplain, fish especially catfish (kambale) is obtained during this period and can be caught in flood plain by hitting it using a machete/bush knife (i.e. Lipupwe)
Small businesses	Village centre													There is business throughout the year for domestic requirements, but also for selling of crops during the dry season
Brewing beer	Village centre													
Beekeeping	Village centre													
House construction	Village centre													At this period people have money obtained from selling of crops, so they can build their houses
IDUINDEMBO														
Crop farming	Upland													During the rainy season crops such as maize, groundnuts and millet are grown
	Lowland													It is always moist, mainly rice cultivation is done in the lowlands and valley bottoms
Livestock production	Upland													To avoid flood water on the lowlands and valley bottoms
	Lowland													There is pasture in lowlands during the dry season
Fishing	River													There is always water in rivers; i.e. perennial rivers such as Mnyera, Mpanga, Kitogota and Mbuli Rivers
	Swamp													There is always water in the larger swamps i.e. Ngapemba swamp
	Floodplain													Water enters into the rivers and floodplain, fish especially catfish (kambale) is obtained during this period in the flood plain using the lipupwe fishing method
Small businesses	Village centre													There is always people gathering at village center
Brewing beer	Village centre													Beer brewed from bamboo juice (ulanzi) is mainly from January to June, while beer brewed from maize and sorghum (komoni) is mainly from July to December
Beekeeping														
House construction														

2. FISHING ACTIVITIES

2.1 Types of fishermen and origins

Fishing is mainly done by men, including both older men and youths. Women and children do also fish but mainly in swamp areas and flood plains that are close to the villages. This was revealed in Utengule and Iduindembo villages. In Tanganyika and Ipinde villages there are no swamps or floodplains that women and children can easily access for fishing.

Three general categories of fishermen were identified based on their location and period of stay in fishing camps: permanent fishermen comprising fishermen who reside permanently in fish camps, seasonal fishermen who reside in fish camps on a seasonal basis, and village fishermen who stay in the villages and do occasional fishing mainly for food (Table 4.4). In Utengule and Iduindembo villages all three types of fishermen were found, in Tanganyika village there are permanent and seasonal fishermen, while in Ipinde there are only permanent fishermen.

Table 4.4 Types of fishermen (relative frequency expressed as a percentage)

Type of fishermen	Tanganyika (%)	Ipinde (%)	Utengule (%)	Iduindembo (%)
Fishermen permanent in camps	35	100	30	40
Fishermen seasonal in camps	65	0	60	30
Fishermen in villages	0	0	10	30
Total	100	100	100	100

2.2 Origins and history of fishermen

Fishermen in the study villages comprised a mix of older residents of Kilombero and more recent immigrants coming from neighbouring regions, including Songea and Iringa Regions during the 1970s and early 1980s (Table 4.5). In Tanganyika village, the majority of fishermen (65%) are Wangoni (coming from the Matumbi-Ilinga area in Songea region) and the remainder Wabena (35% coming from the Iringa region). In Ipinde village, the majority of fishermen are Wabena (80%), while 20% are Wangoni. In Utengule village, fishermen are composed of Wangoni (60%), Wabena (20%), Wandamba (18%), and Wahehe (2%), whereas in Iduindembo village fishermen include Wangoni (40%), Wabena (40%), Wandamba (10%), Wahehe (5%), Wanyakyusa (4%) and Wagogo (1%). In Ngapemba fish camp some of the fishermen come from Malinyi District. Some fishermen from Songea and Malinyi came to the area by foot while others used the train to reach the villages. Wangoni and Wabena came to the villages primarily for the purpose of doing crop farming, particularly rice, maize and cassava farming; then they found that there were good fishing grounds in the villages, such as Ngapemba swamp, and so they started fishing.

Table 4.5 Proportion of fishermen based on their ethnic groups

Ethnic group	Tanganyika (%)	Ipinde (%)	Utengule (%)	Iduindembo (%)
Wangoni	65	20	60	40
Wabena	35	80	20	40
Wandamba	0	0	18	10
Wahehe	0	0	2	5
Wanyakyusa	0	0	0	4
Wagogo	0	0	0	1
Total	100	100	100	100

2.3 Methods of fishing

The dominant fishing methods in all four villages were the use of fishing nets and fishing hooks. In terms of importance fishing nets was scored as 85% and hooks as 14 % (Table 4.6).

It was revealed in Ipinde village that all households collect fish using the *lipupwe* fishing method. This usually happens for a few days in December as water starts entering the floodplain and valley bottoms. Also nearly all households use the *kutanda* fishing method (mosquito nets) at least once during the dry season i.e. August to November to catch fish in Ipinde village.

Table 4.6 Methods of fishing (relative importance as scores and %, and percent of households involved)

Methods of fishing	Tanganyika			Ipinde			Utengule			Iduindembo			Mean	
	Importance score	Importance %	% of hhs	Importance score	Importance %	% of hhs	Importance score	Importance %	% of hhs	Importance score	Importance %	% of hhs	Importance %	% of hhs
Fishing nets (gill nets or <i>kutega</i> fishing method)	2,000	66.38	30	62,500	99.58	20	400	78.28	70	100,000	95.19	30	84.86	37.5
Hooks and baits used as <i>ndoano kitanzi ning'iniza</i> ("don't touch", the hooks and baits partially submerged in the water) or used as <i>ndoano kitanzi kuzamisha/kuzika</i> (the hooks and bait placed on the river bottom using a heavy object such as a piece of brick or a stone)	1,000	33.19	30	250	0.40	20	80	15.66	50	5,000	4.76	30	13.50	32.5
Mosquito nets (<i>kutanda</i> fishing method)	10	0.33	30	10	0.02	100							0.17	65
<i>Lipupwe/lipupu</i>	1	0.03	5	1	0.00	10							0.02	7.5
<i>Dema</i> fish trap	2	0.07	10	5	0.01	10	1	0.20	10	50	0.05	50	0.08	20
<i>Ndanga</i> fish trap							20	3.91	20	5	0.00	10	1.96	15
<i>Lilimbo</i> fish trap							10	1.96	10	1	0.00	5	0.98	7.5
Total	3,013	100.00		62,766	100.00		511	100.00		105,056	100.00		100.00	

2.4 Fishing grounds, fishing camps and selling points

Fishing is carried out in rivers, swamps (wetlands), floodplains and valley bottoms. In Tanganyika village the main fishing grounds are the Mnyera and Luhuji Rivers (although this is not allowed as it is managed by the KNS hunting company) (Table 4.7). For Utengule and Iduindembo villages, Ngapemba swamp was the main fishing ground; this is situated within Utengule village but close to both Utengule and Iduindembo villages. For Ipinde village, some fishing is done in Mnyera River and a few people also go to Ngapemba swamp. Fishermen from the four villages go to 11 fish camps. Fish is sold at fish camps, within villages, in nearby villages, in Malimba and further afield in Njombe, Ruvuma (Songea) and Iringa Regions.

Table 4.7 Fishing grounds, fishing camps and selling points (1 = yes, 0 = no, not mentioned)

Fishing grounds/selling points	Tanganyika	Ipinde	Utengule	Iduindembo
Rivers				
Mnyera	1	1	1	1
Mfuji	1	1	0	0
Luhuji	1	0	0	0
Nyame	1	0	0	0
Mwala	0	1	1	1
Ilembe seasonal river	0	1	0	0
Mpanga	0	0	1	0
Kitogota	0	0	1	0
Mbuli	0	0	1	0
Hambe	0	0	1	0
Swamps				
Lwilwi	1	0	0	0
Kilausi	1	0	0	0
Nduku	1	0	0	0
Idukulu	1	0	0	0
Masikini	1	0	0	0
Ngapemba	0	1	1	1
Ugaganga	0	1	0	0
Itumba	0	1	0	0
Ndolo	0	0	0	1
Yogovelwa	0	0	0	1
Mende	0	0	0	1
Floodplains/valley bottoms				
Farm areas	1	1	1	1
Fish camps				
Kisingo	1	0	0	0
Idukulu	1	0	0	0
Nduku	1	0	0	0
Kisaki	1	0	0	0
Kiulausi	1	0	0	0
Kisingo	0	1	0	0
Miwangani	0	0	1	1
Matema	0	0	1	1
Ishekelo	0	0	1	1
Kitogota	0	0	1	1
Msisi	0	0	0	1
Fish selling points				

Fishing grounds/selling points	Tanganyika	Ipinde	Utengule	Iduindembo
Within the village	1	1	1	1
At fish camp	1	0	0	1
Makambako-Njombe Region	1	0	1	0
Songea-Ruvuma Region	1	0	0	0
Mpanga	0	1	1	1
Matema	0	1	0	0
Mlimba town	0	0	1	1
Masagati ward	0	0	1	0
Mgololo-Mufindi in Iringa Region	0	0	1	0

2.5 Access to fish resources

Access to and management of fisheries is generally controlled by the Fisheries Officer, Mlimba Division under the Kilombero District Council (Table 4.8). The Ngapemba BMU and Utengule Village Council play a specific role concerning the management of Ngapemba wetland. The Fisheries Officer's main functions are to issue fishing licenses and to provide protection through patrolling and the issuing of fines. The BMU is making an important contribution to protecting Ngapemba swamp, facilitated by their constant presence in the area such that they are able to quickly note any illegal doers or offenders. However, being constrained by a lack of legal powers to punish such offenders, the BMU works with the Utengule Village Government as the legal authority to do so. The Utengule Village Government, in addition to exercising its legal powers to punish offenders, its main roles are to oversee fishing activities in the village, to collect levies from fish traders taking fish outside the village, and to resolve conflicts involving fisheries and any other parties in the village.

Table 4.8 Access to fish resources

Village	Institution	Representation	Role
Tanganyika	Village Council	Village Council Village Natural Resources Committee	Resolve conflicts involving fisheries Oversee fisheries activities in the village
	Mlimba Division Administration, under Kilombero District Council	Fisheries Officer Mlimba Division	Issue fishing and fish trading licenses Provide awareness on proper fishing methods Patrols to prevent destruction of fishing grounds happening through illegal and destructive fishing methods
Ipinde	Mlimba Division Administration, under Kilombero District Council	Fisheries Officer Mlimba Division	Issue fishing and fish trading licenses Provide awareness on proper fishing methods Patrols to prevent destruction of fishing grounds happening through illegal and destructive fishing methods e.g. preventing fishing of small fish using fishing nets with mesh size less than 3.5 inches
Utengule	Ngapemba BMU	Ngapemba BMU leadership and members	Protection to prevent destruction of fishing grounds happening through illegal/destructive fishing methods and invasion of cattle in the fishing grounds Collect BMU membership fees Register BMU members
	Mlimba Division Administration, under Kilombero District Council	Fisheries Officer Mlimba Division	Issue fishing and fish trading licenses Provide awareness on proper fishing methods Patrols to prevent destruction of fishing grounds happening through illegal and destructive fishing methods

Village	Institution	Representation	Role
	Village Council	Village Council Village Natural Resources Committee	Resolve conflicts involving fisheries e.g. between fishermen and pastoralists Oversee fisheries activities in the village
Iduindembo	Mlimba Division Administration, under Kilombero District Council	Fisheries Officer Mlimba Division	Issue fishing and fish trading licenses Provide awareness on proper fishing methods Patrols to prevent destruction of fishing grounds happening through illegal and destructive fishing methods
	Ngapemba BMU	Ngapemba BMU leadership and members	Protection to prevent destruction of fishing grounds happening through illegal/destructive fishing methods and invasion of cattle in the fishing grounds Collect BMU membership fees Register BMU members

2.6 Fish species

The most abundant fish are *kambale* (96%) followed by *perege* (3%) (Table 4.9). In terms of food sources, *perege* was considered the most important species (57%), followed by *kambale* (43%), while for selling the most important species was *ndungu* (49%), followed by *perege* (25%) and *kitoga* (23%).

Table 4.9 Types of fish: relative abundance, importance for food and for selling expressed as importance scores and percentages

A. Relative abundance									
Fish species	Tanganyika		Ipinde		Utengule		Iduindembo		Mean
	Score	%	Score	%	Score	%	Score	%	%
Kambale	600	89.69	500	96.34	30,000	98.93	10,000	98.88	95.96
Perege	60	8.97	10	1.93	300	0.99	100	0.99	3.22
Kitoga	1	0.15	6	1.16	15	0.05	2	0.02	0.34
Njege	2	0.30	1	0.19	1	0.00	1	0.01	0.13
Ndungu	6	0.90	2	0.39					0.64
Mbala					10	0.03			0.03
Ndipi							10	0.10	0.10
Total	669	100.00	519	100.00	30,326	100.00	10,113	100.00	100.00
B. Relative importance for food									
Fish species	Tanganyika		Ipinde		Utengule		Iduindembo		Mean
	Score	%	Score	%	Score	%	Score	%	%
Kambale	2	0.02	60,000	98.95	70	4.72	4,000	66.52	42.55
Perege	10,000	98.88	3	0.00	1,400	94.40	2,000	33.26	56.64
Kitoga	1	0.01	30	0.05	10	0.67	2	0.03	0.19
Njege	100	0.99	1	0.00	2	0.13	1	0.02	0.29
Ndungu	10	0.10	600	0.99					0.54
Mbala					1	0.07			0.07
Ndipi							10	0.17	0.17
Total	10,113	100.00	60,634	100.00	1,483	100.00	6,013	100.00	100.00
C. Relative importance for sales									
Fish species	Tanganyika		Ipinde		Utengule		Iduindembo		Mean
	Score	%	Score	%	Score	%	Score	%	%
Kambale	1	0.01	18	0.07	600	32.77	5	0.06	8.23
Perege	15,000	94.90	1	0.00	1,200	65.54	50	0.60	40.26
Kitoga	5	0.03	540	1.96	10	0.55	7,500	90.30	23.21
Njege	750	4.75	3	0.01	20	1.09	750	9.03	3.72
Ndungu	50	0.32	27,000	97.96					24.57
Mbala					1	0.05			0.01
Ndipi							1	0.01	0.00
Total	15,806	100.00	27,562	100.00	1,831	100.00	8,306	100.00	100.00

2.7 Marketing of fish

Fish is sold in fish camps, in villages or to other urban centres (Table 4.10). Most fish (90%) is sold in the fish camps. Only a small amount is processed (mainly by smoking 90%, or else by frying 10%) and this happens mainly in the villages. Fish sold fresh in the fish camp goes to Mlimba or to the villages or Mpanga. Fish that

goes further out to Iringa, Songea and Njombe is in processed form. This means that at least 90% of the fish catch is being consumed within Kilombero District.

Table 4.10 Marketing of fish

Method of marketing	Village	Marketing means applied (Yes=1, No=0)	Reasons
Selling of fish at fish camps or landing sites	Tanganyika	0	Not mentioned
	Ipinde	1	The fisherman may communicate with fish buyers (his customers) who will then come to the camp to buy fish from him
	Utengule	1	At the fish camp there are fish traders waiting to buy fish for selling. Fishermen use their fishing boats to take the fish to the fish camp for selling
	Iduindembo	1	Fishermen meet fish traders at the landing site (i.e. at Forodhani - meaning "customs") and can therefore sell the fish he has caught
Selling fish outside the house in the village e.g. fish sold in bunches	Tanganyika	1	There is no official village market place
	Ipinde	1	The owner of the household is popularly known in the village to be selling fish, so people follow him to his household to buy fish
	Utengule	0	Not mentioned
	Iduindembo	0	Not mentioned
Taking fish to villages and going around the village selling fish (usually fish are packed in a woven bamboo basket and carried on a bicycle)	Tanganyika	1	The fisherman/fish trader can sell the fish faster when taking it around the village to meet fish buyers where they are located in the village
	Ipinde	1	Easy to sell when following fish buyers where they are in the village
	Utengule	1	Easy to sell fish when following fish buyers where they are found in the village. There is no official village market place in Utengule
	Iduindembo	0	Not mentioned
Selling fish within the village centre	Tanganyika	1	There is usually an aggregation of people at the village centre, also fish buyers from Iringa and Songea come to buy fish in the village
	Ipinde	1	There is usually an aggregation of people at the village centre
	Utengule	0	Not mentioned
	Iduindembo	1	It is easy to be noticed/seen by buyers when selling at the village center because there is usually an aggregation of people at the village centre
Taking fish outside the village for sale in urban centres within Kilombero valley such as to Mlimba, Makambako in Njombe region, Iringa and Songea	Tanganyika	1	There is higher fish demand and higher fish prices outside the village
	Ipinde	0	Not mentioned
	Utengule	1	When one has a large amount of fish to sell one may prefer to sell to outside the village to other locations where he can obtain larger fish markets and higher prices
	Iduindembo	0	Not mentioned

For Tanganyika village, fish is mainly sold in processed form, due to the difficulty of moving it from the fishing grounds to fish markets. In the fish camps 85% is sold as processed fish, and all fish brought to the village for selling locally or outside of Tanganyika village is in processed form. For Utengule and Iduindembo most fish sold at fish camps is sold as fresh fish (80 to 85%), while for the fish brought to the villages, 50% to 70% is sold within the villages and outside the villages as processed fish.

For all four villages the price of fresh fish at fishing camps was TZS 5,000, and if processed TZS 6,000 to 7,000; and was sold in a bunch of 3 or 4 fish for that price depending on the size of the fish. In the villages the same bunch of fish bought for TZS 5,000 at a fish camp is divided into a number of smaller portions (say 5 or 6 portions), and then sold for TZS 2,000 each, which enables the fish trader get up to TZS 10,000 to 12,000 per bunch. Prices of fish in Tanganyika village were unusual in that they were higher for fresh fish (TZS 10,000), as they are considered to be more delicious, than processed fish (TZS 7,000). In other villages the price of fresh fish is TZS 7,000 to 8,000, while for processed fish it is TZS 10,000 to 12,000. In Tanganyika village it was reported that the price for processed fish can go up to TZS 15,000 for fish taken to Njombe and Makambako, and up to TZS 16,000 during January to May, this being the season when tea is being harvested in Njombe and when people there have more money to buy fish. However, in general more fish is found in the fish camps and villages during the rainy season (January-May and up to July) and therefore prices are lower, but prices rise again from August to November when fish availability decreases as water level decreases.

2.8 Management of fishing activities

Fishing is allowed for anyone in possession of a fishing license, including fishermen from villages other than the village where the fishing ground is situated. Fishing in Ngapemba swamp is regulated by the Ngapemba BMU. It was revealed in Utengule and Iduindembo villages that people not registered with the Ngapemba BMU can still fish in Ngapemba swamp as long as they follow the BMU bylaws. The bylaws require all fishermen:

- To have a fishing license
- To avoid undertaking any illegal fishing activities, such as the use of poison; the use of illegal fishing nets i.e. fishing nets with mesh size less than 3.5 inches; using fishing methods that destroy fish breeding sites e.g. *pumunda* fishing method whereby *makongo* grass clumps where fish hide and breed are covered with small mesh size fishing nets, the *makongo* grass is then cut and the net is pulled out to collect all the fish hiding in the grass.

These regulations also apply in other areas outside BMU, however, outside BMU area there is less enforcement of the rules as compared to within the BMU area. The BMU has some additional rules including:

- Prohibiting fighting and abusive language while within the fishing camp
- It is a requirement that any new fishermen coming to the camp are required to report to the BMU management before they start fishing, and the management will advise them to register to become BMU members. They will be allowed to fish after they report to the BMU even if they refuse to register as long as they follow the BMU bylaws
- Attending meetings organized by the BMU management.

The reason for better enforcement of rules in the BMU area as compared to outside BMU, was that the BMU leaders and members are always present within the fishing ground and so are quick notice anyone who attempts to break the rules, whereas outside the BMU area rules are enforced by the Fisheries Officer who is only occasionally present (has a large area to cover) to notice and arrest offenders. Informants estimated that 80% of the fishermen within the BMU follow regulations while only 20% do not follow regulation, whereas outside the BMU only 10% follow the regulations and 90% do not follow. Moreover, the number of offenders within the BMU was reported to be decreasing due to the rigorous enforcement of the rules, such that many potential offenders have shifted to other areas outside of the BMU management. Outside of the BMU offenders were said to be increasing due to the lack of alternative employment opportunities. It was revealed that people complete their education but do not get employed and so decide to go for fishing, but some of them undertake illegal fishing activities.

Within the BMU, offenders pay fines ranging from TZS 50,000 to 100,000 and are given a warning not to repeat the offence. Outside the BMU the Fisheries Officer also collects fine from offenders, usually ranging from TZS 50,000 to 200,000, and in cases of illegal fishing activities will confiscate all fishing gears.

For fish traders who want to buy fish at Ngapemba swamp and transport it outside of the village (i.e. outside of Utengule village to Mpanga, Mlimba, Songea, Njombe or Iringa), they are required to pay a levy of between TZS 2,000 to 5,000 to the Utengule village government. These monies are presently held by the management of the BMU as the BMU is not yet fully registered and so cannot operate a bank account.

One of the main challenges faced by fishermen in Utengule and Iduindembo is that KNS restricts fishing in Ndolo, Mende and Iyogovelwa swamps. The impact of this is greater during the dry season when some 40% of Ngapemba swamp (which is the main fishing ground) dries out. Other threats to fisheries in Ngapemba include

incursions by cattle and the resulting destruction of fishing grounds, and the growth of weeds within Ngapemba swamp which present a serious obstacle to fishing activities.

2.9 Ngapemba BMU

The Ngapemba BMU management team is composed of leaders from villages around or nearby Ngapemba swamp and working/fishing in the swamp. The BMU chairperson is from Mpanga village, but there are 15 people in total forming the Ngapemba BMU management who come from Utengule, Iduindembo and Mpanga villages. According to the BMU chairperson, there are about sixty fishermen in Ngapemba fishing camp who are already registered under the Ngapemba BMU, which equates to about 80% of all fishermen in the Ngapemba swamp. In order to become an active member, a fisherman has to pay a registration fee of TZS 10,000, this being TZS 5,000 to become a shareholder of the BMU and TZS 5,000 as an annual membership fee. To date only a few members (15-20%) have paid their fees and are active members of the BMU (there seems little incentive to do so).

People of Iduindembo and Utengule considered the Ngapemba BMU to be a good development. Firstly, it is through the presence of the BMU that the villagers have been able to continue using Ngapemba swamp for fishing. Before the BMU was initiated, the swamp was protected by the KNS hunting company. At that time large groups of cattle were coming to Ngapemba. Fishermen believed that the cattle were destroying the fishing grounds, but since the swamp was under KNS control the villagers could not fish there in any case. The villagers asked the government (Kilombero District) to give them Ngapemba swamp for fishing, and when it was given to them the BMU was started in 2015 to continue protecting the Ngapemba swamp.

Secondly, the BMU gives better protection to Ngapemba swamp, as the BMU can impose fines on those who carry out illegal fishing activities. This is done through the Utengule Village government (as Ngapemba is located within Utengule village) and the BMU retains 30% of the fines. So in Ngapemba there is little illegal fishing. This is different from other areas such as the Mpanga River which is under the control of the Fisheries Officer but who is seldom there, so people are usually free to do what they want. The perception is that illegal fishing and destruction of the fishing grounds by cattle has decreased since initiation of the BMU due to enhanced awareness and stronger enforcement of the rules.

Thirdly, the BMU provides funds (collected from levies and fines) to support BMU registered fishermen in case they get sick while at work or have an accident (e.g. being attacked by a crocodile or any other accident) and don't have enough resources to get medical treatment in hospital. However, any fisherman supported in this way has to return the money to the BMU after being treated and is able to get back to work.

Fourthly, the BMU management has promised fishermen that they will build a BMU office and shop at Ngapemba, to facilitate the issuing of licenses, to sell legal gear to fishermen and to assist with collective marketing of fish so as to enable better prices. This will be done using money they obtain from collecting registration fees and also from fines they get from offenders (including pastoralists who take cattle to the fishing grounds in the BMU area).

Collection of fines from offenders is done in collaboration between the BMU management and the Utengule Village Government. For example pastoralists arrested by the BMU management for taking cattle to the fishing grounds are taken to the Village Government which has power to punish pastoralists for such offenses. The Village Government issues a fine to the pastoralist, and 30% of the money paid by the offender will be taken by the BMU management and the other 70% will remain with the village authority. Based on this arrangement the BMU has already collected TZS 600,000 since 2015.

In summary, it seems that the BMU is a good thing but as yet cannot work on its own. It must continue to rely on the village authority and fishing authority until it is fully established and registered. Efforts should be made to find out the reasons for the delay to full establishment of the BMU and how these could be properly addressed.

2.10 Challenges faced by fishermen

The main challenges faced by fishermen from Tanganyika and Ipinde relate to restrictions imposed by KNS whereby access to fishing grounds is prevented, and those caught fishing illegally are subject to harsh punishments (Table 4.11). For Utengule and Iduindembo, fishermen are allowed to fish in Ngapemba swamp; here the main challenges relate to the presence of weeds and the destruction of fishing nets by hippos and crocodiles.

Table 4.11 Challenges faced by fishermen (relative importance expressed as percentage)

Difficulties	Tanganyika	Ipinde	Utengule	Iduindembo
Restricted from fishing in fishing grounds that are within/ nearby our village due to the presence of KNS operating in our area	98.89			
Difficult to obtain fishing gear, you need to travel to Mlimba (70 km) or to Ifakara (230 km) to buy fishing gear	0.10			
Poor road infrastructure makes it difficult to travel e.g. for taking fish to markets	0.99			
Limited access to awareness training on fisheries e.g. training on how best to fish	0.02			
Villagers are being harassed by KNS staff when found fishing; the KNS staff beat fishermen, destroy their fishing gear and collect fines from fishermen		100		
Ngapemba swamp is being covered by weeds (<i>mafufu/matete</i> grass) making it difficult to fish			93.68	
Invasion of cattle to fishing grounds and destroying fish breeding sites, fishing nets and swamps			0.94	
Use of illegal and destructive fishing methods destroying fish breeding sites			4.68	
Poor fishing gear			0.47	0.05
Crocodile and hippos destroying fishing nets			0.23	99.44
Threat of being attacked by crocodiles and hippos while fishing				0.50
Danger of excess flood waters which may cause the death of fishermen				0.00
Theft of fishing gears e.g. theft of fishing nets				0.01
Total	100	100	100	100

2.11 Conflicts relating to fishermen

Conflicts exist in general between KNS and fishermen (also farmers, hunters and livestock keepers) as all other water bodies besides Ngapemba swamp are under KNS control (Table 4.12). The highest conflict was reported for Iduindembo, where Ndolo, Mende and Iyogovelwa swamps are located but are under the control of KNS. Fishermen complained that they were being beaten heavily if caught fishing in the KNS hunting area, and that their equipment and catches were confiscated and fines imposed. It was reported that the KNS guards sometimes do the same even at Ngapemba swamp if they find anyone fishing there without a license. Villagers in Iduindembo also complained that, despite the restrictions, some KNS guards take bribes from fishermen, including fishermen from areas such as Mlimba, and allow them to come and fish in Ndolo swamp at night.

Proposed solutions for these conflicts included that the villagers should be allowed to fish in swamps under KNS control during the off-season of KNS operations i.e. December to June; or that they should be given Ndolo or Mende swamps to fish; and also that the BMU should establish a good relationship with the KNS management, Village government and the fisheries authority at Kilombero District so that the Ngapemba BMU could also be given control of the other swamps and fishing grounds under the KNS.

Table 4.12 Conflicts relating to fishermen

Conflicts	Villages	Location	Actors	Causes	Solutions	Importance (%)
Conflict between fishermen and KNS	Tanganyika	Mnyera river Luhuji river	Fishermen and KNS	Restrictions on fishing due to the presence of KNS hunting company. Being beaten by KNS game scouts when found fishing and fishing gears destroyed	Villagers to be given an official place for them to fish without being disturbed by KNS	9.09
	Ipinde	Mnyera river, Ndolo swamp, Mende swamp	Fishermen and KNS	Restrictions on fishing due to the presence of KNS hunting company. Being beaten by KNS game scouts when found fishing and fishing gears destroyed	Villagers to be given an official place for them to fish without being disturbed by KNS	0.99
	Utengule	Ndolo swamp, Mende swamp, Iyogovelwa swamp	Fishermen and KNS	Restrictions on fishing due to the presence of KNS hunting company. Being beaten by KNS game scouts when found fishing and fishing gears destroyed	Arrangements to be made for fishermen to be allowed to fish in the fishing grounds located in the area e.g. To fish during off-season for hunting. Fishermen have to respect boundaries.	4
	Iduindembo	Ndolo swamp, Mende swamp, Iyogovelwa swamp Kitogota river	Fishermen and KNS	Restrictions on fishing due to the presence of KNS hunting company. Being beaten by KNS game scouts when found fishing and fishing gears destroyed	A village assembly be convened to make sure that KNS and Iduindembo villagers meet to resolve their conflicts. The existing boundary should be shifted from the village area to area under KNS.	99.01
Conflict between fishermen and the village government on setting aside areas to be used by villagers for fishing	Tanganyika	Mnyera river Luhuji rivers	Fishermen and Tanganyika village government	Village government is not being transparent on the contract that it has entered into with KNS	KNS have to come to the village to discuss with villagers in a village assembly about the contract that the village government has entered with them	90.91
	Ipinde	N.A	N.A	N.A	N.A	N.A
	Utengule	N.A	N.A	N.A	N.A	N.A
	Iduindembo	N.A	N.A	N.A	N.A	N.A
Conflict between crop farmers and KNS	Tanganyika	N.A	N.A	N.A	N.A	N.A
	Ipinde	Farm areas in Ipinde village	Crop farmers Ipinde village and KNS hunting company	Villagers restricted from farming in some village areas by KNS	Villagers need to know proper boundaries between KNS and the village farming areas. Villagers request the District government to intervene to resolve this conflict. The villagers need to know the investor of KNS and require that the investor be asked to come to request for land for his business in the village.	99.01
	Utengule	N.A	N.A	N.A	N.A	N.A
	Iduindembo	N.A	N.A	N.A	N.A	N.A
Conflict between pastoralists and fishermen on livestock	Tanganyika	N.A	N.A	N.A	N.A	N.A
	Ipinde	N.A	N.A	N.A	N.A	N.A
	Utengule	Ngapemba	Pastoralists and	Cattle invasion in fishing grounds,	Pastoralists be given awareness education to respect land	80

Conflicts	Villages	Location	Actors	Causes	Solutions	Importance (%)
grazing along river banks which destroy river banks		swamp	fishermen	destroying fish breeding sites and fishing gears	use plans set in the village	
	Iduindembo	Ngapemba swamp	Pastoralists and fishermen	Cattle invasion in fishing grounds, destroying fish breeding sites and fishing gears	BMU members and pastoralists should respect existing plans on use of village lands. There is an agreement to reduce the number of cattle decided during the village assembly in Iduindembo village, whereby a pastoralist is allowed to have a maximum of 106 cattle, while a crop farmer keeping cattle is allowed to have a maximum of 8 cattle.	0.99
Conflicts amongst fishermen on issues including the tendency of some fishermen to fish in areas where other fishermen have cleaned by removing weeds from fishing ground so as to be able to fish	Tanganyika	N.A	N.A	N.A	N.A	N.A
	Ipinde	N.A	N.A	N.A	N.A	N.A
	Utengule	At fishing grounds and at fish camp	Fishermen themselves	Fishermen fighting for weed free areas in swamps in order to fish. Some fishermen grab areas where fellow fishermen have removed weeds in order to fish and therefore cause conflicts.	Fishermen should be made to respect bylaws. BMU leaders should enforce the bylaws so that conflicts are avoided.	16
	Iduindembo	N.A	N.A	N.A	N.A	N.A

2.12 Trends in fishing activities

Since the Mkapa era (year 2000) the numbers of fishermen and proportion of households fishing are decreasing in Ipinde and Tanganyika due to restrictions, but in the other two villages the numbers are increasing due to population growth and a need for employment, and also because people are now free to fish in Ngapemba swamp (Table 4.13).

Fish catches (numbers and sizes of fish) and availability of fish for food and selling were reported to be decreasing for Iduindembo and Utengule (in Ngapemba), due to population growth and increasing numbers of fishermen as well as climate change. In Tanganyika, due to restrictions imposed by KNS on access to the Mnyera River, people reported that there are now more and larger fish as compared to before, and fishermen are even using larger mesh sizes than before in Tanganyika village. The implication is that although conflicts have been high in the villages for the fishing grounds under hunting block management, the fishing grounds have been highly protected and therefore seem to have more fisheries resources than fishing grounds under community control such as Ngapemba swamp.

Table 4.13 Trends in fishing activities

Factor	Past	Present	Future	Explanation
Number of fishermen				
Tanganyika	200	100	50	The number of fishermen is decreasing due to the presence of fishing restrictions as a result of the hunting business under KNS hunting company
Ipinde	200	100	30	The investor for the hunting company KNS prohibits fishing activities in the fishing grounds round or nearby our village
Utengule	50	100	120	Number of fishermen is increasing due to population growth and a need for getting employment. Also because people are allowed to fish in Ngapemba swamp which is located in Utengule village
Iduindembo	25	100	200	Population of people and fishermen is increasing, and the need for getting employment. Also because people are allowed to fish in Ngapemba swamp
Proportion of households fishing				
Tanganyika	200	100	50	Presence of fishing restrictions due to hunting business under KNS hunting company
Ipinde	200	100	30	Proportion of households fishing is decreasing since the investor for the hunting company KNS prohibit fishing activities in the fishing grounds round or nearby our village
Utengule	50	100	120	Number of fishermen is increasing due to population growth and a need for getting employment. Also because people are allowed to fish in Ngapemba swamp which is located in Utengule village
Iduindembo	25	100	200	Population of people and fishermen is increasing and need for employment is increasing
Number of fishermen permanent in camps				
Tanganyika	100	0	0	It is not possible to spend night in a fish camp due to the presence of fishing restrictions to protect hunting business under KNS hunting company
Ipinde	200	100	30	The investor for the hunting company KNS prohibit fishing activities in the fishing grounds round or nearby our village
Utengule	20	100	200	Fishermen in Ngapemba fish camp are increasing since they are coming from different areas such as Mlimba, Songea, Njombe and Dar es salaam
Iduindembo	25	100	150	Population of people and fishermen is increasing
Number of fishermen seasonal in camps				
Tanganyika	200	100	50	It is not possible to spend night in a fish camp due to the presence of fishing restrictions to protect hunting business under KNS hunting company
Ipinde	200	100	30	The investor for the hunting company KNS prohibit fishing activities in the fishing grounds round or nearby our village
Utengule	20	100	150	Seasonal fishermen are increasing since crop farming is also increasing and fishermen also participate in farming in the village. Also there is awareness education being provided by fisheries officials to discourage people from staying permanently in fish camps

Factor	Past	Present	Future	Explanation
Iduindembo	25	100	150	Crop farming activities are increasing due to increasing use of cattle for ploughing and there is therefore increasing participation of fishermen in crop farming and hence stay only for a season in camps and go to villages for farming at other times
Number of fishermen in villages				
Tanganyika	200	100	50	Presence of fishing restrictions due to hunting business under KNS hunting company
Ipinde	200	100	30	The investor for the hunting company KNS prohibit fishing activities in the fishing grounds round or nearby our village
Utengule	20	100	130	Fishermen staying in villages are increasing due to increasing transport services such as motorcycle services (bodaboda), making it possible to go fishing in Ngapemba swamp and come back to stay in the village
Iduindembo	50	100	150	Increasing economic activities in the villages including crop farming attract more people including fishermen to stay in villages
Types of fishing gear				
Tanganyika	100	100	5	Presence of fishing restrictions due to hunting business under KNS hunting company
Ipinde	200	100	20	It is prohibited to fish using small mesh fishing nets and therefore such type of nets are decreasing
Utengule	20	100	200	Use of different fishing gears is increasing due to increasing technologies, and increasing number of fishermen
Iduindembo	100	100	150	Fish is becoming scarce and smaller in size and therefore there will be increasing use of smaller size fishing nets in the future
Sizes of meshes used				
Tanganyika	50	100	150	Presence of fishing restrictions to stop illegal fishing activities
Ipinde	25	100	100	It is prohibited to use small mesh fishing nets and therefore will continue to use fishing nets allowed in the regulations
Utengule	200	100	50	There is decreasing fish size and availability
Iduindembo	150	100	20	Fish is becoming scarce and smaller in size and therefore there will be increasing use of smaller size fishing nets in the future
Volume of catches				
Tanganyika	200	100	50	Presence of fishing restrictions due to hunting business under KNS hunting company
Ipinde	500	100	50	Presence of fishing restrictions due to hunting business under KNS hunting company. It becomes difficult to go catch fish since there is high security protecting the fishing grounds from the hunting company KNS
Utengule	500	100	30	Population of people and fishermen is increasing making it difficult to get a large fish catch per fisherman
Iduindembo	200	100	50	Fishermen are increasing making it difficult to get a large fish catch per fisherman
Size of fish caught				
Tanganyika	50	100	150	Increasing size of fish due to presence of fishing restrictions as a result of hunting business under KNS hunting company
Ipinde	200	100	25	Size of fish caught is decreasing due to climate change; less rain is received nowadays
Utengule	300	100	20	Fishermen are continually using smaller mesh size fishing nets due to decreasing fish size as a result of climate change and increased fishing activities due to rise in population of fishermen
Iduindembo	200	100	50	Fishermen are increasing making it difficult to get large size fish since the large size fish are decreasing
Volume of sales				
Tanganyika	200	100	50	Presence of fishing restrictions due to hunting business under KNS hunting company
Ipinde	300	100	40	Decreasing fish available for sale due to presence of fishing restrictions as a result of hunting business under KNS hunting company. Climate change is also contributing to decreasing fish availability for sale.

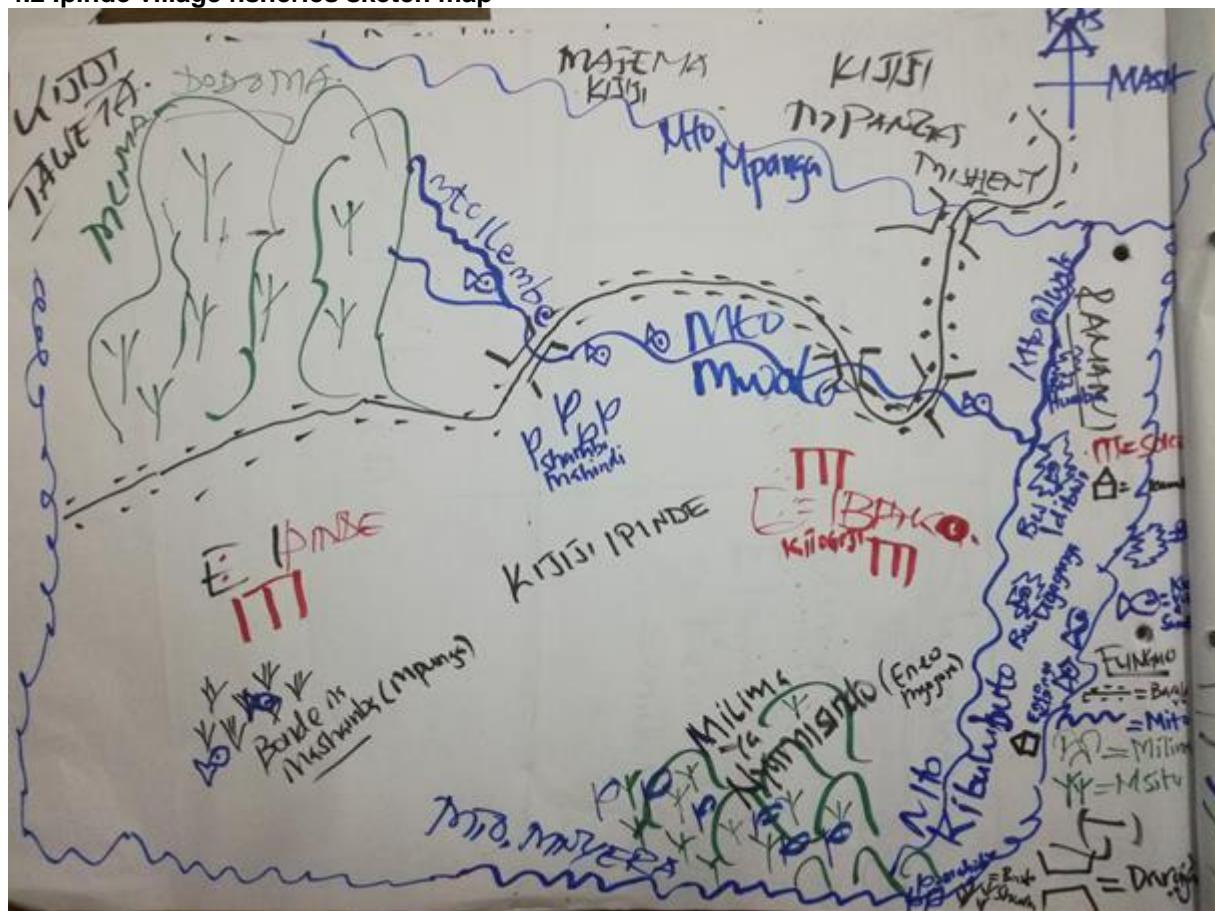
Factor	Past	Present	Future	Explanation
Utengule	20	100	200	Fish consumers will continue to increase and therefore more fish will be sold
Iduindembo	200	100	50	Fishermen are increasing making it difficult to get a large amount of fish to sell
How often we eat fish				
Tanganyika	200	100	50	Presence of fishing restrictions due to hunting business under KNS hunting company
Ipinde	300	100	40	Decreasing fish available for sale due to presence of fishing restrictions as a result of hunting business under KNS hunting company. Climate change is also contributing to decreasing fish availability for sale.
Utengule	200	100	50	Due to decreasing fish availability less fish will be eaten
Iduindembo	200	100	20	The population of people and fishermen is increasing therefore amount of fish obtained for food by a fisherman is decreasing
Number of conflicts				
Tanganyika	0	100	200	KNS hunting company has taken ownership of our village land
Ipinde	0	100	200	The number of conflicts is expected to rise since up to now conflict between fishermen and KNS hunting company on access to fishing grounds is still not resolved.
Utengule	20	100	200	More conflicts due decreasing earning from fishing and increasing number of fishermen
Iduindembo	50	100	150	Existing conflicts have not been resolved yet, more conflicts are therefore expected in the future

2.13 Future of fishing activities

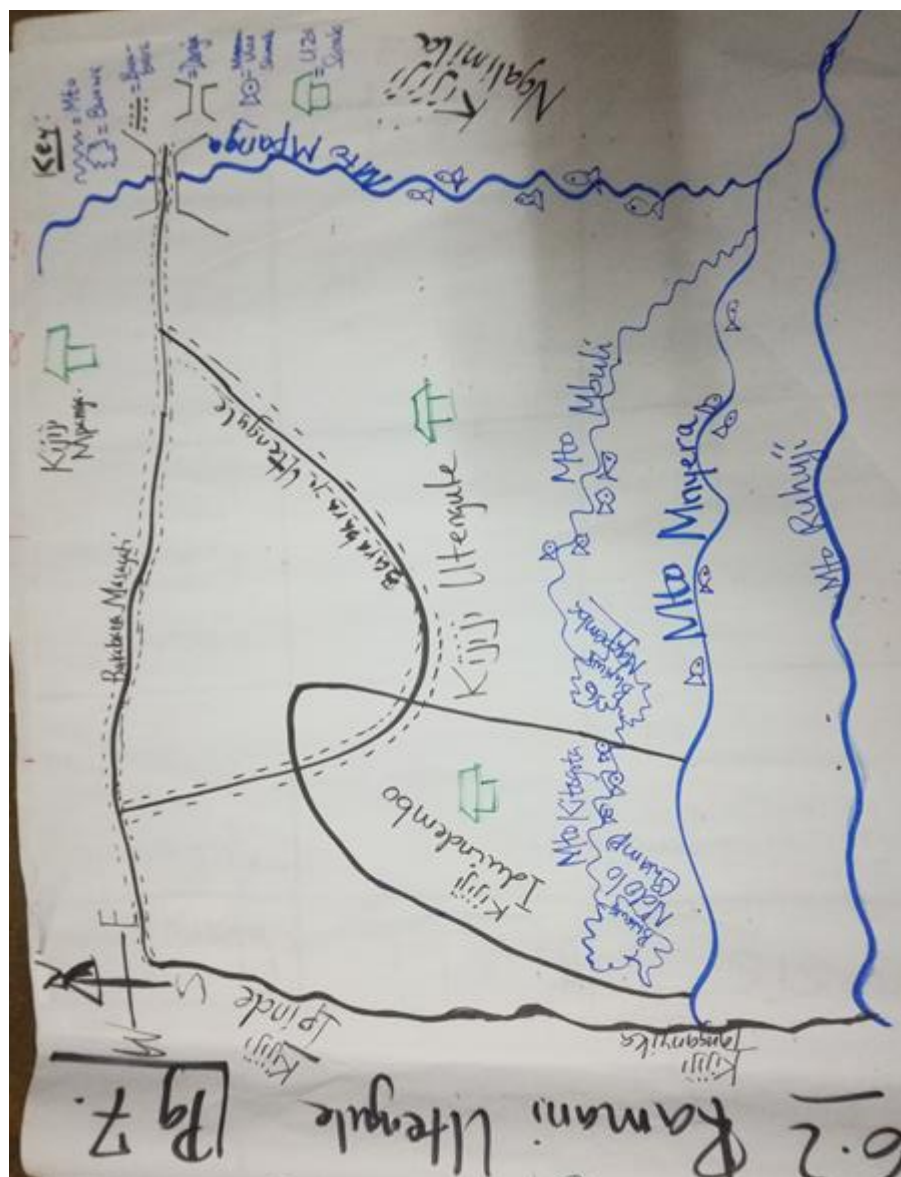
BMU leaders identified the following development needs for fisheries and which they expect to provide in future:

- Building of a BMU office and shop at Ngapemba swamp. The office will provide services to fishermen including registering of fishermen, while the shop will sell legal fishing gears and fish. Villagers noted that it is important for the BMU leaders to have a permanent office to stay in Ngapemba swamp.
- Selling of fish as a group/association so as to achieve a good price for fish
- Collection of levies, the BMU needs to be given the authority and equipment to collect levies by itself (as the BMU) and not through the villages as it is for now,
- The BMU should be able to lend fishing gear to fishermen in the future

Village respondents in Iduindembo also hoped that the BMU could help maintain and uphold good relations with the Village Government, District Authority and with KNS management to protect Ngapemba Swamp. They explained that good relationships with these stakeholders could facilitate the villagers being allowed to fish in other swamps that are currently protected by KNS such as Ndolo, Mende and Iyogovelwa, if a good arrangement on how to do it is designed in a participatory manner. A similar argument was made in Ipinde village that one of the swamps protected by KNS and where fishing is prohibited such as Mende swamp should be granted to villagers to be allowed to fish there. In addition, villagers in Utengule and Ipinde villages mentioned that it could be useful to be allowed to fish in Ndolo or Mende swamps during the off season for hunting activities i.e. from December to June. In Tanganyika village it was suggested that the Government should make an arrangement for the villagers to be given an official fishing ground where they can fish without being disturbed by anyone. It was further noted in Ipinde village that, if the situation will continue as it is now, fisheries activities will decrease in the future because several villages around the area depend on only one swamp i.e. Ngapemba swamp, for fishing.



4.3 Utengule village fisheries sketch map



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ANNEX 5: NATURAL RESOURCES AND WILDLIFE – SAYUNI MARIKI

1. NATURAL RESOURCES

1.1 Occurrence and importance of natural resources

The main natural resources found in all villages include land, forests, water (rivers and swamps/wetlands), fish, honey, wildlife, bamboo, sand, forest vegetables, mushrooms, fruits and palm leaf strips (*ukindu*). Additional resources identified included reeds (*malala*), *mitete* and *milulu/minyi* (both found in wetlands and are probably sedges), and thatching grass (Table 5.1).

Much of Tanganyika village is covered by forests and permanent rivers are more numerous as compared to the other three villages, particularly Iduindembo which, outside of the KNS area, has no remaining forest areas or any large rivers. Honey production is highest for Tanganyika village, followed by Ipinde, then Utengule; while people in Iduindembo harvest a little honey from tree trunks but do not do any beekeeping. Wildlife is mainly confined to the KNS hunting block for all villages. Tanganyika and Ipinde have *milulu* grass (*miny*) that is planted in marshes and undisturbed areas, while Utengule and Iduindembo have reeds (*malala*) that are found on lowlands/valleys as well as in KNS hunting block (they can be harvested under a permit system). All villages have three types of bamboo: wild bamboo which is used for building and making traditional weapons; European bamboo which is big and yellow in colour, and is used as for building and *ulanzi* bamboo which is used to make local beer.

The most important natural resource in all four villages was land, followed by forests then water and, for Utengule, fish (Table 5.2). Other resources such as honey, wildlife, mushrooms, vegetables, fruits, bamboo, *milulu* grass, reeds (*malala*), and palm leaf strip were considered to be relatively unimportant and accounted for less than 1% of the overall importance score for each village.

Table 5.1 Occurrence of natural resources

Natural resources	Occurrence			
	Tanganyika	Ipinde	Utengule	Iduindembo
Forests	Around the village center, KNS hunting block, near rivers Nyame, Muwe and on many family farms	In the village, TFS forest and village forest; KNS hunting block	In the midst of the village	Yogovero forest in the hunting block
Water (rivers, marshes, dams)	Rivers (Mnyela, Nyame, Lukawe, Mfuji, Muwe, Mganga) Swamps (Nyandendia, Lukawe)	Rivers, wells	Rivers (Mpanga, Mnyela, Hogota, Mbuli)	Water taps, traditional wells, seasonal dams
Fish	Rivers and swamps	River Mnyela	Ngapemba swamp	
Honey	Forests in the village	Near KNS forest	Forest (Mlegeza) and other small forests and farms	Very little, in farms
Wildlife	Keys species are found in KNS hunting block but crop raiding wildlife are found in farms	KNS hunting blocks, crop raiding species in farms	Rivers (Kitogota, Mnyela) Swamps (Ngapemba, Mende, Yogowela)	KNS hunting block only
Bamboo	In forests and farms	Farms and forests	Farms and forests	KNS hunting block and farms
Reeds (malala)			Valleys	KNS hunting block
Matete			Swamps (Ngapemba, Mndolo), Rivers (Mpanga & Mnyela)	

Natural resources	Occurrence			
	Tanganyika	Ipinde	Utengule	Iduindembo
Milulu grass /miny	Planted in marshes in the village	Areas that are not cultivated like forests		
Sand	In rivers	River Mnyela	All rivers, valleys	At Utengule village, River Mpanga and peoples farms (charge 5000 TZS /tractor trailer
Forest vegetables	Lowlands, watery places, farms, forests	Farms and forests	Forest and farms	Farms
Mushrooms	Found everywhere in the village but mostly at Ndewe forests. Ndewe are trees that assist growth of mushrooms	Forests	Undisturbed areas	In farms
Thatching grass	Forests and farms	Forests and farms	Farms and forests	
Palm leaf strip (ukindu)	Farms and forests	Farms and forests	Farms and forests	KNS hunting block
Forest fruits	In the forests, few in farms	Forests and farms	Forests and undisturbed areas	KNS hunting block, very few in the village

Table 5.2 Relative importance of natural resources (scores and %)

Resource	Tanganyika		Ipinde		Utengule		Iduindembo	
	Score	%	Score	%	Score	%	Score	%
Land	1,750,000	98.56	15,000,000,000	99.499	2560	50.17	24,000	83.307
Forests	250,000	1.41	75,000,000	0.497	1280	25.08	2,400	8.331
Water (rivers, swamps, dams)	5,000	0.03	500,000	0.003	640	12.54	600	2.083
Fish	3	0.00			320	6.27		
Oxen					160	3.14		
Livestock					80	1.57		
Honey	50	0.00	5000	0.000	40	0.78		
Wildlife	10	0.00	100	0.000	20	0.39		
Grazing land					2	0.04	600	2.083
Bamboo	1	0.00	50	0.000	1	0.02	6	0.021
Milulu grass			1	0.000				
Palm leaf strip (ukindu)							2	0.007
Reeds (malala)							1	0.003
Farms							1200	4.165
Total	17,755,064	100	15,075,505,151	100	5103	100	28,809	100

1.2 Uses of natural resources

In all villages, forests and trees in individual plots are used for timber, poles, logs, traditional medicines, and charcoal production (Table 5.3). In all villages, timber, logs and poles are used by villagers for construction and are also sold to outsiders except in Iduindembo where no one is doing any timber business (no forest areas). In

Tanganyika, where there are still extensive forest areas, the timber business is larger than for Ipinde and Utengule villages. Trees are also used to make furniture and household items, and as firewood for cooking and for burning bricks. Charcoal burning is conducted in all villages but at a low scale, for cooking and mainly for selling to the government staff working in these villages. In Utengule some charcoal is also sold to Ngalimila, Mpanga and Mlimba.

In all villages, wildlife is hunted for meat and for sales. The most preferred species for meat are red duiker, dik-dik, wild pigs, warthogs, cane rats, hedgehogs, puku, buffaloes, hippos, bushbuck, sable antelope, baboon, and elephants. In Tanganyika, crocodiles, lions and leopards are hunted for skins, mainly for business purposes. Some families keep guinea fowl.

More than 80% of honey produced in Tanganyika, 70% in Ipinde and 10% in Utengule is sold outside the villages, while the remainder is used within the villages. Bees wax is sold to the Roman Catholic Mission. Wild fruits, vegetables and mushrooms are used for food and for selling, especially of mushrooms. *Milulu* grass and reeds (*malala*) are used to make mats and baskets, while sand is used for building houses.

Table 5.3 Uses of natural resources

Resources	Tanganyika	Ipinde	Utengule	Iduindembo
Forests	Timber and poles for building and business Logs for building bridges Making furniture Making charcoal for use and selling Firewood for cooking and burning bricks Herbs for medicine by the community	Timber used for building, making furniture and business Firewood used for cooking and burning bricks Charcoal used by a few villagers and some public servants Herbs used by the whole community	Timber used for building and furniture Firewood for cooking and burning bricks Charcoal used by villagers for cooking and selling to people from Ngalimila, Mpanga and Mlimba	Timber used for construction Charcoal used by villagers for cooking
Wildlife	Food Meat and skins are sold for income Keeping of guinea fowl	Meat (red duiker, wild pig, dik-dik, cane rats, bushbuck, hedgehog) Keeping of guinea fowl	Food and selling (within the village and neighbouring villages: puku, hippos, bushbuck, baboon, elephant, hedgehogs, and wild pigs)	Meat and income
Water	Domestic use and for fish	Domestic use and for fish	Domestic use, farming and livestock	Domestic use, livestock
Honey	* Own use and for sale (≥80%)	** Own use and for selling.	Using and selling	Villages (they do not do beekeeping)
Wax	Sold to churches	Sold to churches	Selling	
<i>Minyi/malulu</i>	-	Mats and baskets		
<i>Matete</i>			Sleeping mats	
Sand	Construction	Construction	Construction	
Fruits, roots, vegetables	Food and sale	Food	Food	
Mushrooms	Food and sale	Food and sale	Food and sale	

* There is bitter honey from March to May because bees collect nectar from bitter flowers like rubber but from August to November the honey is sweet because they pick nectar from good flowers.

** There is sweet and bitter honey, it depends where the beehives are located.

1.3 Accessing natural resources

All villages know the procedures to be followed to access indigenous tree species for timber and logs (Table 5.4). The process is as follows:

- i) A person in need of trees sends his/her request to the hamlet leader,
- ii) The hamlet leader forwards the request to the Village Executive Officer (VEO),
- iii) The VEO write a letter of request to the Division Forest Officer
- iv) Before a permit is offered, the Division Forest Office must confirm the tree to be harvested,
- v) A permit is offered.

No permit is needed for the harvesting of poles and small trees for building purposes, but for any cutting of big trees e.g. for making boats or for business (the selling of timber), a permit must be sought. Some villagers claimed that the long procedures have discouraged many people from doing the timber business. For Tanganyika, permits are only required for harvesting of timber, but no permission is required for harvesting trees for building, charcoal, or firewood if harvested in their own plots or open areas. In all villages, no permission is needed for the harvesting of any exotic tree species.

In general, people are not allowed to harvest wildlife resources without a hunting permit. However, in all four villages people do access wildlife illegally from forests and farms. There have been some incidences of people being caught and beaten while hunting wildlife in the KNS hunting block. For instance, in 2016 four villagers from Ipinde were caught hunting in the KNS hunting block and were beaten.

No permit is required to do beekeeping business; although procedures for accessing areas to hang beehives vary among the villages. In Tanganyika, people doing beekeeping business are free to access any forest that is not already being used by others to hang their beehives. Most people prefer to hang beehives in forests close to their houses or farms. In Ipinde, people can hang beehives in their own plots, but in conserved forests a permit is required. In Utengule, most beekeeping activities are done by a beekeeping group of about 20 people. The beekeepers hang their beehives at Mlegeza Forest. Although, people are afraid to hang beehives in farms because of bees stinging people and cattle, still some beekeepers do hang their beehives in farms.

No permit is needed for accessing water, reeds (*malala*), *milulu* grass, fruits, vegetables, mushrooms, and roots; people are free to access these resources except for within the KNS hunting block where a permit is required. Accessing sand from rivers and open areas within villages is free except in Iduindembo where accessing sand in people's farmlands is charged at 10,000 TZS for a full tractor trailer; while those accessing sand from Utengule Village are charged 5,000 TZS. The Utengule Village access sand from lowlands and rivers, but has also set aside an area called Mapoyola mainly for sand extraction.

Table 5.4 Access to natural resources

Resource	Tanganyika	Ipinde	Utengule	Iduindembo
Forests	For indigenous species a permit must be sought from the Division Forest Officer through the village government; no permission is required for exotic species, people can harvest from areas where they live and open areas	Need a permit from the Division Forest Officer when harvesting indigenous trees	Need a permit from Division Forest Officer when harvesting indigenous trees	Need a permit from Division Forest Officer when harvesting indigenous trees
* Wildlife	No access allowed	No access allowed	No access allowed	No access allowed
Water	People are free to use water, there is a regulation to protect water sources	Free access	Free access	Free access

Resource	Tanganyika	Ipinde	Utengule	Iduindembo
Honey and wax	No permit is required; people choose any forest that is not being used by others, but mainly near our settlements	No permit is required to do beekeeping	No permit is required to do beekeeping	-
Reeds (<i>malala</i>)			Free to access from their own areas, except for those in KNS where a permit is required	Access in KNS, a permit is required
<i>Minyi/malulu</i> grass	People are free to access from their own areas	Free to access from their own areas, except for those in KNS a permit is required		Free to access from their own areas except for those in KNS a permit is required
Sand	Free to access	Free access	Free access	In people's farms payment is required
Fruits, vegetables, roots	People can access anywhere these are found	Free access	Free access	Free access
Mushrooms	Can be accessed anywhere	Free access	Free access	Free access

* There are procedures to follow to get a residents hunting permit.

1.4 Constraints in accessing natural resources

For all villages the primary constraint to accessing natural resources concerned access to land (Table 5.5), specifically concerning the lack of customary right of occupancy (Tanganyika 98% and Utengule 39%), and the inability to increase land for cultivation, for Ipinde and Iduindembo due to much of their land being within the KNS hunting block (88% and 98% respectively); and for Utengule being prevented from cultivating in Ndefi forest (39%).

Other relatively important constraints were, for Tanganyika, restrictions on fishing in the Mnyera River and wetlands (2%); for Ipinde, that it is difficult to obtain a permit to harvest timber (9%) and not being allowed to hunt wildlife (2%); for Utengule the growth of weeds in Ngapemba wetland (20%) and incursions of livestock to Ngapemba (2%); and for Iduindembo not being allowed to fish in Yogowelo and Ndolo wetlands within the KNS area (1%).

Table 5.5 Constraints in accessing natural resources (relative importance scores and %)

Constraint	Tanganyika		Ipinde		Utengule		Iduindembo	
	Score	%	Score	%	Score	%	Score	%
We cannot sell our land because we lack customary right of occupancy	10000	97.50			7200	39.12		
KNS does not allow us to fish at River Mnyela and swamps	200	1.95	1	0.88				
Lack of clear farm boundaries between farms and between villages	50	0.49						
Roman Catholic Mission has hindered us from using their farms	5	0.05						

Constraint	Tanganyika		Ipinde		Utengule		Iduindembo	
	Score	%	Score	%	Score	%	Score	%
Blockage of water in its source (farming activities and water committee) make water not to reach other villagers	1	0.01						
Acquiring permit to harvest timber for business and construction is very hard			10	8.85				
Not possible to increase our land (big portion is in KNS)			100	88.50			400	98.77
Not allowed to hunt wildlife for meat			2	1.77			1	0.25
Not allowed to fish at Yogowelo and Ndolo dams/swamps							4	0.99
Lack of permission from district level to increase land from Ndefi Forest					7200	39.12		
Weeds in the swamp has reduced the fishing area					3600	19.56		
Livestock entering the swamp					360	1.96		
KNS does not pay on time					36	0.20		
Fishing license and taxes are high					6	0.03		
Changing the current grazing area to become a farm land					3	0.02		
Illegal fishing destroys many fishes					1	0.01		
Total	10256	100	113	100	18406	100	405	100

1.5. Degradation of natural resources

In the three villages of Tanganyika, Utengule and Iduindembo, cultivation near water sources (springs, rivers and swamps) was the major form of degradation, scoring 79%, 58% and 74%, respectively (Table 5.6). For Ipinde, the clearing of forests was considered to be the primary form of degradation (95%). These were followed by, in Tanganyika, forest fires (13%) and clearing of forests (6%); in Ipinde forest fires (5%); in Utengule, livestock grazing in Ngapemba (29%), uncontrolled grazing (10%) and clearing of forests (2%); and for Iduindembo the clearing of forests (25%). Other less important forms of degradation identified in one or more villages included, poaching, illegal fishing, charcoal production and building houses near water sources.

Some causes of the degradation are similar across villages while others vary between villages (Table 5.7). For instance, people farm nearby water sources to increase production of crops, in particular rice. Forest fires are done mainly to prepare farms for agriculture, for harvesting honey and for hunting wildlife. Tree cutting/forest clearing is done to create and prepare farms, to get poles and timber for construction, logs for making charcoal, timber production and making furniture. Poaching is mainly done to get meat, income and skins (Tanganyika), and also to remove destructive animals from farms. Charcoal production is done to get income and also as a better source of energy for cooking. Uncontrolled grazing is done due to an increase in the number of pastoralists and livestock. Illegal fishing is done mainly because people want money quickly.

Farming and building near water sources was reported to lead to dirty water, a decrease in water flow, and the drying of water sources (Table 5.7). Forest fires lead to the destruction of forests, burning of crops, bees, animals and houses. Forest clearing leads to the drying of water sources, reduced rainfall and an increase in temperature, and reduced habitat for wildlife. Poaching results in fewer wildlife species and the use of snares injures wildlife. Uncontrolled grazing leads to environmental degradation and crop raiding. Illegal fishing leads to fewer fish and, due to the use of poisons, to water pollution and detrimental health effects to consumers.

Table 5.6 Degradation of natural resources (relative importance scores and %)

Type of degradation	Tanganyika		Ipinde		Utengule		Iduindembo	
	Score	%	Score	%	Score	%	Score	%
Forest clearing/uncontrolled cutting of trees	150	6.65	20	95.24	12	1.93	480	24.86
Forest fires	300	13.30	1	4.76			8	0.41
Cultivation at water sources	1800	79.79			360	57.97	1440	74.57
Poaching/illegal hunting	5	0.22			1	0.16	2	0.10
Charcoal production	1	0.04						
Livestock grazing at Ngapemba swamp					180	28.99		
Uncontrolled grazing					60	9.66		
Building houses near water sources					6	0.97		
Fishing by using small nets/illegal fishing					2	0.32	1	0.05
Total	2256	100.00	21	100.00	621	100.00	1,931	100.00

A common solution to perceived environmental degradation, proposed by all villages, was that environmental regulations and laws should be better enforced because people doing illegal activities will only stop if the law is enforced, in particular regulations relating to the destruction of water sources, illegal fishing, poaching, forest fires and charcoal burning (Table 5.7). Provision of environmental education was proposed by all villages as another important solution. This was based on the argument that some degradation occurs because people lack knowledge and awareness of the consequences. Better knowledge on modern farming technology (intensification of production) was also suggested because currently people cultivate large areas but harvest little. Modern technology can improve crop production using existing lands and so reduce the need to look for new lands. Intensification of protection for wildlife was proposed because from the experience of the informants, if it were not for the protection of wildlife in the KNS hunting block, the area would no longer have any wildlife.

Table 5.7 Locations where degradation occurs, causes, impacts and possible solutions

Type of degradation	Location/extent	Causes	Impacts	Possible solutions
TANGANYIKA				
Farming and construction near water sources	Nearby rivers and swamps	Rice farming Settlements	Dirty water Reduced water	Remove the responsible people Environmental education
Forest fires		Agriculture Harvesting honey	Destruction of forests Fires can burn houses and crops	Education Use firebreaks Law/regulations to be used
Forest clearing/tree cutting (by locals, immigrants and district council people)	Forests	Farms Construction Charcoal Timber Furniture	Lack of rain Increase in temperature	Law should be used Environmental education

Type of degradation	Location/extent	Causes	Impacts	Possible solutions
Poaching	Forest, farms (preferred species for meat: cane rats, wild pig, hedgehog, dik-dik, red duiker, hippos, buffalo, warthog, bushbuck, Aardvark (<i>mkwanda</i>), black monkeys, forest giant rats, elephants, eland, fish, waterbuck (<i>ngaputa</i>))	Food/protein To remove destructive animals from farms	Decreased numbers of wildlife	Ask for permission to hunt legally
Charcoal burning	Forests	Better source of energy for cooking	Forests are degraded	Education Laws should be used
IPINDE				
Uncontrolled tree cutting	In our individual forests In farms	Preparing farms	More open areas Wildlife have run away	Education
Forest fires	In our individual forests In farms	Preparing farms Honey harvesting	Fires to escape and burn crops and houses	To put firebreaks Environmental education
UTENGULE				
Cultivation at water sources	Nearby springs, rivers, dams/ swamps	Lack of understanding Regulations not clear to people	Drying of water sources	Environmental education Laws/regulations should be used
Grazing at the dam	Around the dam	Increased livestock	Decreased water and fish	Protection Decrease no. of livestock
Uncontrolled grazing	Farms, water sources	Increased numbers of pastoralists and livestock	Crop raiding Environmental degradation	Education Decrease livestock Laws should be used
Tree cutting (Ndefi forest)	Around the forest	Increased farming due to population increase	Decreased size of the forest	Start modern farming technology
House construction at water sources	Nearby springs, rivers, dams/ swamps	Lack of understanding Regulations not clear to people	Drying of water sources	Environmental education Laws/regulations should be used
Fishing small fishes	Rivers, dams, swamps	Small nets	Decreased fish	Education Laws should be used
Poaching/illegal hunting	Forest, farms	Food Income	Injure wildlife Decreased wildlife	Laws should be used Education Intensify protection

Type of degradation	Location/extent	Causes	Impacts	Possible solutions
IDUINDEMBO				
Farming and construction near water sources	Swamps, seasonal rivers	Lack of education Greediness of our leaders (sell land in those areas)	Dirty water Lack of water	Environmental law should be enforced Environmental education
Tree cutting	Farms, near forests	Construction Expansion of farms and preparing farms	Drought (dry land) Erosion	As above
Forest fires	Patches of forests and farms	Hunting, Charcoal burning Farms preparation	Fires escape and burn crops, animals and houses	As above
Poaching/illegal hunting	KNS and farms	Meat Income	Decreased numbers of wildlife	As above
Illegal fishing	Swamps, rivers	Food Quick money	Killing the fish generation Affect the health of consumers Contaminate water	As above

1.6 Conflicts over natural resources

For all villages the major form of conflict concerning natural resources, related to the presence of the KNS hunting block (Tanganyika, 97%, Ipinde 99%, Utengule 71% and Iduindembo 100%), although the nature of the conflict varied between villages (Table 5.8). For Utengule and Iduindembo villages, the conflict is mainly due to the lack of a clear boundary between the villages and incorporation of village land into the KNS; for Tanganyika, people know and accept the boundary with KNS, but the problem here is related to restrictions regarding access to fish resources within the KNS hunting block; for Ipinde the problem relates to restrictions on access to both land and fish resources.

Regarding access to fish resources, KNS argued that when people come to fish some also poach wildlife. Villagers claimed that KNS had requested them to form a fishing group, and they would be allowed to fish during the hunting off season (February to June). But the villagers argue that at this time during the rainy season, it is difficult to get fish because there will be a lot of water at this time; that the processing of fish is difficult at this time because of the rains; and that the number of customers for fish at this time are few as people have little available money until after they have harvested and sold their crops.

Other less important forms of conflict included those over village boundaries; farm boundaries; with the Roman Catholic Mission (Tanganyika, again relating to the boundary); between farmers and pastoralists (Utengule, 24%); pastoralists and fishermen (Utengule, 5%) and a lack of transparency concerning the sharing of revenues from wildlife.

Table 5.8 Conflicts over natural resources and their relative importance (scores and %)

Type of conflict	Tanganyika		Ipinde		Utengule		Iduindembo	
	Score	%	Score	%	Score	%	Score	%
KNS and villagers (fishing)	3500	97.68						
Tanganyika vs Taweta Village	70	1.95						

Tanganyika vs Madeke Njombe	10	0.28						
Tanganyika and RC Mission	1	0.03						
Among ourselves - farm boundaries	2	0.06	1	0.99			1	0.001
KNS vs village (boundary & fish resources)			100	99.01				
KNS and village on boundary	*				750	71.02	100,000	99.899
Farmers and pastoralists					250	23.67		
Pastoralists and fishermen					50	4.73		
KNS and village - share of revenue is unknown					5	0.47		
Utengule vs Mpanga, Iduindembo and Ipinde villages on boundary issues					1	0.09		
Iduindembo vs Utengule – boundary							100	0.100
Total	3583	100.00	101	100.00	1056	100.00	100,101	100.00

NB: *Tanganyika there is a beacon so they know the boundary between the village and KNS. Before, a portion of the village land was included in the hunting block but this was resolved by the District.

1.7 Trends in natural resources

In all four villages, most natural resources, including the availability of land, forests, wildlife, palm leaves, wetlands, water, fish and reeds (*minyi and malala*), were perceived to have decreased tremendously over the past 20 years (Table 5.9). Grazing areas were also perceived to have decreased (Iduindembo) or remained static (Utengule). The general expectation is that most resources will continue to decline in future, although informants from Utengule suggested that there may be modest increases in wildlife and fish resources due to stronger protection than in the past. Only bamboo and honey were predicted to increase in future, as many people are now doing beekeeping and are cultivating bamboo for business purposes (for use in construction and brewing of beer).

The main reasons given for resource decreases were:

- Land availability – population increase (birth and immigration) and increase in need of big areas for investment,
- Water – farming and grazing near water sources, forest fires, forest clearing and inadequate rains,
- Wildlife – decrease of habitat for wildlife and poaching,
- Forests – timber business, increase of people and thus demand for trees for construction, tree cutting for expansion and preparation of farms,
- Fish – some water sources (rivers, swamps and springs) have dried up, increase in fishing and illegal fishing,
- *Milulu* – some swamps have dried up (they depend on water) and the number of users have increased;
- Grazing land – many areas are used for farming and the number of people in need of farming land is increasing,
- Reeds (*malala* and *ukindu*) – areas where *ukindu* and *malala* previously grew have been used for agriculture, grazing and settlement, and livestock trample and eat the young shoots of *malala*.

While natural resources have generally decreased, the numbers of people and settlements, farms and livestock have increased greatly over the past 20 years, and are expected to continue doing so in future.

Table 5.9 Trends in natural resources

Resource	Mkapa Regime	Current	2030	Explanation
No of people				
Tanganyika				
Ipinde				
Utengule	60	100	120	Increase in immigration Birth rate is high
Iduindembo				
No of livestock				
Tanganyika				
Ipinde				
Utengule	10	100	200	Many intruders Livestock keeping is increasing
Iduindembo				
No. of Farms				
Tanganyika	10	100	200	Population has increased Many immigrants doing farming
Ipinde				
Utengule	40	100	120	Farmers are increasing Needs are increasing
Iduindembo	25	100	400	People are increasing (birth and immigration) Farming technology has increased Expansion of agriculture
Grazing areas				
Tanganyika				
Ipinde				
Utengule	0	100	100	No more land, before did not have pastoralists
Iduindembo	1000	100	25	Many areas are used for farming People in need of farming have increased
Land availability				
Tanganyika	150	100	55	Increase in investment Increase in agriculture Population increase
Ipinde	200	100	50	Population increase
Utengule				
Iduindembo	1000	100	25	Population growth, demand of has increased
Forests				
Tanganyika	400	100	50	Timber business Increase in construction Increase in tree cutting
Ipinde	600	100	50	Shifting cultivation Population increase

Resource	Mkapa Regime	Current	2030	Explanation
Utengule	160	100	80	People are increasing Needs are increasing
Iduindembo	1000	100	25	People increased so increased need for land Farming has increased, clearing of forests
Wildlife				
Tanganyika	300	100	50	Decrease of wildlife habitat Increase in poaching
Ipinde	1000	100	30	Population increase Habitat loss
Utengule	400	100	120	Currently, there is protection but it should increase, before protection was weak
Iduindembo	1000	100	25	Poaching Wildlife habitats have decreased
Honey				
Tanganyika	10	100	150	Many people are doing beekeeping
Ipinde	50	100	500	Increase of people doing beekeeping
Utengule				
Iduindembo				
Bamboo				
Tanganyika				
Ipinde	30	100	700	Increase of people planting bamboo for business and building
Utengule				
Iduindembo	50	100	150	Many people plant them for ulanzi brew, construction, weaving
Palm leaf strip (<i>ukindu</i>)				
Tanganyika				
Ipinde				
Utengule				
Iduindembo	1000	100	25	Areas where <i>ukindu</i> grows have been used for agriculture, grazing and settlement
Water				
Tanganyika	300	100	50	Farming near water sources Forest fires Tree cutting
Ipinde	500	100	40	Population increase Inadequate rains Clearing of forests
Utengule				
Iduindembo				

Resource	Mkapa Regime	Current	2030	Explanation
Swamps				
Tanganyika				
Ipinde				
Utengule				
Iduindembo	1000	100	25	Many fishermen Illegal fishing Livestock increase
Fish				
Tanganyika	300	100	50	Some rivers have dried up Increase in fishing
Ipinde	700	100	20	Insufficient water Population increase
Utengule	200	100	120	Control of illegal fishing
Iduindembo	1000	100	25	Illegal fishing, Fishermen have increased Few sources of water
<i>Mitindi/minyi</i>				
Tanganyika	500	100	25	Swamps have dried up Users have increased
Ipinde				
Utengule				
Iduindembo				
<i>Milulu/milala</i>				
Tanganyika	1000	100	10	Water has decreased (they depend on water) Users have increased
Ipinde				
Utengule				
Iduindembo	1000	100	25	Where reeds (<i>malala</i>) grow, some areas are used for farming, livestock trample over them Livestock eat the young shoots

1.8 Marketing of natural resources

Some natural resources are sold in all villages although this varies with availability (Table 5.10). Timber is produced and sold in Tanganyika, Ipinde and Utengule. Some timber is sold within the village, but much (up to 80%) is sold to external markets, including neighbouring villages of Ngalmila and Mpanga, local centres such as Mlimba and Ifakara and further afield to places such as Arusha, Dar es Salaam, Zanzibar and Pemba. Prices for timber sold in villages range from 4,000-12,000 TZS depending on the size of the timber.

Most charcoal produced in Tanganyika, Ipinde and Iduindembo is sold within the village. In Utengule Village, about 80% is sold outside the village (to Ngalmila, Mpanga and Mlimba). The price for a full sack of charcoal is 10,000 TZS in Tanganyika and 15,000 TZS in Iduindembo.

Wildlife meat is sold in all villages but secretly. For instance, informants in Tanganyika stated that a piece of wild pig meat is sold for about 3,000-5,000 TZS. Mushrooms are also sold in Tanganyika and Utengule; in Tanganyika a one litre container is sold for between 300 and 500 TZS, while in Utengule it is sold for 1,000 TZS.

Bamboo poles are sold within the village for a price of 500 TZS per pole in Utengule and about 5,000-20,000 TZS for three poles in Iduindembo village. The bamboo brew (*ulanzi*) is sold within the village for between 500 and 1,000 TZS per litre in Utengule and Iduindembo. In Utengule reeds are sold within the village for 10,000 TZS per head load. In Iduindembo, a full trailer tractor full of sand is sold 5,000 TZS within the village.

The number of people engaged in honey collection and production is highest in Tanganyika, followed by Ipinde (about 100 people), then Utengule (about 20 people). Honey in hives is harvested two or three times per year, and each producer can harvest about 200 litres per harvest. The amount of honey sold outside of the villages ranges from 80% for Tanganyika, to 70% for Ipinde and 10% for Utengule. This is sold to consumers from neighbouring villages, from local centres such as Mlimba and Ifakara, and to more distant centres such as Morogoro and Dar es Salaam. The price for honey in Tanganyika is 5,000 TZS per litre and for Utengule from 5,000 to 10,000 TZS per litre. Wax is sold to local churches, at 4,000 TZS per kg, and who use it to make candles.

Table 5.10 Marketing of natural resources

Resource	Tanganyika	Ipinde	Utengule	Iduindembo
Timber	Villagers Business people mostly from outside (Mlimba, Ifakara, Arusha, Pemba,)	Timber is sold within the village and outside village. The price varies from 5,000 to 12,000 TZS per piece depending on size. With permit they sell about 70-80% to Dar es Salaam, Zanzibar, Ifakara, Mlimba	Timber is sold within and outside the village. The price varies from 4,000 to 10,000 TZS per piece depending on size With permit they sell about 70% to Dar es Salaam, Ifakara, Mlimba, Ngalmila and Mpanga	
Charcoal	Some is sold in the village, a sack is sold for 10,000 TZS	Sold within the village	20% sold within the village 80% sold outside the village - Ngalmila, Mpanga and Mlimba	A sack is sold for 15,000 TZS within the village
Wildlife	Within the village. A piece of wild pig meat is sold for 3,000-5,000 TZS	Sold within the village (secretly)	Sold within the village (secretly)	Sold within the village secretly
Mushrooms	Within the village a 1litre container is sold 300-500 TZS		80% sold within the village; 1litre container is sold for 1,000 TZS	
Bamboo			90% sold within the village; one pole is 500 TZS	3 poles are sold for 5,000-20,000 TZS within the market
Bamboo brew (Ulanzi)	Sold within the village	Sold within the village	One litre sold for 500 - 1,000 TZS	Sold within the village, a litre for 1,000 TZS
Honey	20% is sold within and (80%), outside the village	70% sold outside the village; 30% sold within the village	90% sold within and 10% outside village; 1litre 5,000-10,000 TZS	
Reeds (malala)			Sold within the village, a portion is sold for 10,000TZS	

Resource	Tanganyika	Ipinde	Utengule	Iduindembo
Sand				Sold within the village, a trailer is 5,000 TZS

1.9 Management of natural resources

All villages have regulations and bylaws that govern the management of forests, water and fish resources (under the MBU). For forest resources there are environmental regulations and laws which are enforced by the village government, the Division Forest Officer and the District Forest Officer. For water there are regulations that require people to protect water sources, with bylaws that indicate the levels of fines to be paid by offenders. The fine of 50,000 TZS was approved by the village assembly after consultation with District level. The Village Environmental Committee (VEC) is responsible for overseeing all issues related to the environment. They apprehend people cutting trees illegally and destroying water sources. Any offenders who are not willing to pay the fine are taken to court, but it seems that this rarely happens. Some informants noted that sometimes the VEC fails to perform its activities properly because some village government leaders allocate farms and settlements to people in water sources.

Wildlife resources are managed by the central government through the district council. The main institutions responsible for wildlife in the area are KNS, who protect their area by apprehending people exploiting wildlife and fishing illegally, and the District Council who is responsible for issuing resident hunting permits (District Game Officer), providing technical advice to villagers, demarcating boundaries and educating villagers. However, villagers at Utengule claimed the KNS does not allow them to hunt there even when they have a district permit. Thus the villages do not participate in the active management of wildlife resource. There are no regulations governing access to and management of other natural resources.

2. WILDLIFE

2.1 Occurrence and abundance of wildlife

A wide variety of wildlife was reported to occur in the study villages (Table 5.11), including large animals such as elephant and buffalo; large predators such as lions, leopards and hyaena; aquatic species such as hippo, crocodiles and turtles (*kasa*); antelope such as eland (*mbunju*), sable (*ngalapi/palahala*), waterbuck (*kuro-ngaputa*), hartebeest (*kongoni*), impala, puku (*sheshe*) and bushbuck (*mbawala*), as well as smaller species of dik-dik and red duikers (*funo*); wild pig and warthog; baboons (*nyani*), black monkeys (*kima*) and vervet monkeys (*ngedere*); as well as aardvark (*mkwanda*), hares, cane rat (*ndezi-kungusi*) and hedgehogs.

Baboons were considered to be the most common wildlife species for Tanganyika (96%) and Utengule (38%), and puku for Ipinde (61%) and Iduindembo (67%). Other species considered to be relatively abundant in one or more villages were: vervet monkeys (Utengule 19%), puku (Utengule 19%), cane rats (Ipinde 20%), dik-dik (Ipinde 10%), buffalo (Utengule 9% and Iduindembo 6%), wild pigs (Ipinde 5%), crocodiles (Utengule 5% and Iduindembo 23%) and hippo (Utengule 5%).

Table 5.11 Wildlife type and abundance

Wildlife species	Tanganyika		Ipinde		Utengule		Iduindembo	
	Score	%	Score	%	Score	%	Score	%
Baboons (<i>nyani</i>)	15,000,000	96.148			16384	37.73	3600	2.790
Small black monkeys (<i>ngedere</i>)	300,000	1.923			8192	18.87	X	
Black monkeys (<i>kima</i>)	300,000	1.923						
Wild pig	30	0.000	576	5.070	126	0.29	1800	1.395
Warthog	6	0.000	6	0.053	126	0.00	900	0.698
Cane rat (<i>ndezi/ kungusi</i>)	300	0.002	2304	20.28	1024	2.36	X	
Dik-dik	2	0.000	1152	10.140	8	0.04	1	0.001
Buffalo	600	0.004	x		4096	9.43	7200	5.580
Puku	x		6912	60.84	8192	18.87	86400	66.961

Wildlife species	Tanganyika		Ipinde		Utengule		Iduindembo	
	Score	%	Score	%	Score	%	Score	%
Hippos	1	0.000	2	0.02	2048	4.72	20	0.016
Crocodiles	x				2048	4.72	28800	22.320
Elephants	x		x		512	1.18	300	0.233
Sable antelope (<i>ngalapi/palahala</i>)			36	0.32	256	0.59	X	
Waterbuck (<i>kuro/ ngaputa</i>)	x				260	0.60	X	
Eland (<i>mbunju</i>)	x				64	0.29	X	
Red duiker (<i>funo</i>)	x		288	2.535				
Bushbuck (<i>mbawala</i>)	x		72	0.634			X	
Aardvark (<i>mkwanda</i>)			12	0.106				
Hare	x		1	0.009	16	0.04	X	
Impala	x		x					
Hartebeest (<i>kongoni</i>)							X	
Hyena	x		x		32	0.15	X	
Leopards	x		x		16	0.07	X	
Lions	x		x		16	0.04	10	0.008
Hedgehogs	x		x		1	0.00		
Turtles (<i>kasa</i>)	x				2	0.02		
Total	15,600,939	100.00	11,361	100.00	43,419	100.00	129,031	100.00
No of species (26 in all)	23		18		20		20	

NB: x shows other wildlife species occurring in low abundance.

In all villages, most wildlife species are found in the KNS hunting block (Table 5.12). In villages that still have forests outside of the KNS area, i.e. Tanganyika, Ipinde and Utengule, some wildlife species are also found in these areas. Some wildlife species are found nearby water sources or inside water (hippos and crocodiles). Some crop raiding wildlife are found nearby farms/in farms (e.g. cane rats), while some are found in forest patches/bushes nearby farms (e.g. wild pigs and baboons). In general, Tanganyika seems to have more wildlife than the other villages, apparently due to the larger extent of undisturbed wildlife habitat the village still has as compared to the other three villages.

Table 5.12 Locations of wildlife

Tanganyika	Ipinde	Utengule	Iduindembo
Wildlife are found in the forests	Government forest	Most wildlife are found in KNS hunting block	At KNS hunting block
Nearby water sources	Village forest	Some are found in patches of forests	
KNS hunting block	KNS forest	Nearby rivers (crocodiles, hippos, small black monkeys)	
Farms		Nearby dams/swamps	
		In people's farms (cane rats, wild pigs, and baboons)	

2.2 Access to wildlife

Wildlife resources are managed by the central government through the District Council (District Game Officer). The main institutions responsible for managing wildlife in the area are KNS who manage and protect the area within the hunting block, and the Ifakara District Council (District Game Officer) who issues hunting permits to residents, provides technical advice to villagers, demarcates boundaries and educates villagers on wildlife matters. However, villagers at Utengule claimed the KNS does not allow them to hunt even when they have a district permit. As such, the villages effectively have no legal access to wildlife and do not formally participate in the management of wildlife.

All villages access wildlife illegally from farms and forests, including from within the KNS area. This is used as a source of meat and income, through sales of meat within the villages. There have been some incidences of people being caught and beaten while hunting wildlife in the KNS hunting block. For instance in 2016 four villagers from Ipinde Village were reportedly caught hunting in the KNS hunting block and were beaten on the soles of their feet. It was also acknowledged that without the protection provided by the KNS all wildlife would rapidly be depleted from the area.

2.3 Threats facing wildlife

The major threats to wildlife (Table 5.13) were considered to be illegal hunting (Tanganyika 56%, Utengule 57% and Iduindembo 88%); plus encroachment into and continued reduction of wildlife habitat (Tanganyika 17%, Ipinde 97%, Utengule 38% and Iduindembo 12%). Other important threats were forest fires (Tanganyika 28%) and growth of cattle populations (Utengule 5%).

Table 5.13 Major threats facing wildlife (relative importance as scores and %)

Threats to wildlife	Tanganyika		Ipinde		Utengule		Iduindembo	
	Score	%	Score	%	Score	%	Score	%
Illegal hunting/ poaching	20	55.56	3	1.95	60	56.60	30	88.24
Forest fires	10	27.78	1	0.65	1	0.94	3	8.82
Decrease of wildlife habitat / encroachment to wildlife habitat due to population increase	5	13.89	150	97.40	30	28.30		
Clearing forests	1	2.78			10	9.43	1	2.94
Livestock increase					5	4.72		
Total	36	100.00	154	100.00	106	100.00	34	100.00

NB: In Utengule the wildlife preferred for hunting are elephants, buffalo, hippos, puku, wild pig, waterbuck and cane rats.

Currently there are no measures in place to conserve wildlife in any of the villages. In order to enhance conservation, all villages proposed setting aside an area for conservation of forests, wildlife and the environment in general, as a way of saving the current situation (Table 5.14), together with the provision of environmental education (including on family planning, good farming practices and wise use of land, job creation for youths so as to discourage them from poaching, construction techniques using blocks rather than wood and cooking with energy saving stoves and gas rather than wood, so as to reduce deforestation). Other measures proposed were i) to stop all activities that are destructive to the environment such as illegal hunting and forest clearing, ii) that the current environmental laws and regulation should be implemented properly by village governments so as to enhance sustainable conservation of resources, and iii) to strengthen the protection of wildlife resources, including the introduction of participatory patrol between villagers, district and KNS.

Table 5.14 Threat to wildlife, their causes, species most affected and possible solutions

Threat/village	Causes	Species most affected	Possible solutions
Poaching			
Tanganyika	Food and income	For meat: puku, buffalo, fish, warthog, wild pig, hippos, elephant, red duiker, hedgehog, cane rats, impala For skins: crocodiles, lion, leopard	Participatory patrols (community and district levels) Environmental education
Ipinde	Food and income	Some wildlife species	Environmental education Wildlife should have their own area and benefit people
Utengule	Protein/food and income	Buffalo, puku, wild pig, elephants, hippos, hedgehogs, cane rats	Strengthen protection Youth employment Conservation education
Iduindembo	Meat and money	All edible animals	Environmental education Protection Income generating activities for youth
Forest fires			
Tanganyika	Honey harvesting Preparation of farms	All species	Environmental education The law should be used
Ipinde	Honey harvesting Preparation of farms	All wildlife species	Environmental education Village government should implement the law/regulations
Utengule	Preparation of farms Hunting activities	All wildlife species	Firebreaks VEC should be equipped to control environmental destruction Education on farm preparations
Iduindembo	Preparing farms Hunting	All species	Environmental education Protection Use the law
Decrease of wildlife habitat			
Tanganyika	Farming	All species	Environmental education The law should be used Education on modern techniques of farming
Ipinde	Increase in agriculture Increase in number of people	All species	Environmental education An area should be demarcated for wildlife

Threat/village	Causes	Species most affected	Possible solutions
Utengule	Intruders are many (most are farmers) Population increase because there is no family planning	All wildlife species	family planning education Education on wise use of land The government should stop the intruders
Iduindembo			
Tree cutting/ clearing of forests			
Tanganyika	Construction Furniture Business Preparation of farms	All wildlife species are affected	Environmental education The law should be used
Ipinde			
Utengule	Expansion of farms Charcoal burning Settlements	All wildlife species	Education on good farming practices House construction by using blocks Cooking by gas(should be easily available) and energy saving stoves
Iduindembo	Preparing farms Construction Selling for income	All wildlife species	Environmental education Protection Use the law Income generating activities for youth
Livestock increase			
Tanganyika			
Ipinde			
Utengule	High rate of immigration of pastoralists with many cattle	All wildlife species	Reduce number of livestock, Education on alternative livelihood activities
Iduindembo			

2.4 Human-wildlife conflicts –types, costs and mitigation measures

Crop raiding was the major form of Human-Wildlife Conflict (HWC) for Tanganyika (94%), Ipinde (99%) and Utengule (100%) villages (Table 5.15). Farmers in Tanganyika stated that if farmers do not guard their crops they will not reap anything, but if careful guarding is done they can manage to harvest 60-90% of the crop. For Iduindembo, where livestock are most abundant and important, predation was identified as being the major form of HWC (75%, followed by crop raiding 25%). Only Tanganyika reported any incidences of wildlife killing and injuring people.

Table 5.15 Types of human-wildlife conflict (relative importance as scores and %)

Forms of human-wildlife conflict	Tanganyika		Ipinde		Utengule		Iduindembo	
	Score	%	Score	%	Score	%	Score	%
Crop raiding	60*	93.75	100	99.01	10,000	99.99	1	25.000
Livestock predation	1	1.56	1	0.99	1	0.01	3	75.000
People killing and injury	3	4.69						
Total	64	100.00	101	100.00	10,001	100.00	4	100.00

Baboons were the highest scored species in terms of damage due to crop raiding (Table 5.16), in Tanganyika (54%), Ipinde (98%) and Utengule (68%) and, for Iduindembo, rats (72%). Tanganyika village also experiences losses to black monkeys (9%), small black monkeys (27%) and rats (9%); Utengule to small black monkeys (14%), hippos (7%), buffalo (7%) and wild pigs (3%); and Iduindembo to baboons (3%), small black monkeys (6%) and cane rats (18%). Other species responsible for lesser amounts of crop raiding were hippos, buffalo, wild pigs, elephants, warthogs, and hare.

Iduindembo is the village that is most affected by livestock predation (Table 5.16). Here lions were reported to be responsible for the majority of losses of large livestock (93%), and to a much lesser extent crocodiles (5%), leopards and hyena (both 1%). Baboons are the major predators of chickens and ducks, and vervet monkeys sometimes steal eggs.

Table 5.16 Wildlife species responsible for crop raiding and livestock predation (relative importance as scores and %)

Wildlife species	Crop raiding								Livestock predation	
	Tanganyika		Ipinde		Utengule		Iduindembo		Iduindembo	
	Score	%	Score	%	Score	%	Score	%	Score	%
Baboons	300	53.96	960,000	98.974	100	68.03	2	2.985		
Small black monkeys	50	8.99	96	0.010	20	13.61	4	5.970		
Black monkeys	150	26.98	182	0.019						
Cane rats	5	0.90	24	0.002	1	0.68	12	17.910		
Rats	50	8.99	9600	0.990			48	71.642		
Hippos	1	0.18	8	0.001	10	6.80				
Wild pig			24	0.002	5	3.40	1	1.493		
Buffalo			4	0.000	10	6.80				
Elephants			1	0.000	1	0.68				
Warthog			8	0.001						
Hare			2	0.000						
Lion									160	93.567
Crocodiles									8	4.678
Leopard									2	1.170
Hyena									1	0.585
Total	556	100.00	969,949	100.00	147	100.00	67	100.00	171	100.00

The main impacts of HWC are injuries and losses of lives, loss of income through the loss of crops and livestock, and the loss of time spent on guarding crops, such that there is reduced time to put towards other development activities (Table 5.17).

Table 5.17 Costs of human wildlife conflicts

Tanganyika	Ipinde	Utengule	Iduindembo
Loss of lives	Loss of lives	Loss of lives: About 3 people were killed by crocodiles, lions and elephants (1990s to 2015)	

Loss of income through losses of crops and livestock	Loss of income, paying guards (500,000TZS/season), loss of crops	Loss of income	Loss of income due to losses of crops and livestock
Waste of time (lack of rest and time to do other development activities)	Waste of time	Waste of time to guard crops.	Loss of time

The main mitigation measures employed against crop raiding for all villages were guarding (using dogs, stones, fires and noises), the use of iron snares (for primates), digging pits (wild pigs) and constructing fences (Table 5.18). Farmers in Tanganyika, and to a much lesser extent Ipinde and Utengule, devote a lot of time to guarding their crops against wildlife. For Tanganyika, farmers claimed to spend every night in their farms during the growing season, such that they have little time for other household activities. Some farmers employ guards for this purpose.

To protect people and children from dangerous animals, in particular crocodiles, the villagers construct bridges, use boats and build protective fences in the rivers where people fetch water. To prevent livestock predation, the villagers protect their livestock during the day and put livestock in stockades at night.

Table 5.18 Mitigation measures for human-wildlife conflict

Type of conflict	Tanganyika	Ipinde	Utengule	Iduindembo
Crop raiding	Guarding Use dogs Use iron snares (primates) Pits (wild pigs) Construct fences	Guarding	Guarding using stones, fire and making noises	Guarding (chasing monkeys 2-3 times per farming season)
Killing people	For crocodiles: Use of bridges, Use of boats, Building fences in the river where people fetch water	For crocodiles: Use of bridges Use of boats Building fence in the river where people fetch water	For crocodiles: Use of bridges Use of boats Building fence in the river where people fetch water	
Livestock predation	Guarding Put animals in stockades	Protection	Protection	Protection

2.5 Benefits of wildlife

In addition to meat and income obtained through informal use of wildlife in all villages, the villages of Tanganyika, Ipinde and Utengule have received some formal wildlife-based income and support from KNS at the community level (Table 5.19). In Tanganyika, KNS has supported construction of the school (classrooms), village government office, the dispensary, bridges, and has provided desks for the school and sporting equipment. For Ipinde, KNS has supported renovation of teachers' house and the village government office, and also compensated 6 million TZS to each household whose houses were mistakenly burnt near the KNS in 2013. Utengule has received 7.4 million TZS, of which 2 million was used to build a doctors house. Iduindembo has not received any support from KNS, partly because it is a new village.

Despite the above support received, the villagers perceived it as being very small, unpredictable, and lacking in transparency at all levels, particularly as to what amounts of benefits they should receive, and concerning the flow of money from KNS to the district level and then back to the village.

Table 5.19 Benefits derived from wildlife

Tanganyika	Ipinde	Utengule	Iduindembo
Food (meat)	Protein/food	Food	Meat
Income from meat and skins	Income (meat)	Income	Income

Support from KNS: School, building classrooms Village government office, Dispensary Bridge, Desks Sports equipment	Support from KNS Renovation of teachers house Renovation of village government office Compensation (in 2013, those whose houses were burnt near KNS were compensated 6M TZS each)	Support from KNS Building materials (7.4M TZS for roof sheets and timber) Built a doctors house (2M TZS)	No support received from KNS
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2.6 Trends in wildlife

Trends of wildlife

The perceived trend in all villages is that wildlife populations of all species have declined greatly over the past 20 years and will continue to do so (Table 5.20). This was ascribed to more people and more clearing of forests for farms, leading to decreased habitat for wildlife, coupled with an increase in poaching. The extent of human wildlife conflicts was also perceived to have increased, partly because many people are farming nearby wildlife habitats. The frequency of eating bush meat has decreased, because wildlife species are no longer easily available and because KNS has intensified protection of wildlife within its area.

Table 5.20 Trends in wildlife

Resource	Mkapa Regime	Present score	2030	Explanation
TANGANYIKA				
Buffalo	200	100	55	
Cane rats	300	100	70	
Dik-dik	400	100	75	
Elephants	500	100	25	
Impala	500	100	20	
Warthogs	200	100	50	
Wild pigs	400	100	60	
No of people	25	100	150	
No of farms	25	100	200	
No of houses	25	100	200	
Conflicts concerning boundaries and resources	20	100	150	
Human wildlife conflicts	10	100	200	
IPINDE				
Bushbuck (mbawala)	500	100	30	Population increase Decrease of wildlife habitats Many intruders Increase of poachers
Puku	1000	100	40	As above
Cane rats	1000	100	50	As above
Dik-dik	20000	100	60	As above

Resource	Mkapa Regime	Present score	2030	Explanation
Bushbuck (mbawala)	500	100	30	As above
Red duiker (funo)	800	100	10	As above
Wild pig	600	100	20	As above
No of people	50	100	150	Immigration Birth rate has increased
No of farms	40	100	150	Many people farming
No of houses	30	100	140	Immigrants, new families are increasing
Human-wildlife conflicts	20	100	150	Farms have increased nearby forests
% of houses hunting	40	100	110	People have increased and poachers have increased too
How often to eat bush meat	200	100	10	Wildlife have decreased; KNS has intensified protection of wildlife
IDUINDEMBO				
Baboon	1000	100	100	Have a lot of food
Buffalo	1000	100	25	Poaching and loss of habitat
Crocodiles	1000	100	125	Have sufficient food and they are not eaten
Elephant	1000	100	25	Poaching and loss of habitat
Puku	1000	100	25	Poaching and loss of habitat
Warthog	1000	100	25	Poaching and loss of habitat
Wild pig	1000	100	25	Poaching for food and income and loss of habitat
No. of people	25	100	200	Birth and immigration
Availability of wildlife	400	100	25	Poaching for food and income Habitat is decreasing
Conflicts	10	100	400	Many people but not sufficient land
% of houses hunting	500	100	20	Wildlife are decreasing and are not easily sighted; many people
How often to eat bush meat	700	100	10	Wildlife are decreasing and are not easily sighted; many people

2.7 Measures to conserve wildlife

Currently there are no measures in place to conserve wildlife in any of the villages (Table 5.21). All villages proposed setting aside an area for conservation of forest, wildlife and environment in general as a way of saving the current situation, coupled with provision of environmental education (Table 5.22). Other measures proposed are: i) to stop all activities that are destructive to the environment such as illegal hunting and forest clearing, ii) the current environmental laws and regulation should be implemented properly to enhance sustainable conservation of resources, and iii) to continue protecting wildlife resources.

Table 5.21 Current measures to conserve wildlife

Tanganyika	Ipinde	Utengule	Iduindembo
No measures in place to conserve wildlife in the village	No measures in place	No measures in place to conserve wildlife in the village	No measures in place

Table 5.22 Possible new conservation measures

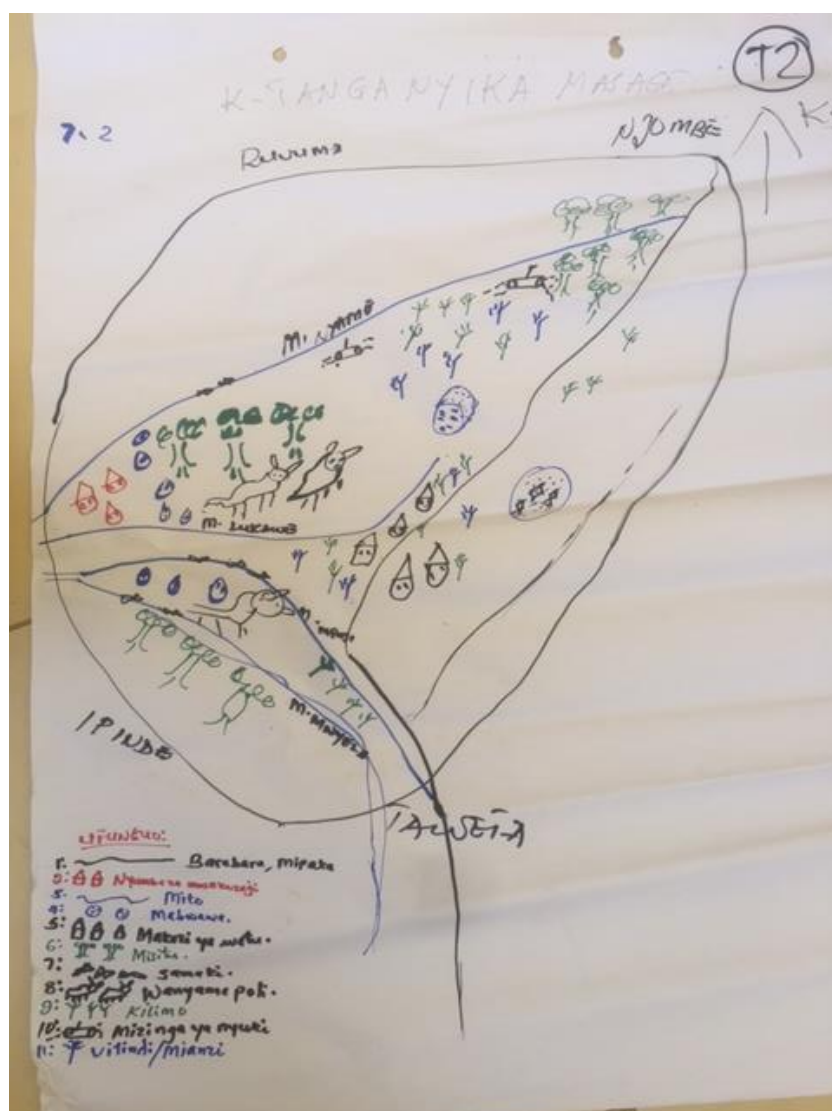
Tanganyika	Ipinde	Utengule	Iduindembo
Stop illegal hunting	Participatory patrols	Environmental education should be given	Create an area for wildlife and environmental conservation
Demarcate village forests	There should be a game officer to assist chasing wildlife away from our farms	We should set aside areas for conservation	Provision of education to villagers on environmental conservation
Stop uncontrolled tree cutting	Strengthen protection of environment	Strengthen protection of resources	Protection of wildlife and forests should continue because without it the resources would have been finished
The available environmental laws and regulations should be implemented properly to enhance sustainable conservation of resources	Environmental education should be given in villages, schools and religious houses	Improved transparency on how KNS operate	
Education should be given on effects of environmental destruction	Areas should be set aside for conservation	Tangible benefits from wildlife will help us to protect wildlife (we know the poachers)	

3. DISCUSSION AND RECOMMENDATIONS

Human populations in all four villages are increasing rapidly, through birth and immigration, so exerting growing pressure on the remaining natural resources, to the extent that some resources are now becoming scarce or have already been eliminated. This is particularly the case for Iduindembo village, where there are no remaining forests in the village area, and least so for Tanganyika where the remaining extent of natural habitat is largest. The situation demands immediate action. The natural resource conflicts the villages are experiencing is the result of increasing resource scarcity in the area, a situation that is likely to become critical in the near future.

Based on the survey findings, it is clear that the study villages have lost a lot of biodiversity and ecosystem services due to population increase, forest clearing, and unwise use of land. In order to reduce the current rate of destruction, immigration into these villages should be controlled, and education on proper farming methods should be given and implemented, together with conservation education so as to enable villagers to conserve their environment so that ecosystem services can be revitalized.

All villages have realized the dangers of environmental destruction and have proposed the creation of a conservation area. Since the land within the KNS hunting block belongs to villagers, the creation of a WMA could be a better option, but the demarcation of the area should follow the current alignment of the KNS border. This is important because it will help to save the available biodiversity and provide habitat for wildlife. Apart from that it will enable villagers to realize more benefits as indicated in the WMA regulations of 2012, i.e. block fees, 75%; game fees, 45%; conservation fees, 45%; observation fees, 45% and permit fees, 15%.



[illegible]

Hand-drawn map of the K/Ltengule area, showing a river, a road, and various landmarks. The map is oriented with the river at the top and the road at the bottom. The river is labeled 'K/Ltengule' and 'K/Ltengule'. The road is labeled 'K/Ltengule'. The map shows a river flowing from the top left to the bottom right. A road runs along the bottom. Various landmarks are marked with symbols and labels: a large area labeled 'K/Ltengule', a smaller area labeled 'K/Ltengule', and several small areas labeled 'K/Ltengule'. The map is drawn on a piece of paper with a grid pattern.

