Environmental Management and Biodiversity Conservation of Forests, Woodlands, and Wetlands of the Rufiji Delta and Floodplain

Assessment of Potential Rangeland Resources in Selected Areas towards Designing a Livestock Development Strategy in Rufiji District

Angello Joseph Mwilawa

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For more information please contact

Project Manager,
Rufiji Environment Management Project
P.O. Box 13513
Dar-es-Salaam, Tanzania
Tel: 44 Utete Rufiji 0r 023-2402972 o r 022- 2666088/0741 322366 Dar-es-Salaam
Email: rempute1@bushmail.net or iucndar@epiq.or.tz

[1] The Rufiji District Council implements Rufiji Environment Management Project with technical assistance from IUCN – The World Conservation Union, and funding from the Royal Netherlands Embassy.

Rufiji Environment Management Project – REMP

Project Goal: To promote the long-term conservation through 'wise use' of the lower Rufiji forests, woodlands and wetlands, such that biodiversity is conserved, critical ecological functions are maintained, renewable natural resources are used sustainably and the livelihoods of the area's inhabitants are secured and enhanced**.**

Objectives

- To promote the integration of environmental conservation and sustainable development through environmental planning within the Rufiji Delta and Floodplain.

- To promote the sustainable use of natural resources and enhance the livelihoods of local communities by implementing sustainable pilot development activities based on wise use principles.

- To promote awareness of the values of forests, woodlands and wetlands and the importance of wise use at village, district, regional and central government levels, and to influence national policies on natural resource management.

Project Area

The project area is within Rufiji District in the ecosystems affected by the flooding of the river (floodplain and delta), downstream of the Selous Game Reserve and also including several upland forests of special importance.

Project Implementation

The project is run from the district Headquarters in Utete by the Rufiji District Administration through a district Environmental Management Team coordinated by the District Executive Director. The Project Manager is employed by the project and two Technical Advisers are employed by IUCN.

Project partners, particularly NEMC, the Coast Region, RUBADA, The Royal Netherlands Embassy and the Ministry of Natural Resources and Tourism, collaborate formally through their participation in the Project Steering Committee and also informally.

Project Outputs

At the end of the first five –year phase (1998-2003) of the project the expected outputs are:

An Environmental Management Plan: an integrated plan for the management of the ecosystems (forests, woodlands and wetlands) and natural resources of the project area that has been tested and revised so that it can be assured of success - especially through development hand-in-hand with the District council and the people of Rufiji.

Village (or community) Natural Resource Management Plans: These will be produced in pilot villages to facilitate village planning for natural resource management. The project will support the implementation of these plans by researching the legislation, providing training and some support for zoning, mapping and gazettement of reserves.

Established Wise Use Activities: These will consist of the successful sustainable development activities that are being tried and tested with pilot village and communities and are shown to be sustainable

Key forests will be conserved: Forests in Rufiji District that have shown high levels of plant biodiversity, endemism or other valuable biodiversity characteristics will be conserved by gazettement, forest management for conservation, and /or awareness-raising with their traditional owners.

Exeutive Summary

Rufiji District, the southernmost District of Coast Region, covers an area of 13,339 km^2 and is characterized by four main soil types:

- Nutrient-poor coarse sands covered by Miombo woodland and coastal forest mosaics (4250 km^2 plus some 3400 km^2 inside the Selous Game Reserve)
- Finer red sandy soils originally covered by coastal forest (2700 km^2),
- The Rufiji River floodplain (1700 km^2) of loams and clays interspersed with sands, covered by tall grass and occasional trees.
- Fine salty clays of the delta covered by mangrove and grasslands (1300 km^2).

The average annual rainfall ranges from 1200 mm at the coast to 600 mm in the western floodplain and displays a bimodal pattern. The heaviest rainy season begins in mid March and ends in May. The lighter short rains fall from mid November to January. Only part of the floodplain soils are highly suitable for agriculture and, because of the need for fallows and the variable area reached by the annual floods, some 15,000 ha, of the estimated 45,000 ha that are suitable on the floodplain, are annually cultivated. Some 25,000 ha of the coastal forest on the red soils of the Northern Hills have already been cleared for cultivation. There is only a limited potential for sustainable forms of agriculture elsewhere in the district. Traditionally, the Rufiji inhabitants acquire their animal protein needs from fishing, hunting and poultry-keeping. Except in the delta, the inhabitants traditionally are not keepers of large livestock (goats, sheep, cattle), mostly because of the abundance of Tsetse flies. Therefore, the number of large livestock in the district has traditionally been small, a few hundred at the most and often owned by immigrant government staff. Since 2002 a fundamental change has occurred and immigrant pastoralists and agro-pastoralists have come into the District from other regions/ districts in search of pasture and water bringing considerable herds with them. Currently, it is estimated that the district has about 5,000 head of indigenous cattle (mainly cattle (4,000) from immigrating pastoralists), 300 dairy cattle, 7000 goats, 1,000 layer chickens and 400,000 local chickens. As expected the arrival of the immigrants has been welcomed in some places, while in other places it has been a source of tension and conflict.

With the aim of assessing the utilization, by immigrant and local livestock keepers of the natural resources of the District, the Rufiji District Council through its District Agricultural and Livestock Department, with the support from the Rufiji Environment Management Project (REMP), contracted this study. The main output expected from the study was to provide baseline information on the physical potential of Rufiji's grasslands, and contribute in developing a District Livestock Management Strategy. This strategy would strive towards ecological, social and economic sustainability. Terms of reference were prepared to guide the study, bearing in mind the goal of REMP namely, to promote the long-term conservation through wise use of the lower Rufiji River forests, woodlands and wetlands, such that biodiversity is conserved, critical ecological functions are maintained, renewable natural resources are used sustainably, and the livelihoods of the area's inhabitants are secured and enhanced. Among other things the study did not consider the value and economics of wild animals versus pastoral production, but this could be a subject for further research. Similarly, because of the limitation to one discipline in the team, the study gives views mainly on pastoral production and pays only minor attention to other important users such as the indigenous cultivators, fishers and hunters. The study was carried out in February 2003, an exceptionally dry year when the Rufiji river did not flood and the floodplain remained dry and accessible. The consultant visited a total of 20 villages namely: Mohoro, Chumbi A, B, & C, Muyuyu, Ruaruke A & B, Kikale, Hanga, Mlanzi, Kivinja A and B, Bungu B, Mjawa, and Uponda. Others were Kilimani, Ngorongo east, Mgomba, Ikwiriri South and North and lastly Umwe north. The villages were selected by the DALDO's office, as areas which seem to have physical potential for pastoralism and /or were already grazed by traditional pastoral herds. Brief interviews were conducted with focus groups in all the

villages visited and with key informants identified from the respective areas. A checklist was prepared using the Terms of Reference given. During the field range assessment, range condition was assessed using visual appraisal of relative proportion of desirable, undesirable forage plants and presence of perennial grasses in the ground layer. The indigenous knowledge of forage quality from immigrating pastoralists, who had familiarity with some of the species found in Rufiji, was used. Forage yields were estimated through actual clipping methods and Grazing Capacity was estimated. These were once-off, one season production studies. The results should therefore be viewed with the caution as only a series of studies over a period of several seasons under actual grazing that can provide accurate grazing capacity data.

The overall results showed that, on a purely forage yield basis, Rufiji District has some areas that could potentially support extensive livestock production. Most of the potential rangelands assessed were in good condition, perhaps because they have never been subjected to regular livestock grazing, but others had some limitations. Extensive grazing areas that might be considered for supporting livestock production with different animal units are mentioned. For proper assessment for use of any of the sites as rangelands, studies of the sites under actual grazing need to be undertaken. Before recommending any site for designation as a rangeland area, social and economic studies are required. Livestock infrastructure is inadequate in all the areas. The study has outlined the requirements in each village which include dips, watering points and Tsetse control where applicable. Livestock markets are required and market locations have been suggested. The following recommendations are made to assist the District Council with the development of a District Livestock Management Strategy:

- A District statement should be issued asking prospective immigrant pastoralists to wait outside until the District, in collaboration with the villagers, has developed a Livestock Management Strategy that will provide wise and sustainable use of the available grazing resource. Meanwhile those pastoralists who are in Rufiji already should work together with local people in respective villages to properly allocate and demarcate the grazing areas and watering points and stock routes.
- Vegetation maps need to be established that will guide the District Council for planning, implementing and analyzing the results of subsequent rangeland surveys (as a necessary early element of rangelands inventory). Rangeland Management decisions require an understanding of vegetation dynamics (changes). With such information District Councils and villages should be able to make proper judgments. Special attention should be paid to the impact of the new burning regimes that may be imposed by the immigrant livestock keepers. This should be seen as part of the development of a wider vision on burning practices and their impacts in the District.
- The District Council should broadly categorise the district land into areas where pastoralism is not permitted, permitted seasonally, permitted with conditions outlined in District and /or village by-laws. The District Council should apply the precautionary principle with regard to protection of some selected highly biodiverse areas and initially exclude them completely from pastoralism. Special care should also be taken to avoid damage to standing crops and plantings in the floodplain. The recession-type Mlao cultivation may be an unfamiliar land use to immigrant pastoralists.
- Land use attributes should be monitored to determine any changes. As many changes are long-term in nature, range trend monitoring must also be long-term. There is a need to convene frequent meetings among the rangeland users to discuss and assess the rangeland status periodically. The District Council should plan and budget for this monitoring and seek support for this new function from higher authorities and donors.
- Immigrating pastoralists, local people in their respective villages and extension staff should, taking into consideration the needs of other users/land uses including domestic water collectors, fishers, wild fauna and flora, estimate the rational animal unit number of livestock that can be kept in their areas. Special attention needs to be given to the potential deterioration of water

quality of stagnant water bodies such as the flood-plain associated lakes, should these be used as watering points. The importance of the lakes for domestic water supply and local livelihoods and the risks of their eutrophication, with the associated spread of harmful waterweeds should be taken into account.

- The size and the potentiality of a particular grazing land will determine the reasonable number of livestock units that will be allowed to a particular village or community. Strict adherence to agreed numbers could reduce conflicts.
- Villagers should be supplied with objective information on the proper number of animal units that can be kept in their villages without negative effect to their rangelands.
- Villages should be assisted to develop by-laws governing all land uses and conservation strategies. In this case it implies the need for clear demarcation of zones for livestock grazing and crop cultivation activities.
- There should be a deliberate effort on awareness creation and education on livestock husbandry and rangelands management (for local natural resource users and for immigrant pastoralists)
- Strengthening communication between the District and villages. Also, communication mechanisms should be established at village level between local people and immigrating livestock keepers. The District Council should play a facilitation role in ensuring such communication.
- The village governments should be empowered through knowledge acquisition on village resource ownership, management and utilization.
- Establishment of livestock markets, in places like Ikwiriri and Nyambawala, should be considered in collaboration with village and ward authorities and immigrant pastoralists.
- There is a need to invite more agricultural and veterinary outlets in the district.
- District Councils and livestock keepers should mobilize resources to facilitate construction of livestock infrastructure in the identified locations.
- There is a need to strengthen extension services particularly by adding/employing more livestock extension staff/ field officers in the district and bringing veterinary services closer to livestock keepers. However, for sustainability District Council should facilitate training of para vets from communities themselves. They can be trained in LITIs and MATIs.

Muhtasari Wa Taarifa

MSHAURI BINGWA WA UOTO WA NYANDA ZA MALISHO KUHUSU TATHMINI YA UOTO WA NYANDA ZA MALISHO KATIKA MAENEO YALIYOTAJWA KWA LENGO LA KUWA NA MKAKATI WA KUSIMAMIA NAKUENDE LEZA MIFUGO WILAYA YA RUFIJI

Wilaya ya Rufiji ni miongoni mwa wilaya sita zinazounda Mkoa wa Pwani na ambayo iko kusini zaidi ya wilaya zingine. Wilaya hii ina ukubwa wa eneo za mraba km² 13,339 na imegawanyika katika makundi manne(4) ya aina za udongo kama ifuatavyo:-

- Udongo wa kichanga uliokosa mbolea uliogubikwa na miti aina ya Miombo na aina nyingine za Misitu ya Pwani yenye ukubwa wa eneo km² 4,250 (pamoja na eneo la Selous Game Reserve lenye ukubwa wa eneo za mraba km² 3,400).
- Udongo mwekundu laini wa kichanga wenye asili ya kugubikwa na Misitu ya Pwani wenye ukubwa wa eneo la mraba km² 2,700.
- Bonde la Mafuriko la Mto Rufiji lenye udongo tifu tifu uliochanganyika na udongo wa mfinyanzi wenye ukubwa wa eneo la mraba km² 1,700. Aina hii ya udongo una kiasi kidogo cha mchanga uliotawaliwa na nyasi ndefu na miti ya hapa na pale.
- Udongo laini wa kifinyanzi wa chumvi chumvi ulioko maeneo ya Delta uliogubikwa na misitu ya mikoko (kapa) na mbuga za nyasi zenye ukubwa wa km² 1,300.

Wilaya inapata wastani wa mvua kati ya mm 1200 kwa maeneo ya pwani mpaka mm 600 magharibi mwa maeneo ya mafuriko ya Mto Rufiji. Wilaya huwa inapata mvua za aina mbili yaani mvua kubwa za Masika zinazoanza katikati ya mwezi wa March na kumalizika mwishoni mwa mwezi Mei; pia kuna mvua za Vuli zinazoanza katikati ya mwezi wa Novemba na kukatika mwezi Januari.

Ni eneo kiasi tu ya bonde la Mafuriko la Mto Rufiji ndilo lenye udongo wenye rutuba nzuri inayofaa kwa kilimo. Tena ni kwa sababu ya kilimo cha kupumzisha ardhi au kulazimishwa kupumzishwa kwa sababu ya mafuriko ya mwaka yanapotokea ambayo husababisha maeneo hayo kutokulimwa. Kiasi cha makisio ya hektari 45,000 ambazo ziko katika ukanda wa Mafuriko zinazofaa kwa Kilimo ni hektari 15,000 ndizo zinazolimwa kila mwaka. Kiasi cha hektari zipatazo 25,000 zilizo na misitu ya pwani na ambazo zimetawaliwa na Milima ya Kaskazini yenye udongo mwekundu zimefyekwa kwa ajili ya kilimo. Kutokana na hali hiyo kuna maeneo machache yaliyobaki ambayo kiendelevu yanafaa kwa kilimo wilayani.

Kwa asili, wananchi wa wilaya hii huwa wanapata viini lishe vya protini kutokana na uvuvi, uwindaji na ufugaji wa kuku. Ni wananchi waishio katika Delta tu walio na ng'ombe ,mbuzi na kondoo. Sababu moja inayowafanya wananchi wa maeneo hayo kutokufuga wanyama wakubwa (mbuzi, kondoo na ng'ombe) ni uwingi wa mbung'o. Kwa hiyo ni wazi kuwa idadi ya wanyama wakubwa kwa asili ni kidogo/asilimia chache ya wanyama wakubwa zaidi sana wanamilikiwa na wafanyakazi wahamiaji wa serikali.

Tangu mwaka 2002 kumekuwa na mabadiliko makubwa kutokana na wafugaji wa jadi na wakulima wafugaji kuingia wilayani toka mikoa na wilaya zingine kwa ajili ya kutafuta malisho na maji. Wafugaji hao wameingia na idadi kubwa ya mifugo.

Mpaka sasa wilaya inakadiriwa kuwa na idadi ifuatayo ya mifugo:-

- Ng'ombe …….5000 (4000 wafugaji wa jadi)
- Mbuzi……...7000
- Ng'ombe wa maziwa……300
- Kuku wa mayai…….1000
- Kuku wa asili…….400,000.

Uingiaji wa wafugaji wa jadi wilayani kumepokelewa vizuri na wananchi wengine, lakini katika baadhi ya maeneo/vijiji ni chanzo cha matatizo/migogoro. Kuingia kwa wafugaji wa jadi kumeamsha hisia mpya toka kwa wananchi, madiwani na Timu ya Kusimamia Mazingira ya Wilaya (EMT) kutaka kujua/ kutathmini uwepo, na uwezo wa uoto wa nyanda za malisho zilizopo. Halmashauri ya Wilaya kupitia idara yake ya Kilimo/Mifugo ikisaidiwa na Mradi wa Kusimamia Mazingira Rufiji (MUMARU-REMP) ilimwajiri mtaalamu bingwa wa nyanda za malisho toka Taasisi ya Uchunguzi Mpwapwa. Lengo la Halmashauri ilikuwa ni kupata taarifa za awali za kuwepo kwa uoto wa nyanda za malisho, ubora wake na uwezo wake katika kuhimili idadi ya mifugo iliyopo.

Taarifa hizo zingesaidia wilaya kutengeneza Mkakati wa Kusimamia na Kuendeleza Ufugaji Endelevu.

Mkakati huo ungeangalia zaidi mahusiano yaliyopo baina ya wanyama, watu na mimea; mambo ya jamii na mambo ya kiuchumi ili yawe endelevu. Hadidu za rejea zilitengenezwa ili kuratibu utafiti/tathmini huku tukizingatia mapendekezo ya MUMARU yaani kudumisha uhifadhi wa muda mrefu kupitia matumizi mazuri ya misitu iliyopo mabondeni mwa Mto Rufiji, miti na ardhi chepe chepe kiasi cha bioanuai zilizopo zinahifadhiwa, mahusiano ya viumbe yanatunza, rasilimali zinazojirudia zinatumika kiendelevu na maisha ya wananchi katika maeneo husika yanalindwa na hali ya kipato kinaboreshwa. Pamoja na hayo yote, tathmini hiyo haikuangalia thamani za kiuchumi za wanyama pori kulinganisha na uzalishaji wa ng'ombe wa asili. Bali hilo linahitaji utafiti wa kina.

Licha ya hayo utafiti/tathmini hiyo ilihusu zaidi uzalishaji wa ng'ombe wa asili na kutoa umuhimu mdogo kwa watumiaji wengine wa nyanda za malisho kama vile wakulima, wavuvi na wawindaji. Tathmini hiyo ilifanyika mnamo mwezi wa Februari 2002, mwaka ambao haujawahi kutokea kwa ukame na Mto Rufiji kukosa mafuriko. Hivyo maeneo ya mafuriko kubaki makavu hali ambayo iliwezesha maeneo kufikika bila shida. Mtaalamu bingwa alitembelea vijiji ishirini (20) navyo ni; Mohoro, Chumbi A,B na C; Muyuyu, Ruaruke A na B; Kikale, Hanga, Mlanzi, Kivinja A na B; Bungu, Mjawa, Uponda, Kilimani, Ngorongo, Mgomba, Ikwiriri Kusini na Kaskazini na Umwe Kaskazini. Vijiji hivyo vilipendekezwa na ofisi ya DALDO kama maeneo yenye dalili za kuwa na uoto mzuri wa nyanda za malisho kwa ajili ya mifugo au maeneo hayo yalikwisha kuwako na wanyama wa asili wakichungwa.

Usaili mdogo ulifanyika kwa makundi maalumu yaliyoko katika vijiji na watu maarufu au viongozi walitambuliwa na kuhojiwa. Orodha ya maswali iliandaliwa kwa kutumia hadidu za rejea alizopewa na Afisa Kilimo/Mifugo na kuthibitishwa na Timu ya Kusimamia Mazingira (EMT). Wakati wa tathmini katika mbuga; uzuri wa nyanda za malisho ulikadiriwa kwa kutumia macho kulinganisha na uoto wa malisho hafifu, uoto wa kudumu wa nyasi katika ardhi. Elimu ya asili ya utambuzi wa malisho mazuri toka kwa wafugaji wa jadi ambao walikuwa tayari wana uzoefu mdogo wa Rufiji ulitumika. Uzalishaji wa malisho ulipimwa kwa njia ya kukata na kupima malisho kwa idadi fulani ya wanyama ulikadiriwa.
Shughuli hii ya utafiti wa uzalishaji wa malisho ilikuwa ya msimu mmoja kwa hiyo matokeo ya utafiti/tathmini hiyo lazima yaangaliwe kwa uangalifu sana. Ili kupata takwimu zilizo sahihi ilitakiwa tathmini kadhaa zifanyike kwa muda wa misimu mingi kwa wanyama kulishwa katika maeneo husika. Ndipo unaweza kupata majibu yanayoaminika hususan ya uwezo wa malisho.

Tahadhari:- Hatuna vipimo vya ukubwa kwa maeneo yaliyotajwa. Kwa hiyo bado hatuwezi kukisia idadi ya mifugo inayofaa kwa eneo lo lote la kijiji au kwa Wilaya nzima.

Kwa ujumla matokeo hayo yanahusu upimaji wa nyasi tu, yanaonyesha kwamba Rufiji ina maeneo machache yanayoweza kulisha mifugo katika usimamizi wa aina ya "extensive" yaani eneo kubwa linahitajika kwa wanyama wachache. Maeneo mengi yaliyotathminiwa yalionyesha kuwa yana uoto mzuri wa nyanda za malisho kwa sababu pengine yalikuwa hayajatumika na wanyama kwa muda mrefu. Mengine yalikuwa na mapungufu/ au matatizo yaliyojitokeza.

Maeneo ya nyanda za malisho yanayoweza kufikiriwa kuwa yanafaa kwa idadi kadhaa ya mifugo yametajwa. Eneo lo lote lisitumike kama nyanda za malisho kabla ya tathmini kufanyika kwa wanyama kulisha katika eneo husika kwa muda maalaum. Kabla ya eneo kutangazwa kuwa nyanda za malisho utafiti wa kina wa kijamii na kiuchumi lazima ufanyike. Miundo mbinu kwa ajili ya mifugo katika maeneo yote zilikuwa hakuna. Utafiti huu umeorodhesha mahitaji ya kila kijiji ikijumuisha majosho, maeneo ya maji, uzuiaji wa mbung'o. Minada inayohitajika na mapendekezo ya wapi kujengwa yametajwa.

Ushauri ufuatao umependekezwa ili kusaidia Halmashauri ya Wilaya kutengeneza mkakati wa Kusimamia na Kuendeleza Ufugaji Endelevu.

- Halmashauri ya Wilaya itoe tamko la kuzuia uingiaji wa wafugaji wa asili kutoka Mikoa mingine hadi hapo Halmashauri, ikishirikiana na vijiji vikamilishe Mkakati wa Kusimamia na Kuendeleza Ufugaji ambao utatoa matumizi bora na endelevu ya Nyanda za Malisho yaliyopo. Wakati huo huo wafugaji jadi ambao wamekwishaingia inabidi washirikiane pamoja na wenyeji wa maeneo husika ili kutenga mipaka kwa ajili ya kugawa maeneo kwa matumizi mbali mbali kama vile maeneo ya kilimo, uvuvi, misitu, malisho, vyanzo vya maji na njia za mifugo.

- Ramani za uoto wa asili zianzishwe ili zisaidie kama mwongozo kwa Halmashuri ya Wilaya katika kupanga mipango, utekelezaji na uchanganuaji wa matokeo yaliyofanywa juu ya Utafiti wa Nyanda za Malisho. Kwa taarifa hizo Halmashauri ya Wilaya pamoja na vijiji vitaweza kufanya maamuzi yanayofaa hususan usimamizi wa nyanda za malisho yanahitaji kuhusu mabadiliko ya uoto, msimu hadi msimu. Taarifa za takwimu yazingatiwe mabadiliko yanayoweza kufuatana na uchomaji moto malisho na wafugaji wa jadi. Hii inaweza kuwa moja ya njia ya kuelewa matokeo yanayosababishwa na uchomaji moto kwa Wilaya nzima.

- Halmashauri ya Wilaya itenge maeneo ambayo wafugaji wa jadi hawaruhusiwi kuingia na kukaa, kuruhusiwa kuchungia kwa misimu/majira mbali mbali, kuruhusiwa kwa masharti yaliyolotolewa na Halmashauri au sheria ndogo za vijiji. Wilaya izingatie kanuni za tahadhari zinazohusu uzuiaji wa wafugaji wa jadi kuingia katika maeneo ambayo yana wingi wa bioanuai.

- Pia iwekwe taratibu na kanuni za pekee kuepuka uharibifu wa mazao na upondaji wa miche katika tambarare ya Mafuriko. Kilimo cha Mlao kitakuwa kigeni kwa wafugaji wa jadi wengi.

- Watumiaji wote wote wa nyanda za malisho wanashauriwa wakae pamoja ili kujadili, kuratibui na kukisia mabadiliko. Kwa asili mabadiliko mengi ni ya muda mrefu, hivyo mipango ya kuratibu mbuga inafaa iwe ya muda mrefu. Inafaa watumiaji wa nyanda za malisho wakae mara kwa mara ilio kujadili na kupima hali ya nyanda kwa vipindi maalum. Halmashauri ya Wilaya iwe na mpango na bajeti kwa ajili ya kuratibu masuala hayo na inafaa watafutwe wahisani waweze kusaidia.

- Wafugaji wa jadi, wakazi wa vijiji husika na wataalam wa ugani inafaa wafikirie mahitaji ya watumiaji wengine wa Nyanda za malisho na ardhi kama vile wachota maji, wavuvi, vimelea vya mimea na wanyama wadogo, ukadiriaji wa idadi ya mifugo ambao wanaweza kutunzwa

katika eneo moja.

- Uangalifu mkubwa unahitajika katika vijiji vyote juu ya uchafuzi wa vyanzo vya maji safi yaliyoenea katika tambarare za mafuriko ambako kuna mabwawa ambayo yanatumika wanadamu. Umuhimu wa maji ya mabwawa kwa matumizi ya wananchi kwa ajili ya maisha yao na hatari itakayojitokeza kuhusiana na kusambaa kwa magugu maji hatari inafaa izingatiwe.

- Ukubwa na uzuri wa eneo la malisho ni kigezo cha kukuongoza kujua idadi ya mifugo inayoruhusiwa katika eneo husika.

- Wanakijiji inafaa wapatiwe taarifa na takwimu zisizo na ubaguzi juu ya idadi ya mifugo inayoweza kuhodhiwa katika kijiji husika bila ya kuleta uharibifu Nyanda za Malisho.

- Wanakijiji inabidi wapewe msaada wa kitaalam jinsi ya kutengeneza sheria ndogo ndogo zinazohusu uhifadhi na matumizi bora ya ardhi. Kwa hali hiyo inabidi kijiji kitenge maeneo kwa ajili ya shughuli za Mifugo na Kilimo

- Inabidi pawepo na uhamasishaji na utoaji wa elimu kuhusu ufugaji bora pamoja na kutunzaji wa maeneo ya malisho na maliasili kwa wafugaji asili na watumiaji wengine wa ardhi.

- Kuimarisha mawasiliano mazuri kati ya Wilaya na vijiji pia njia za mawasiliano kati ya wenyeji wa kijiji na wafugaji jadi ziimarishwe. Yote hayo kuimarika inabidi Halmashauri ya Wilaya isaidie katika jambo hilo.

- Serikali za vijiji zipewe mamlaka kwa kuelimishwa ili kujua umilikaji, utunzaji na utumiaji wa maliasili zilizopo inavyotakiwa.

- Inapendekezwa kuanzisha minada katika maeneo yanayofaa kama vile Ikwiriri, Nyambawala kwa kushirikiana na kijiji , kata na wafugaji jadi.

- Kuna ulazima wa kuwakaribisha wawekezaji wa nje na ndani katika nyanja za kilimo na mifugo

- Halmashuri ya Wilaya na wafugaji wa jadi lazima washirikiane kuanzisha miundo mbinu husika katika maeneo yaliyopendekezwa.

- Halmashauri ya Wilaya inabidi iimarishe huduma za ugani kwa kuajiri wataalam wa mifugo ili wawe karibu na wafugaji. Ili huduma hiyo iwe endelevu Halmashauri ya Wilaya ifanye mpango wa kufundisha wanavijiji mambo ya ufugaji bora (wahudumu wa tiba ya awali) ili wawe wanatoa huduma vijijini, wafundishwe katika vyuo vya Mifugo.

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Acronyms and Definitions

AEZ	Agro-Ecological / Economic Zones
BRALUP	Bureau of Resource Assessment and Land Use Planning
DALDO	District Agricultural and Livestock Development Officer
EMT	Environment Management Team
GPS	Global Positioning System
IUCN	The World Conservation Union
IRA	Institute of Resource Assessment
MBOMIPA	Matumizi Bora ya Malihai Idodi na Pawaga
PA	Protected Areas
LPRI	Livestock Production Research Institute
LITI	Livestock Training Institute
RDC	Rufiji District Council
REMP	Rufiji Environment Management Project
MUMARU	Mradi wa Uhifadhi wa Mazingira Rufiji (Swahili for REMP)
MWLD	Ministry of Water and Livestock Development
STTA	Short Term Technical Adviser
TACD	Technical Adviser Community Develeopment
ToR	Terms Of Reference
WCA	Wildlife Conservation Act
WD	Wildlife Division
URT	United Republic of Tanzania
Rangelands	Is an uncultivated land that will support grazing and browsing animals; however, in this context the area can be used also for agriculture; may include fallowed fields and wooded areas. Although most rangelands are arid or semi-arid and predominantly grassy, the author of the report assumes that rangelands also occur in sub-humid and humid zones and in areas with predominantly woody vegetation or which support shifting cultivation
Stocking Rate	Is the actual number of animals on the specific area for a specific period of time, usually for grazing season; basically it is the number of animals that the livestock owner decides to put on the land.
Carrying Capacity	Is the average number of animals (or stocking rate) a range can support/ sustain over time, even though the seasonal and /or annual numbers may vary.
Grazing Capacity	Is a specific number of animals that may graze on a unit of land year after year without injury to the land; it gives the potential of situation. Consider the ratio of the rangeland forage growth by the herbivore requirement.
Range Condition	Is the current productivity of a rangeland relative to what that range is naturally capable of producing; expresses what rangeland situation is at the time when a range condition survey is carried out.

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1 Introduction

1.1 Geographical Location and Description of the study area

Rufiji is among the districts in Coast Region and is located at about 7 ^{o} 30'S to 8 ^{o} 40'S and 39^{o}50'E to 39 ^{o} 40'E along the east coast of Tanzania. The soils are characterized by blackish grey to grey clayey vertisols (black cotton soils) occurring along riverbanks and in pans (mbugas) away from the rivers. These soils are associated with water logging so that plant species which cannot tolerate water logging cannot survive under this soils. The rainfall ranges from 600 – 1200 mm. Rufiji District is located in the coast region and has its District headquarters at Utete. The human population stands at about 193,000 (URT 2002). The climate of Rufiji District tends to have bimodal rains where by the heaviest rainy season begins in mid March and ends in early June while the light and short rains falls in mid November and end early January. The District covers on area of 13,339 km$^{2.}$ Out of this, 4,824 km^{2} are deemed suitable for crop and livestock production. Rufiji is adjacent to the Selous Game Reserve and is blessed with large concentration of wild herbivores throughout the area. It is reported that only 900 km^{2}, are seasonally cultivated although cultivation takes place almost all the year around at different places. The dry season (May/June to August) is when there is flood recession and agriculture is done in flood plains (DALDOs Reports). Major means of survival in the district include agriculture, fishing, forest product, livestock keeping (mainly poultry) and petty business. Fishery plays a significant role. It is estimated to have a total economic value of $ 7.4 million at the district level (Turpie, 2000 REMP Technical report no. 17)

1.2 Livestock status in the area

The District has no traditional pastoralists and the inhabitants of this area traditionally are not livestock keepers. For a long time the number of livestock kept in the District has been small. In the recent years also Heifer Project International (HPI) has introduced a small number of dairy cattle under zero-grazing system. However, local chickens are kept in significant numbers. It is estimated that the district has about 5,000 head of indigenous cattle (including 4,000 cattle from immigrating pastoralists), 300 dairy cattle, 7000 Goats, 1000 layers and 400,000 local chickens. In the recent years, there has been immigration of pastoralists and agropastoralists with their large number of cattle from other places in search of pasture and water. Nationally, population pressure coupled with alienation of large tracts of land to investors and other agriculturists, has necessitated use of even marginal grazing land for cultivation resulting in overgrazing and migration of people to other regions. For example the Maasai have moved to Morogoro Region, giving rise to intense conflicts between crop farmers and livestock keepers in the immigrating areas. Since 2001 many Sukuma and Barbaigs have moved to Rufiji from Mbeya, Iringa, Kilombero -Morogoro, Kisarawe, Kibaha and Dar es Salaam. It has been estimated that by December 2002 a total of over 4,000 cattle had arrived in the District (DALDOs Report February 2002). It is estimated that, at the rate pastoralists are entering Rufiji District at present, ten times this number of cattle will have arrived before the end of 2003.

As expected, their arrival has been welcomed in some places, while in other places it has been a source of tension and conflict. The tensions observed were in the areas or villages where the local people were not consulted nor informed before or on their arrival. Also in some cases where cattle had grazed on crop fields, and there were difficulties in agreement on compensation between the crop field owners and pastoralists. With this situation, the Rufiji District Council Authority together with the Rufiji Environment Project (REMP) management team decided to make rangelands resources assessment geared at planning livestock management in the District in a more sustainable way. The assessment aims at generating information necessary for long term conservation of biodiversity, which is necessary for livestock and environment management planning. For proper and effective rangelands utilization for livestock production it is very important that all the potential areas for grazing be clearly defined, agreed by present land users, and possible infrastructure should be put in place. Terms of reference

were given for study implementation (Appendix 1). This report has made suggestions, mainly relating to the physical production capacity of the potential rangelands, on some of the areas, while others need further research. Issues such as potential impact on other economic enterprises especially fisheries, crop production and wildlife enterprises and on the aquatic and forest ecosystems are not dealt with in this consultancy and need further research.

REMP's critical objectives are to ensure that existing biodiversity flora and fauna are managed and conserved, potential ecosystems are maintained, sustainable utilization of renewable natural resources and human well being are improved. REMP "MUMARU" is a project operating within the District with technical support from The World Conservation Union (IUCN).

2 Methodology

2.1 Selection of Study Villages

A total of 20 villages were visited. The villages were purposefully selected by the District Agricultural Livestock Office (DALDO's) following site visits made by two District Livestock Subject Matter Specialists (SMS) and the REMP –Technical Adviser in Community Development (TACD) a month earlier. The criteria used in selecting these villages were, the status of the grasslands, presence of immigrating pastoralists and extensive livestock grazing areas that could possibly attract immigrating pastoralists from other regions. The consultant did not have an influence on selection of the villages visited.

2.2 Sampling procedure and Interviews

Focused group interviews were employed using a checklist based on the Terms of Reference (ToR). The groups were composed of village leaders, village elders, youth and representation from women. Participatory tools were used to facilitate the discussions and for good response. Areas with pastoralists were visited and interviews were conducted. The questions prepared in the checklist were based on the issues to be answered in the Terms of Reference (Appendix 1). Informal discussions were undertaken also with key informants. Among the issues in the checklist were livestock issues, infrastructure availability, water sources, stock routes, relationships between local residents and pastoralists. Other key informants interviewed were the District Lands, Natural Resources and Environment and District Agricultural and Livestock Officers. It was noted that due to lack of enough time and multidisciplinary team the consultant might have missed other important issues in detail like wildlife, biodiversity and recent socio-economics data.

2.3 Field data Collection

The consultant and his accompanying District Subject Matter Specialist visited the villages within the suggested total number of days in early February (Appendix 2). In all the villages visited there was good welcome from the local people and they were willing to take us to the areas earmarked as potential for extensive livestock grazing. The areas said to be earmarked were those identified by the villagers themselves in response to a previous letter received from the District Authority, requesting villages to demarcate land for various use including grazing lands. Global Positioning System (GPS) readings were taken in all interested areas for future mapping and follow up activities. This included the areas that were reachable like some potential grazing areas and watering points (Appendix 3). In all the meetings all the participants in each village were photographed using digital camera (Appendix 4).

2.4 Range condition

This approach was used to arrive at grazing capacities or proper stocking rates. During the field assessment two methods were used in assessing range condition: the relative proportion of desirable and undesirable forage plant species were used to describe classes of range condition. The assistance of immigrating pastoralists on issues relating to vegetation and tsetse distribution in the area was used. Also the presence of perennial grasses in the ground layer, especially in relation to what is maximal possible under those conditions and the condition of the perennial grass tufts. According to Food Agricultural Organization (FAO) (1991) the assessment of the range condition could involve two components: the condition of the pasture and the extent of soil erosion under grazing conditions. Pasture condition was assessed from relative proportions of desirable and undesirable plants, by estimation of their relative amounts in comparisons with those that are optimal for the environmental conditions prevalent in the area. Desirable species in this context included grasses perennials and sweet grasses, and the undesirables included shrubs, annuals and sour grasses. From the measurements the range condition was given in four classes (Table 1). Tse tse infestation was assessed through

pastoralists interviews and visual appraisal while walking across the grazing areas.

Table 1: Range condition assessment basing on percentage cover of herb layer

Range Condition	% Basal cover of herb layer
Excellent	More than 75
Good Condition	Between 50 – 75
Fair condition	Between 25 - 50
Poor Condition	Less than 25

2.5 Estimation of Forage Yields

The method used to estimate herbage yields was as described by Repport et al (1992). A 100 metre length transect was established in the entire grazing site and sampling points were located along the transect at almost 20 metre intervals. Herbage in a 0.5 square metre quadrat was clipped to ground level using a pair of secateurs. Fresh samples from each point were weighed in the field using a spring balance. Later the average dry weight for samples per quadrat was estimated and calculated for the production of dry matter yield per hectare for each grazing areas. Pastoralists and local people were willing to provide labour while collecting the data.

2.6 Estimation of Grazing Capacity

The suggested and reported grazing lands as was listed by DALDOs office and mentioned by villages for field visit were assessed for its grazing capacity. By definition, Grazing Capacity (GC) refers to a specific number of animals that may graze on a unit of land year after year without injury to the land. It gives therefore the potential situation. A first approximation of grazing capacity was obtained by dividing the rangeland forage growth by the herbivore requirement. Proper Use Factor (PUF) of 0.6 was used because of sub humid and humid nature of the area assessed (Pratt and Gwynne, 1977). A PUF of 0.1 was considered to have been consumed by termites. The Animal Unit (A.U.) considered is equivalent to traditional cattle with 250 kg live weight that consumes 6.5 kgDM/day. Grazing Capacity is the ratio of forage production (F) to herbivore requirement of dry matter in weight per animal unit per unit time multiplied with PUF in decimal. Proper Use Factor refers to the maximum proportion of forage growth that can be grazed each year from a given type of forage without inducing a downward trend in forage production. Forage quality (perennial and palatable species) and drinking water accessibility were equally considered. The main variable used for the estimation of grazing capacity was the standing crop available for forage. This was estimated by determining forage weight by clipping. However, other methods could be used like remote sensing (e.g. using NDVI) and models e.g. PHYGROW model. The overall grazing capacity given for each area did not consider other wild herbivores. However, as it was mentioned earlier due closeness to the Selous Game Reserve, wild herbivores are found in this areas. Further studies should establish the estimated number of herbivores around and hence estimate forage consumption by grazer/ browsers and browser/ grazers.

3 Results and Discussion

3.1 Brief overview of the villages visited

i. South of River Rufiji / Inner Delta

The villages outlined under this zone are Mohoro, Kiwanga and Chumbi.
Topography: All villages are situated in flood plain area associated with forests.
Hydrology: Always river flood is present and some small lakes

ii. North of River Rufiji; Flood Plains of Rufiji and Ruhoi Rivers towards Delta

The villages outlined under this zone are Muyuyu, Mtunda and Kikale
Topography: The all villages are situated in flood plain area associated with forests and hilly
Hydrology: Always river floods and makes some small lakes.

iii. North of River Rufiji and Flood Plains and Terrace

The villages outlined under this zone are Mgomba, Umwe and Ikwiriri
Topography: The villages are situated in flood plain area, associated with forests and hilly.
Hydrology: Usually the river floods and makes some small lakes.

iv. Western Flood plain

The villages outlined under this zone are Ngorongo, Ikwiriri North and Kilimani
Topography: Flood plain.
Hydrology: Always river flood is present.

v. High lands (Plateau)

The villages outlined under this zone are Bungu,Ruaruke,Mjawa,Uponda andMlanzi.
Topography: Almost the areas are hilly and covered by forest.
Hydrology: There are temporal ponds.

3.1.1 Mohoro

Mohoro has the following sub villages: Sungapwani, Sungabara, Nyampakapwani, Nyampakabara, Old Mohoro, King'ongo and Mtuleke. The village main activities are agriculture, timber and forest harvesting, fishing and charcoal making. The main crops grown are rice, maize, cassava, cashew nuts, sugarcane and coconuts. Timber harvesting is done mainly by people from outside the village who obtain a permit from the District Council and about 25% of the revenue is supposed to be returned to the village. Charcoal making is done mainly by local people but there is no revenue that is returned to the village.

Pastoralists of the Sukuma ethnicity arrived in Mohoro village at the end of year 2001. On arrival, some of the pastoralists informed the village government of their arrival and were given a permit to stay. Later other pastoralists came and settled illegally. It was noted that, the village had demarcated the grazing area at Nyambawala. However, only one pastoralist called Mchapakazi Zagazaga agreed to stay there. Others stay at the following sub villages King'ongo, Mtuleke and Kilindi. The other livestock keepers mentioned are: Yuda Masasa, Musa Makwega, Mulekwa Njoro, Ngwege, Paulo Hessa, James Chuma, J. Hessa, Bulendu, Daudi Mashamba and Masolozu Munosana. The village has one local cattle keeper. Some other local farmers keep goats. About 150 goats are kept in the village.

3.1.2 Kiwanga

Pastoralists of the Sukuma ethnicity arrived in Kiwanga village during the year 2002, with three herds of cattle. On arrival, the pastoralists reported to the village government and they were allocated to stay in Mohoro- Kiwanga border. The area was not used for cultivation in recent years except in some cases where some old established cashew and mango trees may have been cultivated by indigenous families 20/30 years back. However, it was observed that there was cultivation taking place by pastoralists themselves and other people. Similar to Mohoro, the main activities of the people in Kiwanga are agriculture, fishing, charcoal making, timber logging, salt making and petty business. So far their relationship with the pastoralists has been good.

3.1.3 Chumbi

The activities carried out by Chumbi residents are mainly crop cultivation, fishing, timber harvesting and charcoal making. The crops grown are rice, maize, millet, bananas, cashewnuts, simsim, coconuts, and sugarcane. The main source of water for the people and livestock is Mohoro river. During the year 2001 two Sukuma pastoral communities arrived in Chumbi. The village government was informed and allocated them the area in Kiyengea at Chumbi C for livestock keeping. The pastoralists present in Chumbi are: Tisa Maduka who stays in Bwembeletele, Omaru Maganga and Matias Maganga at Tuacheni and Hassan Maganga in Kiyengea.

3.1.4 Muyuyu

Agriculture is the main activity of the Muyuyu residents. They plant rice, maize, cassava, cashewnuts, millet, simsim and fruits. Other activities are fishing in the following small ponds and lakes, Ndambwe, Nyakongo, Kyakala, Lung'ala, Nyakalimba, Mpapai, Mwongoswe, Kipera, Mbiligani, Bwembweni, Pungu, Nyakiyaka, and Lungola river. Timber making and tree harvesting is also another activity which is done in collaboration with the District Council. The village received pastoralists during the year 2002. The pastoralists were allocated the following areas: Nyankongo, Nyakatungulu and Mtunda for the Barbaigs, where as Nyakalimba and Mbiliganyi were allocated to Sukuma pastoral communities. Immigrant pastoralists are; Emmanuel Rugolola (Nyamwezi), Wiliam and Mahemba (Barbaigs) and Mkanda (Sukuma).

3.1.5 Mtunda

Mtunda is divided into Mtunda A and B each with three sub-villages. Mtunda A has the following sub villages Mtunda A, Mbongola and Nguwalo while Mtunda B has sub-village Mtunda B, Nganyanga and Beta. Sukuma pastoralists arrived in Mtunda and were settled at Ruhoi Mkwajuni overlooking the flood plain few kms away from the village centre. It was apparent that the relationship with local people was good. The main activities in the village are agriculture, fishing, timber harvesting, and petty business.

Currently crop cultivation is undertaken in the following areas Mangawa, Mbongola, Ngunguyungwa, Domba, Dei and Dodwa. Later it will be expanded to Mpalakili, Mwanafugu, Mwakenge and Ndandala. A pastoralists called Bujiku Shindamagaji, informed that he came from Kimbiji-Kigamboni in Dar es Salaam. The route he used was through Sangasanga, Songa, Mpafu, Ruaruke, Kikale, Mtunda and Kikwajuni. Livestock get drinking water from Litawa waterhole.

3.1.6 Kikale

Kikale has the following sub villages Kikale town and Makoge. The main activities in the village are agriculture, fishing, timber harvesting and fuelwood selling. Areas reported potential for grazing were, Nyanjuguni near valley bottom and Yogobale on uplands. There were no pastoralists settled in this area.

3.1.7 Mgomba North

The main activities are agriculture, fishing, Charcoal making and timber harvesting. Areas used for cultivation are Mapwigili, Nyamaturi, Bondeni Bwata, Kilalani, Tipo, Nyoti, Ngulunge and Mpondeni. Areas suggested as potential for grazing are Pangapanga and Gulwandanga. Sources of water available for livestock are lake Matola and Uba. The villagers benefit from Rufiji river. When the river floods it provides alluvial soils which are fertile, fishing and water flows to other dams. There were no pastoralists settled in this area.

3.1.8 Umwe North

The main activities are, agriculture, charcoal making and petty business. Areas used for cultivation are, Nyamitumba and Mbumbako. Crops cultivated are: rice, maize, cassava, simsim, cashewnuts, cowpeas, groundnuts, banana, millet, various fruits and pigeon peas. The village extends up to Mbogola where it borders with forest reserve. The area that might be considered for grazing is Kiagabe. On the northern part, Mikasange and Nyakatombe could also be used. Watering points available are Ruhoi River, which is salty, and Kiagabe pond.

3.1.9 Ikwiriri South

Similar to other villages, the main activities for Ikwiriri South are agriculture, fishing, timber harvesting, charcoal making and beekeeping. Also farmers are involved in petty business. Pastoralists arrived in Ikwiriri at the beginning of February 2002. There was a temporary agreement as to whether or not they should stay near Nyamwage. Areas that could be used for grazing are Mtongani, Nyamwage and around Ilu lake. The watering area to be used is Pasudishi, a road-making borrow pit. Pastoralists in this area are from Barbaig ethnicities namely are: Mayoka Joseph, Sadiki Mabehe, George Loya, Lameck and Saidi Kidawami.

3.1.10 Mlanzi

Agriculture is the main activity followed by charcoal making. The crops grown are cassava, maize, various fruits, rice and vegetables. Charcoal making is done in areas being cleared for cultivation. Areas used for cultivation are Nyambombwe, Kikimbili, Kimbundu, Bundai, Nyamwimbi and Mpondi. The village has no extensive grazing areas.

3.1.11 Hanga

The main activities in this village are agriculture, fishing and charcoal making. The agricultural crops grown are rice, maize, cashewnuts, palm, fruits, millet, bananas, tomatoes etc. Cultivation is mainly done in the following areas: Nyambwande (sub- village of Ng'ambe, Mangunga and Ngundutupi), Kimbogo (sub-village of Kilabe, Mikuruti and Obeni), Ngambe (sub-village of Mikuyu, Mtajuta, Mitamani and Ng'ambe and Mkima (sub-village of Msangamwelu, Kibwibwi and Hanga). Charcoal making is done locally in crop fields. Fishing is done in the Indian Ocean. The village has some 19 goats which are not well taken care of. The village has identified possible grazing areas at Viahemeni and Kilabe in Mkukurume area.

3.1.12 Kivinja A

The participants reported that the main activities were fishing in the Indian Ocean, and , agriculture with main crops being rice, cashewnuts, cassava and cowpeas. Other activities were charcoal making. The pastoralists who were residing at Chaduma visited the village and stayed for about two months. However, they stayed only for a short time because of water logging and inadequancy of palatable plant species. Then they returned north to Mkuranga. The village has a shortage of water for humans.

3.1.13 Mjawa

This is another village with the following main activities: agriculture, charcoal making, timber harvesting, and petty business. Areas used for crops growing were Bonjo, Mtetani, Dutani and Gossa. Charcoal making is done around the fields. There was no livestock kept around the village with the exception of only a few chicken. They earmarked an areas for extensive livestock grazing as Mianzini and Mkadi. But also part of Mkadi is used for beekeeping. There is a serious problem of water for humans. They have to wait for over six hours to obtain water from dug wells.

3.1.14 Uponda

The village has two sub villages namely; Uponda and Uchembe. The main activities in the village are agriculture, charcoal making and timber harvesting. Pastoralists stayed for about two months at Uchembe. During rains, the area has a problem of water logging. Pastoralists abandoned staying in this area. The water ponds are very far from the residents and it was observed that men fetch water using bicycles.

3.1.15 Bungu

Similar to other villages agriculture is the main activity, followed by charcoal making. Beekeeping is being implemented by a group of 17 village members. Also about 7 people have cattle kept under zero grazing system through HPI project, while others own some chicken. Pastoralists arrived in the village in the year 2002 and they stayed for about 8 months. Village members informed us that sometimes, while cattle passing graze in crops. Farmers reported that the presence of livestock provided them with animal products of which they were lacking. They bought meat at a good (negotiable) price. Villagers informed us that the potential areas suggested for grazing were Uchembe and Mbungio.Also part of the Kigandu forestry area could be used for grazing. One of the major problem is water for both livestock and human beings. Village members are willing to host livestock keepers but need a good and clear understanding between themselves.

3.1.16 Ruaruke B

The village has the following sub villages Mgererani, Nyanindi Makoge, Sangweni Matosa, Mfule Mkumbini and Kimbele Fumiti. The activities done in the village are cultivation in all the sub villages and mainly on the following crops; maize, cassava, rice, cashewnuts, palms, coconuts, Bananas, fruits, and cowpeas. Other activities are fishing in Indian Ocean and Mtunda pond, and forestry logging mainly from mangroves is for timber making. Livestock keeping comprises mainly local chicken and a few sheep and goats. The team was informed that during the year 2002, pastoralists stayed for one night only and they proceeded to other villages. The village has earmarked Sangueni and Mkumbini for extensive livestock grazing. Watering points were: Njassa Gegedu, Njassa Miliki, Ntwana, Mkelele to Nyamisati. Other grazing areas suggested were Kimbwele to Mkumbini

3.1.17 Ruaruke A

The main activities in Ruaruke are agriculture, fishing, timber making, charcoal making and salt making. Crops grown are cassava, maize, cashewnuts, simsim,coconuts, palms, sugarcane, cowpeas and fruits. Areas used for cropping are in all sub villages which are Nyambarapi, Kindanda, Mwenge, Kiwaga, Mbowa. The only livestock kept are local chickens and few goats. Fishing is done in the Indian Ocean. Salt making is done in Ruaruke B. Areas suggested for livestock extensive grazing are in the southern part called Nyamtimba and north east called Kimbwili. The areas need approval from village members before they are used. Areas used as sources of water from natural wells are Famiti, Nyamtimba, Nyamindi, Nyambarapi, Nganora, Mkumbini, Matosa, Ndegwa, Kimbwili, Kikunda, Mpingo, Ntaminalo, Kikunda, Mwangimbwage, Mfaume, Mpangapanga and Mtendeni.

3.1.18 Ngorongo (East)

The meeting was well attended although the villagers had another meeting to attend. The villagers informed the team that their main activities were as follows:
-agriculture: growing rice, maize, cashew nuts, simsim, cotton, cassava, millets, bananas, cowpeas, pumpkins, sugarcane and various fruits.
-fishing is done in Rufiji river and Mtambo pond.
-timber cutting is also done but they have no control since the permission for harvesting trees comes from the District Council.
-livestock keeping is done but mainly on chicken and have few cattle and sheep which are kept by one person.
-Cutting and selling trees for various use
-charcoal making
-other petty business

The village has not received pastoralists yet but they have seen them in the neighboring villages and the problems that are being faced. The village has heard bad experiences from other villages and hence discussions were favouring to oppose any idea related to livestock keeping in their area. The village has extensive grazing area but there is no water at all. The areas used for crop growing are: Baweni, Mtuluma, Nyasule, Kitoti and Mtandeni. The areas that could be earmarked for livestock keeping should be south of the Rufiji river at Lwangwa, Mbingo, Mipogoro and Kibebele. The watering area could perhaps be Ndagala, Mayai, Makibwi and Kumbeiba. The villagers unanimously informed that they do not like keeping livestock but they need irrigation facilities.

3.1.19 Kilimani

The main activities in the village are agriculture, beekeeping, fishing, timber harvesting, livestock keeping and small petty business. Crops grown are: maize, rice, pumpkins, cashew nuts, simsim, cotton, potatoes, various fruits, millet, vegetables and cowpeas. Areas used for cultivation are Gefu, Mpongonya, Nyera, Kilombero, Songosongo, Mona, Nyafisi, Mkongomandai, Nturuma, Mbungo and Kowani in Ngorongo. Kilimani has not yet set aside a specific area for extensive grazing. Fishing is done in small dams at Mtambo, Ngwele, Nyakitolo, Msanga, Meli, Matimbwa bora, Majiwe, Kiporoi, Rupindo, Mwangia and Kitumbokesi. Also fishing is done in Rufiji river. Livestock keeping is mainly local chicken, and some turkeys and doves. But, cattle and goats used to be kept by two people in the village. Of recent, a few Barbaig pastoralists have been reported and are staying in the village at Meli and Sanga. There was no proper formality with their arrival. Due to the past conflicts local farmers do not want livestock keepers in the area. It was apparent that in this meeting farmers had misconceived ideas that were related to conflict resolution between Barabaig pastoralists and crop cultivators in the area, which had been requested from the District Authority. It was difficult even to decide where the meeting should be conducted. However, finally the place was identified and over a hundred participants attended. Following good introduction and clarification of our objectives, the meeting went on very smoothly with cheers at the end.

3.1.20 Ikwiriri North

Agriculture was reported to be the main activity in this village. Several crops are been cultivated, these are rice, maize, cassava, ground nuts, cow peas, cashew nuts, simsim, cotton, fruits and vegetables. The areas used for crop cultivation are Kilalani, Bwata, Mpalange, Nyoti, Kifuru, Mbongola bordering to Mng'aru, Nyamitumba, Mbomboko, Kiukilio, Mikasenge and Kiakala. Other activities are charcoal making, timber making, fishing, beekeeping, and petty business. Livestock keeping is done on local chicken with very few goats and cattle. Village members informed that pastoralists arrived and stayed at Mparange and later they went to Muyuyu. The village reported that they do not have an area yet for grazing but discussions are going on with Umwe on a particular land ownership to be adopted.

3.2 Areas used and or suggested for extensive grazing and watering points

Most of the villages visited had earmarked specific areas as potentialextensive livestock grazing areas. This was the follow-up implementation of the directive from the District authority demanding all villages to have grazing areas. About 19 main grazing areas were proposed (by villagers interviewed following our visits) and some of them were visited for actual field assessment. In each grazing area, watering points for livestock were reported (Table 2).

It was noted that Nyambawala was the most preferred grazing area for Mohoro and Kiwanga residents despite other factors. Other areas in Mohoro are good but quite small and sometimes are close to cropping areas. The rangelands assessed in Muhoro were: Nyambawala; Londondo and Mtuleke. Kiwanga village leadership has earmarked the area bordering to Mohoro at Londondo as a grazing area. The areas in Londondo Shella and Mtuleke had less tsetse flies compared to Nyawambala. However, crop cultivators mainly use Shella area and so it would not be available to pastoralists..

Muyuyu has potential grazing areas but requires control of livestock numbers especially at Mpaje. Lung'ara is most preferred by residents, but pastoralists feel that it is too far but will go there later when they have brought their families. Also pastoralists would like to stay close to the local people so that children can go to school and they can market their milk.

Mtunda has a good potential grazing area and a slight tsetse problem.

Mgomba north has good extensive potential grazing areas i.eover 200 ha (authors and villagers estimates) but has high tree density.

Ikwiriri south has a small area i.e less than 100 ha (authors and villagers estimates) that might carry a very small number of animal units for sustainable extensive livestock grazing. Hanga, Kilabe and Mkuruma have the potential for grazing, but it is a small area and that it is surrounded by crop cultivation. Kivinja A, extensive potential grazing area is located at Chaduma that joins with Kisanjani. The other part of Kivinja has extensive grazing area but less palatable species. In Mjawa water was a big problem especially for human consumption. Hence livestock keeping might not be appropriate.

Uchembe in Uponda is a good extensive potential grazing area but water is a problem and during the wet season, a major part of the grassland is water logged. Also it is not clear whether the area belongs to Uponda village or Bungu village. The area has sparse tree distribution which favors forage growth but needs construction of dams for livestock and water sources close to people.

Ruaruke A & B have good extensive potential grazing areas but during the wet season the areas are water logged except in a few places where bomas could be constructed like Kimbwili and Nyamtimba. Livestock keeping is unlikely to be appropriate in water logged areas.

Kilimani has good potential grazing areas but there has been miscommunication with pastoralists which has caused serious conflict between them and the resident villagers.

Ngorongo residents have heard bad experience from other villages, hence do not like extensive livestock keeping at all.

Umwe has extensive ungrazed area around Kiagabe valley. The area floods to a certain level and hence not cultivated.

It was apparent that the watering points suggested are mainly areas where livestock can access without

interference with human domestic use. The consultant did not have adequate time or assistance to make estimates of the sizes of the potential grazing areas visited. Therefore it is impossible to calculate overall carrying capacities per particular grazing area, per village or for the whole district.

In summary, potential grazing areas exist but many areas are limited by flooding, lack of suitable water supply, closeness to cultivation and lack of clarity regarding adminsitrative area under which the site belongs. Also calculation of size of the potential grazing areas available per village is a pre-requisite to calculating the possible carrying capacity for each village. It should be remembered that these were once-off, one season production studies. The results should be viewed with the caution that it is only a series of studies over a period of several seasons under actual grazing that can provide accurate grazing capacity data. Also if one refers to Table 8 it is seen that the grass/forage characteristics of the Ikwiriri area are considered only marginally suitable for livestock.

Table 2: Potential Grazing areas and watering points in the villages visited in Rufiji District (suggested by village leaders and district officers)

Village	Possible Grazing area	Possible Watering points
Mohoro	Londondo; Nyambawala*, King'ongo *, Mtuleke*,* Kilindi *, Luwiko – crops grown	Shimo la udongo,, Kwamnenwa, Nyamkundi, Nyambawala, Mwake, Bomba, Lupunga, Shella, Mpelepele and Sunga –to be used by people only
Kiwanga	Kiwanga*-Mohoro border	Shimo la udongo
Muyuyu	Nyakongo, Nyakatungulu, Mtunda*, Nyakalimba, Mbilingani, Mikaribora*; Lung'ara	Lung'ara dam, Nyankongo, and Pungu, Nyakiako
Chumbi	Kiyengea* (Chumbi C), Twacheni*,	Mohoro river,
Mtunda	Ruhoi Mkwajuni, Mbawa –Kihutu, Ruhoi (Mbiligani, Ngunguyungwa, Kichumbe), Ngatima (Kilagasi, Ntungya, Kifimbo)	Ruhoi river (problem muddy and high salt level), Litawa Rambo dam
Kikale	Nyanjuguni (valley), Yogobale (potential for wildlife but northeast for grazing)	Ruhoi river from Kikale,
Mgomba North	Pangapanga and Gulwandanga (good but tree density high–open up)	Matola dam, Uba Lake and other small seasonal ponds around Uba dam
Umwe North	Kiagabe, Nyamitumba, mbumbuko Ngumbuluni (forestry reserve)	Ruhoi river, Kiagabe dam
Ikwiriri (S)	Nyamwage*, Mtongani*, Ilu	Poka river, Pasudishi,
Mlanzi	No grazing area available	Dug wells available and charcos
Hanga	Viahemeni, Mkukuruma near Kilabe (good but small)	Mkukuruma Kilabe southwards
Kivinja A	Chaduma, Kivinja Kisanjani	Mpundule, Bogela river, and Mzingwi. (Generally water for human is a problem)
Mjawa	Mianzini, Mkadi (beekeeping)	Bottom valley of mianzini. (Similarly water for human is a serious problem)
Uponda	Uchembe	Zumbe dam, Kiloka dam, Nyamidevu
Bungu	Uchembe, Mbungio, Kigandu (Forestry area)	Nyang'ombe dam, Zumbe dam, Kimara dam, Matakula dam, Uvuteni river
Ngorongo (E)	Suggested for: Lwangwa, Mbingo, Mipopolo, Kibebele	Ndangala, Mayai, Makibwi and Kumbeiba
Kilimani	Meli* and Sanga*	Meli and Sanga, Lembangwele dam, Masanga dam,
Ruaruke B	Sangweni, Kimbwili -Mkumbini	Gegedu, Njassa Miliki, Ntwana and Mkelele to Nyamisati
Ruaruka A	Nyamtimba, Kimbwili	Mkelele – furrow passes to Kimbwili
Ikwiriri (N)	Mbongola and Kifuru. However, there is no clear demarcation with Umwe –discussions going on	

*Livestock Present during the visits

3.3 Status of the Grasslands Assessed

The status of the grassland in terms of their condition and their estimated forage yield is presented in Table 3. It was apparent that Nyambawala, Mtunda, Mgomba and Umwe North had excellent grassland condition but are limited by the presence of tsetse. It should also be noted that Mtunda, Mgomba and Umwe North and many other sites mentioned, were not being grazed during the study period.

The areas of Muyuyu, Chumbi, Kilimani and Ikwiriri had fair condition mainly due to on going grazing and improper livestock distribution.

Table 4 presents the estimated Grazing Capacity and the number of animal units allowable per 50 Hectares, assuming that all other factors are optimal and continue to be optimal from season to season. For example, to calculate the number of animal units which might be contempleted for Ikwiriri South (if all stakeholders agreed to pastoralism on the approximately 100 Hectares of grassland and if the pastoralists were able to manage the tsetse fly problem) the following simple mathematics can be followed. Animal Units per year per 50 Ha is estimated at 30. Multiply by 2 to get the Animal Units possible for 100 Ha. That is an estimate of the sustainable carrying capacity of a maximum of 60 Animal Units per year for the Ikwiriri South area. The herds arriving in Rufiji range from 50 to 200 head. Therefore Ikwiriri South could carry only one small herd each year. Some, areas mentioned in Table 4 (four) have even lower estimated grazing capacity than this. The other nine areas were estimated to have higher carrying capacity but it must be remembered that many other factors should be considered in estimating the suitability of a site for pastoralism. Also if one refers to Table 8, for example, it is seen that the grass/forage characteristics of the Ikwiriri area are considered only marginally suitable for livestock and that there is a medium level of tsetse infestation. Therefore decision makers, taking these and other ecological and social factors into account, might categorise the area as unsuitable for pastoralism.

Table 3: The grassland condition and estimated forage yields (Kg Dm/ha) for each potential grazing area in the villages visited

Potential grazing area	Range condition	Forage yields (kg DM/ha)
Mohoro – Nyambawala	Excellent	4200
Muyuyu- Nyankongo/ Nyakatungulu/	Fair condition	2400
Mtunda – Ruhoi/Mkwajuni, Mbawa,kihutu;,Ngatima	Excellent	4620
Chumbi – Kiyengea/Tuacheni	Fair condition	2050
Ruaruke B – Sangweni/Mkumbini	Good condition	3400
Ruaruke A – Nyamtimba /Kimbwili	Good condition	2500
Kikale –Yogobale/Nyanjuguni	Good condition	3250
Hanga – Viahemeni/Mkukuruma	Good condition	3100
Kivinja –Chaduma	Fair condition	3850
Uponda –Uchembe/Mbugio	Good condition	3300
Kilimani	Fair condition	2400
Mgomba – Pangapanga/ Gwalandanga	Excellent	4830
Ikwiriri –Nyamwage /Mtongani	Fair condition	2850
Umwe North- Kiagabe	Excellent	4560

Table 4: The estimated Grazing Capacity (A.U. /ha) and estimated number of animal units possible per 50 Hectares of pasture in the village visited

Potential grazing area	Grazing Capacity (A.U./ha/day)	Animal Units(A.U.) /yr/ for 50 ha.
Mohoro – Nyambawala	323	44
Muyuyu- Nyankongo/ Nyakatungulu	196	25
Mtunda – Ruhoi/Mkwajuni, Mbawa, kihutu, Ngatima	355	49
Chumbi – Kiyengea/Tuacheni	158	22
Ruaruke – Sangweni/Mkumbini	262	36
Ruaruke – Nyamtimba /Kimbwili	192	26
Kikale –Yogobale/Nyanjuguni	250	34
Hanga – Viahemeni/Mkukuruma	238	33
Kivinja –Chaduma	296	41
Uponda –Uchembe/mbugio	254	35
Kilimani	185	25
Mgomba – Pangapanga/ Gwalandanga	372	51
Ikwiriri –Nyamwage /Mtongani	219	30
Umwe North- Kiagabe	351	48

3.4 Status of Livestock Infrastructure

As expected in all the potential grazing areas visited there was no infrastructure available for livestock with an exception of Kilimani where there is a cattle dip only which is not functional. During the interviews it was noted that pastoralists are using knapsack sprayers but not for the whole herd and it is repeated after several days/ weeks. Also most of the animal treatment is done by them using the little knowledge they have. However, under extensive and pastoral livestock keeping dipping is normally appropriate because is cheap to run. Livestock keepers with a few cattle buying a sprayer can be expensive but if well facilitated can contribute to the dipping. Dipping is the most efficient way to control ticks since the whole body of an animal gets wet and concentration of acaricide can be controlled for whole herds and from different bomas in the area. Usually there is tick resistance with different concentration and frequencies. With dipping it is easy to monitor and even when there is a need to change acaricide to make it uniform for all. Dipping can have detrimental effects on the environment and biodiversity hence, a thoroughly analysis/ survey need to be done by environmentalists before considering the use of dips in conparison to other pest control measures. It can be noted that it is difficult to control and monitor the type of acaricide and concentration to be used in all the bomas. Despite the veterinary services they are locally providing, it was apparent that there is high demand for livestock extension staff and veterinary shops (pastoralists demand). Probably, it is advised that there should be training of para vets in their own communities. The majority of indigenous people depend on fishing as a source of protein and cash, they might be affected if pastoral production should be allowed. As per ToR, possible infrastructure and areas for dips, market and watering points have been suggested. Table 5 presents some of the infrastructure required and possible areas to be constructed. Much more thorough analysis of pastoral demography and ecological impacts, particularly aquatic, beekeeping and avian issues, needs to be made before decisions are made regarding provision and location of such infrastructure.

Table 5: Identification of possible areas for Dip construction, Market places and Watering points

Village name	Dip	Market	Watering point required
Mohoro	Nyambawala	Nyambawala	-
Chumbi	Kiyengea	Nyambawala	-
Mtunda	Mtunda	Ikwiriri	-
Ruaruke	*	Ruaruke	-
Kikale	*	Ruaruke	-
Bungu	*	Bungu	Uchembe/Mbungio
Kilimani	Kilimani	Kilimani	-
Mgomba	Gulwandanga	Ikwiriri	-
Ikwiriri	*	Ikwiriri	-
Umwe	Gulwandanga	Ikwiriri	-

* Need identification - Available

3.5 Inventory of dominant pasture species

Most rangeland vegetation changes over time. Climatic and characteristics of the rangeland vegetation in Rufiji falls within humid and sub-humid zone. The rainfall ranges from high (1200 mm) to medium (600 mm). The villages' area is dominated by the following main species: Panicum – Hyparrhenia tall grass. *Panicum maximum* (Guinea grass) dominates locally in most areas. *Hyparrhenia spp*., especially *H. rufa* (together with *Chloris gayana* (Rhodes grass – Shingamagajis grazing area), Eragrostis and *Sporobolus spp*) dominates seasonally flooded plain grassland, *Echinocloa pyramidalis* (Antelope Grass), which grows to 2-3 metres tall was also observed. *Cynodon* and *Cyperus spp* were commonly seen in association with *Echinocloa*. It was apparent that where forests have been cleared Panicum maximum (Guinea grass) and Digitaria spp. were observed while in areas with infertile coastal sand, essentially ungrazed, commonly were covered with *Bothriochloa* spp., *Echinocloa pyramidalis*, *Hyparrhenia spp*., *Panicum spp*., P. maximum, *Themeda triandra* (Red Oat Grass) and *Setaria sphacelata* (Common Setaria) in some places. In areas with some pastoralists in presence of light grazing, *Heteropogon contortus* (Spear grass) starts to replace other species. Changes of rangelands vegetation overtime have implications on potential rangelands production, and, likewise on the management of rangeland resources. Table 6 and 7 presents a list of forage species observed in the area.

Table 6: Observed dominant grass and herb species situated in various potential extensive grazing lands visited

Grass /Herb species	Family
Anaelema spp	Fabaceae
Chloris gayana (Rhodes Grass)	Poaceae
Chloris virgata	Poaceae
Cynodon dactyon (Star Grass)	Poaceae
Hyparrhenia spp	Poaceae
Brachiaria spp	Poaceae
Hyparrhenia rufa	Poaceae
Bothriochloa insculpta (Sweet Pitted Grass)	Poaceae
Bothriochloa spp	Poaceae
Leptochloa chinnensis	Poaceae
Heteropogon contortus (Spear Grass)	Poaceae
Indigofera spp	Fabaceae
Panicum spp	Poaceae
Jasminium spp	Oleaceae
Panicum maximum (Guinea Grass)	Poaceae
Panicum spp	Poaceae
Setaria sphacelata (Common Setaria)	Poaceae
Sporobolus spp (Pyramid Dropseed)	Poaceae
Echinochloa pyramidalis (Antelope grass)	Poaceae
Eragrostis spp (Sand Love Grass)	Poaceae
Digitaria milanjiana (Wooly Finger Grass)	Poaceae
Cyperus rotundus	Cyperacea
Commellina benghalensis	Commelinaceae
Blepharis spp	Acanthaceae

Table 7: Observed tree/ shrub browse species situated in various potentialextensive grazing land visited

Tree/ Shrub species	Family
Acacia spp	Mimosaceae
Acacia nilotica	Mimosaceae
Acacia drepanolobium	Mimosaceae
Albizia spp	Mimosaceae
Albizia harveyi	Mimosaceae
Acacia senegal	Mimosaceae
Brachistegia spiciformis	Caesalpiniaceae
Combretum pentagonum	Combretaceae
Combretum spp	Combretaceae
Cordia spp	Caesalpiniacea
Crotalaria spp	Fabaceae
Dichrostachys cinerea	Mimosaceae
Grewia bicolor	Tiliaceae
Grewia spp	Tiliacea
Markhamia lutea	Bignoniaceae
Terminalia spp	Combretaceae

3.6 Areas suitable for extensive livestock grazing

Visual appraisal and field assessment provided the suggestion on the suitable areas for extensive livestock grazing. Table 8 gives the status of grasslands suitability in areas assessed. The main factors which have been considered in this case is the primary production of the vegetation which is dependent on rainfall, physical soil characteristics, cover by perennial grasses and shrubs and the utilization of the vegetation by the animals. In areas which have not therefore been grazed, the actual utilization could

not be measured.The other factor considered is the availability of drinking water (environment). However, in future other factors need to be considered such as density and performance of the animals (secondary production). Availability of livestock infrastructure is also another important factor to be considered. In identification of tsetse infested areas only visual appraisal and discussions with local people was used. The widely spread species of tse tse observed was the *Glossina morsitans*. Others species were *Glossina austen* and *G. pallidispes.* However, in controlling methods to be employed one needs to make fly-rounds and sample catches to determine the densities for each particular area. The densities can later be translated in terms of methods of control e.g. tse tse traps.

Caution needs to be taken by local villagers to clearly demarcate stock routes so that they should not interfere with crop fields. It is suggested that the District Council, in consultation with village governments, should zone areas unsuitable, suitable with limitations and pre-requisites and suitable for livestock production.

Table 8: Grass/ Forage suitability rating of the identified and visited potential extensive grazing areas

Name of grazing area	Suitability of the forage	Major Constraints/Requirements
Mohoro – Nyambawala***	(++)	Dip, Tse tse traps
Muyuyu- Nyankongo/ Nyakatungulu/ **	(++)	Dip, stock routes, Tse tse traps/Tsetse Control
Mtunda – Ruhoi/Mkwajuni, Mbawa,kihutu;,Ngatima*	(++)	Dip, stock routes
Chumbi – Kiyengea/Tuacheni**	(+)	Dip, forage improvement
Ruaruke B – Sangweni/Mkumbini*	(0)	Dip, watering points, stock routes
Ruaruke A – Nyamtimba /Kimbwili*	(0)	Dip, watering points, stock routes
Kikale,Yogobale/Nyanjuguni*	(+)	Watering sources, Dip
Hanga – Viahemeni/Mkukuruma*	(0)	Watering sources, Dip
Kivinja –Chaduma*	(0)	Watering sources, Dip
Uponda –Uchembe/mbugio*	(+)	Water sources, Dip,
Kilimani**	(++)	Education and conflict resolution, Dip, tsetse control
Mgomba – Pangapanga/ Gwalandanga***	(++)	Tse tse traps/Tsetse Control, Dip, tsetse control
Ikwiriri –Nyamwage /Mtongani**	(0)	Dip, stock routes
Umwe North- Kiagabe**	(++)	Dip, Tse tse traps and or Tsetse Control

* low tsetse intensity ** medium tsetse infestation *** high tsetse infestation

(-)=unsuitable; (0) =marginal; (+) =suitable; (++) =very suitable

3.7 Available Livestock Infrastructure

As was expected, since the District had few numbers of livestock kept it was apparent that in all the villages visited, there was no livestock infrastructure in place. However, it was observed that some pastoralists have sprayers for spraying their animals instead of dips. As it was mentioned before in areas where pastoral production will be considered then dipping could be appropriate instead of spraying. If the villagers and District Councils are to consider using these grazing lands the following infrastructures need to be considered by the stakeholders; these should include: clear identification of grazing areas ; stock routes to be identified; Veterinary centres (veterinary shops drugs and advisories); construction of dips; and provision of markets for livestock sales. Market access is a critical factor influencing market participation and risk management by pastoralists. Pastoralists with better market access sell livestock at higher rate. Marketing may play a greater role n modifying herd size in high market access sites than in low access sites especially in bad years or prolonged drought. There are no

specific routes used by immigrating pastoralists. Probably the villages concerned, pastoralists and other stakeholders should identify the livestock routes. The areas need to be visited, identified and protected for other users. Of course the stock routes should not interfere with other uses like cropping activities, fisheries or domestic water collection.

3.8 Identification of grasslands users

Rufiji is endowed with abundance of natural resources of which some of them are found in these grasslands. It was apparent that grasslands had many users with different objectives and interest. The following were the main present users of the potential rangelands:

Crop cultivators: Cultivation is one of the most extensive use of grasslands visited. Land clearing is being operated extensively and with little knowledge on farming practices that considers sustainable use of resources. As population growth increases, there is more demand for food and hence more land is cleared for cultivation beginning with potential areas and later with marginal land.

Timber logging: The main objective is to harvest trees for selling. Their interest is to gain as much profit as possible with minimum or little investment. It was apparent that there is intensive forest harvesting. Illegal logging and charcoal production take place even in forest reserves. The harvesters have no or little knowledge on sustainable forestry harvesting.

Charcoal making: The main objective is to make charcoal for home use and as a source of cash. The later objective is more destructive because trees are cut without proper tree harvesting but rather just to cut trees that could provide charcoal and get cash from the sales.

Honey hunters and beekeeping: Beekeeping is another enterprise that is being advocated for honey and wax production. However, honey hunters are found in these grasslands where they obtain honey to make their living. At times fires are caused by this category of people.

Miners: It is apparent that mining could be beneficial in the short run but might not be sustainable. There were a few places which revealed artisan or commercial pits and other signs indicating mining exploration trials like in Ruaruke.

Fishing activities: Fishing is among the important economic activity in these grasslands areas. Available grasslands resources are associated with fishing as an enterprise in most of these areas. In areas where water is used for fishing then it might not appropriate for livestock use because of conflict of interest.

Tourism: Most of the grasslands areas visited had abundance of wildlife and birds that could provide tourism attraction.

For proper and effective grasslands utilization for livestock production it is very important that all the potential areas for grazing be fully agreed by all users, clearly defined and possible infrastructure should be put in place.

The report has suggested some of the areas but other areas not suitable for pastoralists because of not enough drinking water, high intensity of tsetse infestation, small size, too salty and flooded “njacha”. Other areas might require further research. Implementing developmental project activities in these areas requires participation and involvement of all stakeholders from problem identification, stakeholders’ analysis and interventions.

3.9 Potential conflict in the study area

Heretofore livestock ranging has not been practised in Rufiji. Residents are fishers, farmers and harvest timber , wild fauna and other grassland, woodland and aquatic products. The introduction of traditional pastoralism brings with it many land and natural resource use issues which have the potential to cause conflicts between the residents and the pastoralists. With careful stock numbers limitation, zonation and by-law imposition such conflicts can be prevented.

The problem of livestock grazing on crop fields is well known. It is a constant source of tension between farmers and herders. The farmers allege that the stock cause material harm when graze on fields, damage the soil and spread unwanted weeds and that they are a nuisance. The herders retort that no harm is done. During the interviews, it was apparent that the main aspects to this problem were the "hostility due to increased risk of crop loss and hostility due to land degradation". The management of this problem depends much on the machinery of the government at village level. It is the job of diverse officers – extension officers, the village elder's councils, village and sub village chairmen, village and ward executive officers and policemen to sort out the cases of crop damage. It is easy for herders to bribe these officials and for the farmer to have little security. One point of crucial research is to establish how changes on the quality of government at village level will affect relations between farmers and herders. Again the research design is relatively simple –one has to select and compare places known for strong and weak government respectively, and then examine farmer/ herder interactions in these sites. Hostility due to degradation also has a material basis. It is alleged that the trampling of cattle causes damage to the soil, that the material they eat deprives the land of nutrients and that they spread unwanted plants. Certainly the possibility of decline in nutrients availability must be accepted because herding cattle in kraals produces the well recognized practice of *nutrient stripping* in grazing areas and *concentration* in the settlement areas. If nutrients are increasing in the kraals, then they must be decreasing in the surrounding grazing (and farm) lands. The crucial issue however is; is this decline in soil quality due to grazing significant? Or it is marginal when compared to the effect of the other farming practices? However, in future it will also be important to try to measure the consequences according to the farmers point of view. How does grazing affect their own practices? Is it the decline in nutrient status which is resented (and is grazing really the cause of the decline) or is it the change in soil texture which is the problem (trampling makes it harder to hoe, or stirs up dust)? Is there a shortage of land? How intensively is land being used?

Other conflicts observed and anticipated were: water sharing with domestic uses vs livestock watering like in Shella; dogs owned by pastoralists are offensive to most Moslem residents; fishing sites might be disturbed or damaged by herds and chemicals that might be used for cattle treatment.

Among the villages visited it was apparent that Kilimani, Mohoro -Shella, and partly Uponda had experienced this type of tension. Other villages such as Ngorongo, Ikwiriri North and South, Ruaruke A and B, were on defensive side having heard negative experiences from other villages elsewhere. The existing tension also could be resolved if the village assembly was involved in making decisions regarding the hosting of pastoralists, the numbers to carry and what rules should be observed by pastoralist with respect to the locals. The immigrating pastoralists should agree on point of contacts by establishing some by laws on what happens if there is breakage of agreement. In areas where there is conflict the possible and sound solution is to bring the different parties together and agree to resolve the differences peacefully.

3.10 Thoughts on Coping with Conflict

In other parts of East Africa herders and farmers relations oscillate between conflict and cooperation. Local conflicts often arise over crop damage. Herder-farmer relations may be tense during growing season but ease after grain harvest, when farmers are eager to obtain manure for their fields and herders to gain access to crop residues for their animals. The situation in Rufiji differs in that floods usually

extends the agricultural season to all but one month of the year, leaving little time for crop residue consumption by livestock.

Local people in Rufiji villages should reserve their own rights to resources and to maintain their identity with the help of the District Councils by placing tight limits on outsiders especially on flood recession agriculture "mlau". They may welcome herders on temporary basis to graze on crop residues. It is expected that immigrant herders should respect this and that will maintain good relations with farmers. Farmers who invest in large scale cash cropping are less likely than traditional small holder to seek good relations with herders. Similarly, commercial farmers exclusive land use rights, may deny herders access to valuable grazing resources.

3.11 Land tenure system

Similar to other parts of the country, the National Land Policy (NLP) and the Land Act 1999 and the Village Land Act 1999 applies to Rufiji District. The land is vested in the President and managed and regulated on his behalf by the Commissioner for Lands. At village level, it is prescribed as a management role for the Village Council and a consultative role for the Village Assembly. Land is arguably the most common pool resource. Communal land ownership is the dorminant land tenure system in the area. At village level, the boundary issue obviously is not simply one of the demarcation or geographical space. Usually it is about resources and, very frequently, a common resource like pastures and forests which may not be physically occupied by households but to which the community has defined (customary rights to) access. Yet it is easier for outside interests to rationalize and justify excluding such lands from villages on the ground that they are unoccupied. It was apparent that some areas are under disagreement as to who has the right to own the land. The villages under discussions are between Uchembe -Uponda and Bungu, Ikwiriri north and Umwe. It is important for all villages to define their land and natural resources, their boundaries and their customary access rights.

It is important to keep on educating village members on the reviewed land policy in the country. The posters that remind villages on issues on land policy are quite useful. Some of the posters were seen at Ikwiriri (S) which had the following Swahili words:

ZIJUE SHERIA ZA ARDHI 1999 NA JINSIA
kifungu cha 60 (2) –sheria za Ardhi Vijijini ya 1999:
"Kifungu hiki kinaeleza kuwa baraza la kijiji limepewa Uwezo wa kuunda
baraza la ardhi ya kijiji litakalo kuwa na wajumbe saba (7) na kati yao watatu (3) LAZIMA wawe wanawake".

Kifungu cha 60 (9) Sheria ya Ardhi Vijijini ya 1999
"Kifungu hiki kinatamka kuwa koramu katika Baraza za ardhi la kijiji litakuwa na wajumbe wasiopungua wanne (4) na kati yao wanawake ni lazima wawe wawili (2)"
WITO: Mikutano katika mabaraza ya Ardhi isiendeshwe bila koramu iliyopo kisheria kufuatwa.

This implies that successful resource management can not be divorced from economic activities, such as cultivation fishing, hunting or herding. Among the villages visited, ownership, conservation and management of resources should go together. The rules of tenure have effect on preservation and protection and thus affecting surrounding ecosystem. The resource conservation will be practiced by those to whom the resources belong. When the resource is owned, then villages will be serious to invest time and effort in conservation. Almost in all villages, there is a need for deliberate creation of awareness and education. Villages should be facilitated in making the overall village environment management plan and describe the boundaries of its land and natural resources, and therefore mechanism of ownership will be initiated. That means Rufiji has a variety of flora and fauna with great biodiversity. Local communities mainly depend on forests to supply their needs such a building material, herbal medicines, wild fruits, and bee's products. Forestry is the main source of bioenergy for

the rural households (and even poor urban and semi-urban households in the form of both wood and charcoal) which accounts for 92 per cent of the total energy consumption in Tanzania.

3.12 Rangelands Management Practices and Options

Among the proposed grazing areas, various stakeholders need to convene and suggest points of contact on wise use of those areas. The environment is the basic determinant of the nature and its productivity. These include climate, topography and soil, which determine the potential of the rangeland to support certain types and levels of land use. Within the limits set by this potential, the influence of pyric (fire) and biological environmental factors (tree cutting, shifting cultivation, grazing) result in different types of vegetation and levels of productivity.

Cutting of trees

The current trend of cutting trees and intensive forest harvesting may change the physiognomic compositional nature of vegetation. Land clearing for cultivation opens dense dry forests and thicket allowing grasses and other herbaceous species to increase in abundance. Also fires fueled by dry grass maintain the open character of the vegetation. Persistent cutting of trees for fuel, charcoal and bush on rangelands, modifies the botanical composition of the woody vegetation. Tree cutting is detrimental in the sense that it increases erosion and reduces grass growth under subsequent rapid growth of dense stands of understory trees and shrubs.

Browsing/Grazing

The degree of grazing affects the structure, composition, quality and productivity of rangeland vegetation. It was apparent that in areas like Kiagabe, Pangapanga, and Gulwandanga ungrazed perennial grassland accumulated dead material, increasers and woody plants; unless periodically defoliated, many grasses lose vigor and die early, thereby becoming less effective competitors against woody plants. Light to moderate levels of grazing actually maximize both primary (vegetation) and secondary (herbivores) production and encourage perennial grassland at the expense of woody vegetation. Similarly, overgrazing reduces ground cover, plant height, forage quality and productivity; changes are induced in the dominant growth form of herbaceous plants: Tall bunch grass species give way to shorter rhizomatous and stolonifereous perennials which are replaced by annual grasses and forb species. Eventually woody vegetation may be abundant which results to reduced cover of palatable perennial grasses and increased amounts of less valuable and herb species. Impact of grazing on range lands vegetation depends on the type of herbivore, the number of animals utilizing the area and the distribution of use in time and space. Grazing and browsing animals bring about a number of impacts on rangeland vegetation. High densities of grazing animals reduce ground cover, increase unpalatable species and reduce productivity and carrying capacity. The impact of grazing reflects how animals are distributed in terms of space and time. A given number of herbivores will have less effect on vegetation when distributed over a wider area than when concentrated in a smaller area. Similarly, grazing is apt to have a greater negative impact when the vegetation of an area is grazed continuously than when it is grazed only periodically, and therefore given opportunity to rest and maintain it's vigor.

Overgrazing / Over utilization

A rangeland is overgrazed when grazing pressure induces undesirable changes in plant species and /or visible signs of soil erosion. Overgrazing is a relative term in as much as desirability of plant species depends on the intended use of a rangeland.

For proper use of these grassland areas, all relevant key stakeholders need to be identified. Stakeholder analysis should be conducted to identify their objectives and interest. This will lead to common understanding and agreement on sustainable use of resources. All stakeholders should participate in formulation of rules, regulation and by-laws that will govern the sustainable use of resources

particularly on sustainable livestock production.

Among the rules that could be included is the implementation of the District directives in demarcating areas for cultivation, fishing, wildlife management areas, biodiversity protection areas (birds, butterfly etc potential habitats for research and tourism) and grazing areas. Users of these areas need to establish by-laws to reinforce the effectiveness and seriousness of the agreement. For crop cultivators recommended farming practices to be employed while considering sustainable use of resources. Similarly, immigrating pastoralists and agropastoralists should adhere to the principles of range management, while the District Council through their departments should provide education and technical support required during implementation of the directives.

3.13 Options For Consideration

- Establishment of District Range management Task force (DRTF) to evaluate and monitor range utilization trend. Probably, if there is a similar department (e.g Environment Management Team), it can be given this responsibility. The emphasis should be keeping the livestock numbers to the agreed stocking rates. They should work hand in hand with village government in enforcing village by-laws on sustainable utilization of grasslands, wildlife and watershed protection.
- Villages, and village governments to control wild fires.
- With environmental consideration in mind livestock disease control should be given a priority through regular dipping, vaccination for viral diseases and provision of *prophylactic* drugs for *trypanosomiasis*
- Identification of poisonous plants and their possible suppression/eradication
- Bush or shrub/trees can selectively be controlled manually through pastoralist self help programs. Burning can effectively control shrubs/trees, but should be controlled by skilled range managers from DALDOs office or Natural Resource department. Environmental impact must be properly considered before any vegetation management measures are planned.
- For proper livestock distribution, livestock handling facilities need to be installed or built. These include; dips, charcos, stock routes and veterinary services to be made available close to livestock keepers.
- The District Council to initiate the livestock keepers registry and to supervise and make sure that, every village has its own registry showing names, livestock numbers, area immigrated from and information on the immigrants.
- Villages to conduct census annually and should be reported to District Council at least before budget period for the district. That means, levies will be collected BUT some money must be ploughed back for the Livestock development activities.
- Villages should have committees to monitor and supervise the sustainable use of rangelands.
- Pastoralists should be ready to reduce livestock numbers when advised especially when numbers exceeds the ecological holding capacity and this should be clearly shown in the agreement or by laws
- At National level there should be coordination between regions and districts where animals are migrating to and from. This should go hand in hand with thorough animal vaccination.
- The involvement of immigrating livestock keepers more closely and fully, in development interventions. Within the District range/livestock development should be based on a better understanding of the production potential of the areas and fully involve the villages and other users in an development interventions. In this case, improvement in livestock husbandry practices and management of rangelands resources.
- Vegetation maps need to be established that will guide the District Council for planning, implementing and analyzing the results of subsequent rangelands surveys (as a necessary early element of rangelands inventory). Rangeland Management decisions require an understanding of vegetation dynamics (changes). With such information District Councils and villages should

be able to make proper judgment. Land use attributes must be monitored to determine any changes. As many changes are long-term in nature, range trend monitoring must also be long-term.

- Particular attention must be paid to resource areas, infrastructure and other creation established including: water sources, salt-licks-Na, stock routes established, low lying areas of higher productivity, strategic fodder reserves and access farm land. Access of herders to other farm inputs such as agro industrial by-products should also be considered.

4 Conclusions and Recommendations

4.1 Conclusions

From the assessment, it can be concluded that Rufiji District has areas which are, using physical measurement parameters, potentially suitable for livestock production. The extensive grassland available supports a number of wild animals and could also provide forage to livestock. The study shows that most of the rangelands sampled are in good condition and are potential areas for livestock grazing. However , many of the sampled areas have never been grazed. Since the assessment considered the present status, their long-term suitability needs to be monitored in terms of animal condition and the range productivity over several seasons. From the analysis, areas that could support extensive livestock grazing area are Nyambawala, Muyuyu, Mtunda, Chumbi, Ruaruke B, Kikale, Kilimani, Umwe North and Mgomba North.

However, in all these areas there is tsetse infestation and no livestock infrastructure. Similarly, there are areas that are not suitable for pastoral type of production system such as those that may interfere with the biodiversity conservation and cause environmental pollution in flood plains and in areas where tse tse control is difficult and water for livestock is lacking.

In areas where livestock might be allowed to graze there is a need to keep the livestock number to the suggested animal unit number per given area. This will allow sustainable use of the land. Similarly, for efficient and sustainable use of these areas, there is a need to have infrastructure in place such as dips, watering points and livestock markets. Most of the areas have no livestock extension staff. The District Council might be required to employ and locate them in areas that might be used for livestock.

Traditionally, the local people are not livestock keepers, for sustainable use of the rangelands, there is a need to educate the local people and immigrating pastoralists on livestock husbandry.

There is a need to have village by-laws and agreements between crop farmers and livestock keepers to have clear demarcation of all land use and conservation areas especially the cropping and grazing areas.

Water sources for human beings should not be used for watering livestock. Village governments should have frequent meetings of all the village members and all other stakeholders to discuss issues relating to rangelands management and utilization. The District Council through its relevant departments should facilitate and probably initiate these efforts. There is a need to convene frequent meeting among the rangeland users to discuss and assess the rangelands status periodically. Among other things the study did not consider the value and economics of wild animals versus pastoral production This issues should receive further research.

4.2 Recommendations

From the area sampled for assessment and the analysis, Rufiji has the potential of supporting extensive livestock grazing. However, it has some limitation in some areas such as presence of floodplains (that are used for agriculture and where farmers practice recession agriculture), tsetse infestations, lack of water for livestock and lack of other infrastructure.

The study, recommends the following that need to be considered:

- A District statement should be issued asking prospective immigrant pastoralists to wait outside until the District, in collaboration with the villagers has developed a Livestock Management Strategy that will provide wise and sustainable use of the available grazing resource. Meanwhile those pastoralists who are in Rufiji already should work together with local people in the respective villages to properly allocate and demarcate the grazing areas, watering points and stock routes.
- Vegetation maps need to be established that will guide the District Council in planning, implementing and analyzing the results of subsequent rangelands surveys (as a necessary early element of rangelands inventory). Rangeland Management decisions require an understanding

of vegetation dynamics (changes). With such information District Councils and villages should be able to make proper judgments.

- The District Council should broadly categorise the district land into areas where pastorlism is not permitted, permitted seasonally, permitted with conditions outlined in District and /or village by-laws. It is suggested that the District Council, in consultation with village governments, should zone areas unsuitable, suitable with limitations and pre-requisites and suitable for livestock production. The District Council should apply the precautionary principle with regard to protection of some selected highly biodiverse areas and initially exclude them completely from pastoralism.
- Land use attributes should be monitored to determine any changes. As many changes are long-term in nature, range trend monitoring must also be long-term. There is a need to convene frequent meeting among the rangeland users to discuss and assess the rangelands status periodically. The District Council should plan and budget for this monitoring and seek support for this new function from higher authorities and donors.
- Immigrating pastoralists, local people in their respective villages and extension staff should, considering the needs of other users/land uses including domestic water collectors, fishers, wild fauna and flora, estimate the rational animal unit number of livestock that can be kept in their areas.
- The size and the potentiality of a particular grazing land will determine the reasonable number of livestock units that will be allowed to a particular village or community. Strict adherence to agreed numbers can reduce conflicts.
- Villagers should be educated on the proper number of animal units that can be kept in their villages without negative effect to their rangelands
- Villagers should be assisted to develop by-laws governing all land uses and conservation strategies. In this case. it implies the need for clear demarcation of zones for livestock grazing and crop cultivation activities.
- There should be a deliberate effort on awareness creation and education on livestock husbandry and rangelands management (for local natural resource users and for immigrant pastoralists)
- Strengthening communication between the district and villages. Also, communication mechanisms should be established at village level between local people and immigrating livestock keepers. The district Council should play a facilitation role in ensuring such communication.
- The village governments should be empowered through knowledge acquisition on village resource ownership, management and utilization. Similarly, raising awareness among the community on the sustainable utilization of Natural Resources and benefits sharing among various Natural resources users.
- Establishment of livestock markets, in places like Ikwiriri and Nyambawala should be considered in collaboration with village ward authorities and immigrant pastoralists.
- There is a need to invite more agricultural and veterinary outlets in the district
- District Councils and livestock keepers should mobilize resources to facilitate construction of livestock infrastructure in the identified locations
- There is a need to strengthen extension services particularly by adding/employing more livestock extension staff/ field officers in the district and bringing veterinary services close to livestock keepers. However, for sustainability District Council should facilitate training of para vets from communities themselves. They can be trained in LITIs and MATIs.

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6 Appendices

6.1 Appendix 1: Rufiji Environment Management Project TERMS OF REFERENCE (TOR) for Rangelands Assessment – DEVELOPING LIVESTOCK PRODUCTION STRATEGY for Rufiji District

TASKS OF THE CONSULTANCY:

1. Assess the status of the rangelands recourses in the plateau and flood plains agro ecological zones. Make the inventory of dominant pastures and forage species; their distribution pattern and their availability to grazing livestock need to be captured. The assessment should include the identification of poisonous plants or noxious forage plant species and locate areas where their occurrence posses the threat to grazing ruminants
2. In consultation with local communities and their village governments identify and recommend areas suitable for sustainable livestock production
3. Estimate the carrying capacities of the identified areas for livestock production
4. Identify tsetse infested areas and locate them if possible what is the intensity of infestation
5. Identify and locate available infrastructure e.g. stock routes and propose the missing ones, which are necessary for livestock production. Should consider ecological integrity (dips). Should recommend the infrastructure required
6. Investigate other range users and Identify the present stakeholders of the rangelands resources. Investigate wildlife management in the villages.
7. Predict the potential conflict among different stakeholders which are likely to occur.
8. Investigate the prevalent land tenure system and the way it affects (positively or Negatively) the rangelands resource management
9. Identify and locate water sources for grazing animals. Focus on water sources (lakes, rivers) when the vulnerability of drinking water to contamination is of primary concern and when the wetlands ecological integrity is likely to be jeopardized.
10. Propose some management options that will ensure wise use of rangelands resource and enhancement of inhabitants livelihood. Consider integrated rangeland resource mananagement approaches that improve the role of rangelands ecosystem as provider of good and services to wide range of stakeholders. Should suggest rules, regulations and laws governing sustainable livestock production
11. Define roles and responsibilities of major stakeholders taking into account their interest and their expertise to facilitate the implementation of the management options to be selected
12. Analyze and report on the assessed rangelands and their implications for Rufiji inhabitants in a manner that is readily understood by natural resource managers, district leaders, decision makers and the public at large. Community involvement during data collection (including the agropastoralists) is of paramount importance. This is not just because community should be the most affected by the management decision to achieve objectives but also their indigenous knowledge need to be tapped. Consider gender involvement during data collection
13. Convene a feedback workshop get local perspectives from relevant stakeholders meeting

6.2 Appendix 2: Time Table for Surveying Rufiji Rangelands for Livestock Production.

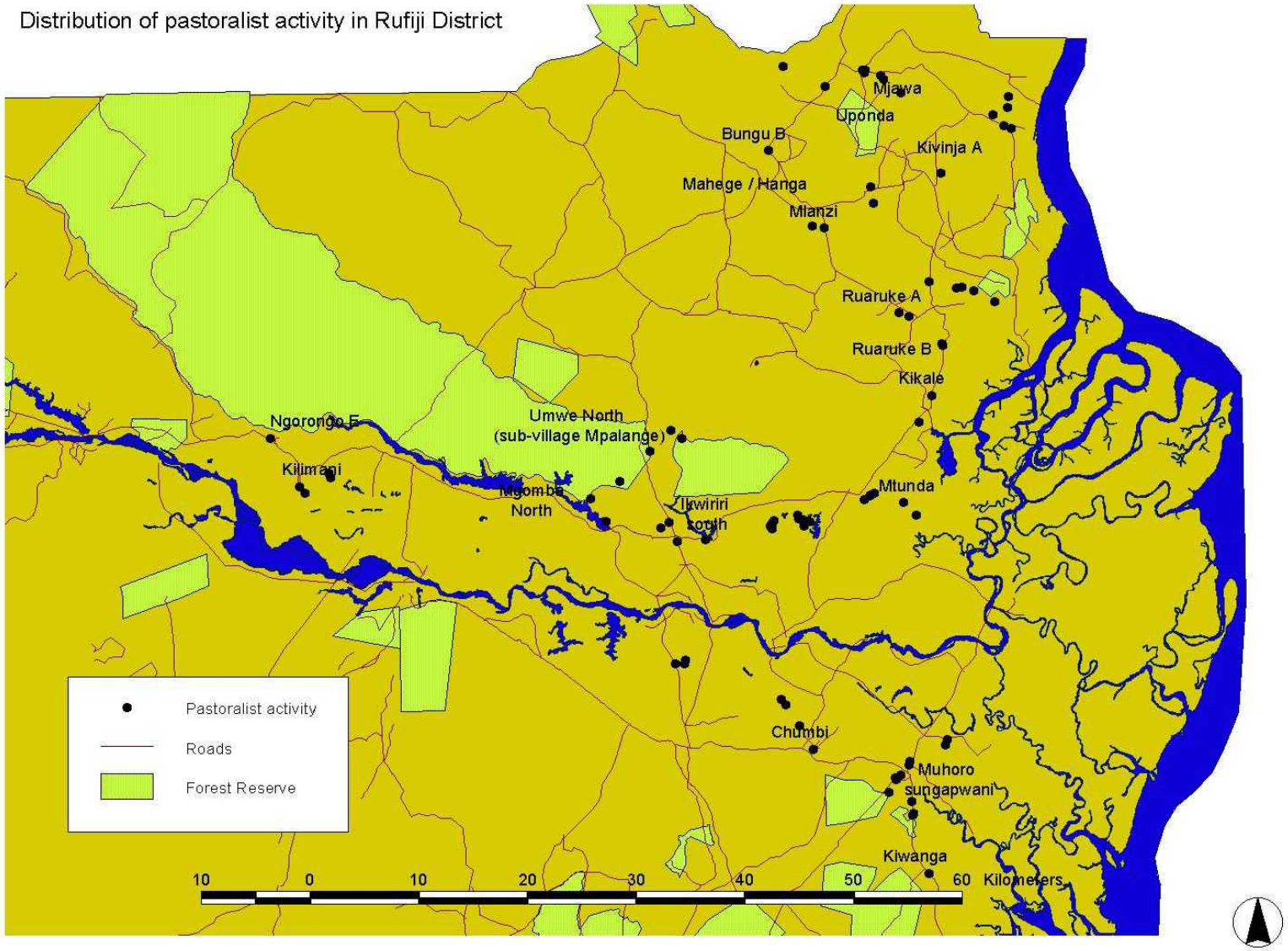
Date Feb., 2003	Division	Ward	Village
10th Feb	Meeting with EMT members and preparation for the field visit		
11th –12th Feb			Chumbi (A,B,C)
	Muhoro	Nyamwage	Muhoro
			Kiwanga
13th –14th Feb			Mtuda (A&B)
	Kikale	Mtunda	Muyuyu
			Njianne
15th Feb		Umwe	Umwe (N)
15th Feb	Ikwiriri	Mgomba	Mgomba (N)
			Ikwiriri (N)
16th Feb	Ikwiriri	Ikwiriri	Ikwiriri (S)
			Hanga
17th Feb		Mahege	Mlanzi
			Kivinja (A & B)
			Bungu B
18th Feb		Bungu	Uponda
			Mjawa
			Kilimani (E)
19th Feb		Ngorongo	Kilimani (W)
			Ngorongo (E)
			Ngorongo (W)
24th Feb	Brief Presentation of field report to District and REMP		

6.3 Appendix 3: Areas visited and their location GPS readings in UT M zone 37 ARC 1960

Village/ visited/	Grazing sites/or Pastoral Households	Watering points/Rivers/ Dams/Charcos	GPS readings	
			37 L	UTM
Mohoro - Sungapwani			0519762	9100284
	Mlekwa Njoro*		0520210	9095823
		Shimo la Udongo	0520102	9095685
	Londondo		0520003	9096972
	Mtuleke area: Masasa Yuda		0523244	9102631
		Bondekikoro	0523136	9102120
		Sunga: used people	0519841	9100658
Kiwanga			0521646	9090347
	Luwiko		0518546	9098938
	Omari Rabia*		0518473	9099116
	Nyambawala		0517902	9097756
		Shella for human use	0518993	9099350
Chumbi			0510940	9101724
	Kiyengea Area: Hassan Mbogoma		0508428	9105788
		Mohoro river	0508059	9106321
	Matias Maganga		0509720	9103928
Muyuyu	Mahembe Hanje		0507348	9122712
	Hababa Kishinganyi,		0507150	9122524
		Korongo, Nyamkongo Kingora (calves)	0507170	9122037
	Mpaje		0507043	9122210
	Edward Labia		0510107	9122242
	Mzee Charles		0510082	9122599
	Hune Ndaaki		0510048	9122868
		Lung'ara	0510627	9122688
	Lung'ara		0515637	9124657
	Emannuel Lugolola		0509508	9123253
	Mkande Nhune		0509646	9122913
		River Luhoi	0516163	9125054
Mtunda			0520434	9123279
	Ruhoi plains		0516576	9125254
	Bujiku Singamagaji		0519218	9124433
Kikale			0521848	9134254
	Yogobale area		0520703	9131839
		Ruhoi river	0516224	9125127
Mgomba North			0496952	9122081
	Pangapanga area		0490537	9124787
		Uba dam	0491944	9122670
	Gulwandanga		0493166	9126317

Umwe North				
(Sub Village-Mpalange)			0495965	9129155
	Nyakatombe/Makasange – northwards area		0497892	9131089
	Kiagabe valley		0498884	9130299
Ikwiriri South			0498437	9120850
	Sadiki Lukas (Mtongani)		0499233	9109889
		Pasudishi dam	0498303	9109628
	Saidi Kidawami		0499140	9109631
Mlanzi			0511935	9149641
		Water area	0510881	9149844
Mahege/Hanga			0516264	9153425
		Mkukurume /Kilabe	0516526	9151967
Kivinja A			0527437	9160082
	Chaduma area		0528519	9159068
		Mpundule	0529172	9158799
	Kisanjani		0528845	9160695
		Mzingwi-Bogela	0528917	9161739
	Mahege area		0522721	9154727
Mjawa			0515472	9164164
	Mianzini area		0519048	9162054
	Mkadi-Beekeeping		0517387	9163317
		Mkadi wells	0517142	9163642
		Dug wells	0515760	9164194
		Water-people	0515626	9163888
Uponda			0512013	9162628
	Uchembe area		0508211	9164466
Bungu B			0506834	9156780
Ruaruke B			0519777	9141557
	Kimbwele		0524160	9144091
	Construct boma		0524600	9144223
	Barabara simu		0525740	9143918
		Mkelele	0527657	9142853
		To Nyanjati	0521632	9144684
	Njassa Sangweni		0522786	9139015
		Njassa Miliki	0522870	9138843
Ruaruka A			0518859	9141842
Ikwriri North			0497715	9122576
Ngorongo (E)			0461091	9130284
Kilimani			0463787	9125887
	Kidadela Kidemsha		0466475	9127097
		Sanga/Meli	0466633	9126700
		Lembangwele	0464278	9125257

6.4 Appendix 4: Map showing Pastoral activity in East Rufiji District



Appendix 5: List of Participants During Field Data Collection

Utete HQ 1st meeting with District EMT	
Name	Designation
N.O. Mmbaga	Senior Community Development Officer (CDO)
S.O. Nindai	District Natural Resource Officer (DNRO)/Secretary
S.M. Sagara	Senior Agriculture Officer (SAFO).
E.B. Chirwa	District Fishery Officer (DfsO).
A.B. Mwakalinga	District Subject Matter Specilist (DSMS) FPN/Weather
Nandi R.X	District Subject Matter Specilist (DSMS) Land Planning (LP)
Olivier	Chief technical Adviser (CTA) REMP
Bainga Bwenda	Agricultural Field Officer (AFO).
Magamba Mhalla	District Subject Matter Specilist (DSMS) – LP.
Peter J.M.B	District Agriculture and Livestock officer (DALDO)
Deogratias Kashasha	Livestock Officer (L.O)
Abdulrahman Masoud	District Youth Development Officer (DYDO)
Chande	District Land and Natural Resource and Environment officer (DLNREO) (Assistant Coordinator of REMP
Angello Mwillawa	Senior Livestock Research Scientist – From LPRI, MPWAPWA -Consultant

Village	**Name**	**Designation**		**Village**	**Name**	**Designation**
MOHORO	Saidi Makwangu	M/Kiti Kitongoji		CHUMBI A/B/C.	Mohamedi B. Mpilli	M/Kiti Chumbi B
	Abdallah Goboleni	M/Kiti			Juma Mikuli	M/Kiti Cumbi C.
	Omari M. Mbonde	Manakijiji			Ramadhani Nganga	Mjumbe wa Serikali
	Athumani O Lyongo	Mwanakijiji			Abdallahman Ngongwa	Afisa Mtendaji Chumbi B.
	Shamte A. Kitara	Mwanakijiji			Hamisi Ibrahimu	Mjumbe wa Serikali
	Abbasi M Mkali	Afisa Mtendaji wa kijiji			Yusufu Kisoma	Mjumbe wa Serikali Chumbi A
					Mharami Bushiri	M/Kiti Kitongoji Chumbi A.
					Mussa H. Mbati	Mjumbe wa Serikali
KIWANGA	Hamisi Y. Mangongoli	Mjumbe wa Serikali			Habibu Gongolo	Mjumbe wa Serkali Chumbi C
	Ibrahim Mkinga	Mwanakijiji			OmariUgando	Mjumbe wa Serikali Chumbi C
	Saidi B. Kiyaka	Mjumbe wa Serikali				
	Makamba S Mpilli	Balozi		MUYUYU	Mussa A. Mlawa	Diwani Kata ya Myunda
	Mohamedi M. Ndekyo	Mwanakijiji			Omari kaidu	Mwanakijiji
	Shabini Lijoa	Mwanakijiji			Shuari M. Ngongota	Mwanakijiji
	Salum A. Mbonde	Mjumbe wa Serikali			Mohamedi Mkamba	Mwanakijiji
	Yusufu A. Mandagala	M/Kiti wa Kijiji			Jumanne Nurani	Village member
	Ahamadi Kinoga	Mjumbe wa Serikali			Abdallah Manzelele	Village member
	Rukia Mchuchuri	Mwanakijiji			Ali H. Nogemoyo	Village member

	Safia Alli	Mwanakijiji			Hussein A. Mege	Village member
	Hadija Athumani	Mwanakijiji			Pongwe a. Mtupa	Village member
					Saidi I. Manjelela	Village member
MTUNDA (A) &(B)	Yahya Lwambo	Village Chairman Mtuda A.			Mwarami alli Mtupa	Village member
	Amani S. Ndumbikwa	Village member			Halingumu Ndabwe	Village member
	Mbuma M. Mitongia	Village member			Kassimu A. Mtupa	Village member
	Sophia A Mtulia	Village Leader			Salumu S. Mwingo	Village member
	Saidi S Malengwe	CCM chairperson Mtunda A.			Razaki H. Matimbwa	Village member
	Mwanahawa K. Mbondela	Village leader			Puto Luamba	Village member
	Zaituni K. Kwamaya	Village leader			Muharami Mkingo	Village member
	Mkali Mohamedi	Village member			Juma B. Jongo	Village member
	Saidi O Nyaielo	CCM Secretary mtuda B.			Aliy S. Mchekwa	Village member
	Jabil A Manzi	Village leader Mtunda B.			Omari A. Ngomwe	Village member
	Shabani K Sea.	Village secretary Mtunda A.			Ramadhani A. Mtupa	Village member
	Hamisi Mpendu	Village member			Hamisi Luambo	Village member
	Mzee Halunda Mlaazi	Village member			Bakari A. Jongo	Village member
	Jabili H. Magombelia	Village member			Hamisi I Kiguni	Village member
	Hamisi S. Ugando	Village member			Shante Nogemoyo	Village member
	Habudala Kasimu	Village member			Bakari S. Mkamba	Village member
	Mustafa Ndota	Village member			Hamisi M. Ngung'unde	Village member
	Amili Upatacho	Village member			Hassani A. Mega	Village member
	Magesis' Shabani	Village member			Saidi Kibambe	Village member
	Saidi Muwa	Village member				
	Omali Katala	Village member		KIKALE	Musa S. Mamba	
	Musa Mkamba	Village member			Said A. Mlekeni	
	Shabani Musa	Village member			Hamis A. Mbarange	
	Nuhu Ali Mkeda	Village member			Hathidhi B. Mueka	VEO
	Hadamu Shebe	Village member			Hon. Y. Mlawa	Councillor
	Ali H. Mtula	Village member				
	Bakali Mbokoimo	Village member		MGOMBA KASKAZINI	Haruna Omari Simba	Village Chairperson
	Ali Mohamedi	Village member			Moshi Mkanywe	Village leader
	Ali Bakali	Village member			Hussein Yusufu Likoselo	Village leader
	Hamiss Bakali	Village member			Tatu Seif Mponda	Village leader
	Bakali Yusufu	Village member			Mohamed S. Mkundi	VEO
	Mzee Idi	Village member			Pili Athuman Nyawaba	Village leader
	Ali Yusufu	Village member			Abdallah Mtupa	Village leader
	Rashidi Ndubikila	Village member				
	Yusufu Punguto	Village member		UMWE KASKAZINI	Rajabu J. Kilimali	Chairman

	Yusufu Ungando	Village member			Bakari S. Mpembenua	VEO
	Omari Mbondela	Village member			Said M. Mbute	Village member
	Yusuf Mang'onga	Village member			Said A. Mtimbe	Village member
	Saleli Mlawa	Village member			Hassan S. Mbonde	Village member
	Musa Ali	Village member			Omari M. Mpawane	Village member
	Mzee Kassimu Sea	Village member			Mohamedi J. Ngatebuli	Village member
	Musa Omali	Village member			Said H. Said	Village member
	Musa Mohamedi	Village member			Ali J. Matengua	Village member
	Hasani A. Upindo	Village member			Ali M. Mbute	Village member
	Juma Musa	Village member			Ali B. Mpalaki	Village member
	Omali Mgomi	Village member				
	Yusufu Mtupa	Village member		IKWIRIRI KUSINI	Shaban Kilingamoyo	Chairman
	Mohamed Musa	Village member			Fatu Mkwaonywe	Village leader
	Juma Maege	Village member			Mohamed R. Mgomi	VEO
					Kiwenini Kirungi	Village leader
MLANZI	Ali J. Mtangiamoyo	VEO				
	Said Amili	Village member		HANGA	Hamisi Saidi	Village Leader
	Zuberi Ligwala	P/school Chairman			Mharami Kasimu	Village member
	Hismaili O. Mpaka	Village member			Ramadhani Toromeni	Village member
	Jumanne Rute	Village member			Juma S. Pukwa	Village member
	Musa jumaa				Juma I. Rwambo	Village member
	Juma Rondo	Village member			Haji Abdallah	Village Leader
	Jumanne Kijimba	Village member			Yusuf H. Rukwa	Village member
	Said O. Mpaka	Village member			Ally Bakari	Village member
	Bakari Kenda	Village member			Salumu B. Toromeni	Village member
	Seifu Amiri	Village member			Hassani Ngumbo	Village member
	Hija Mpaka	Village leader			Hamisi Salumu	Village leader
	Musa Saidi	Village member			Ramadhani S. Rukwa	Village leader
	Hamisi Ngajima	Village member			Haji Kasimu	Village member
	Seifu Ngaora	Village member			Shabani M. Mnele	Village member
	Jumu Kufakulala	Village member			Nuru M. Mandume	Village member
	Abdallah Londo	Village member			Musa Bakari	Village member
	Hajidu Juma	Village member			Nomani Said	Village member
	Hamisi Ngajima	Village member			Shabani Mhina	Village member
	Mohamedi Ngwilika	Village member			Jowa Hemedi	Village leader
	Mohamedi Lipola	Village member			Twaiba Iddi	V/ Chairman
	Haruna Amili	Village member			Rashidi Mwishehe	Village member
	Hisa Muenga	Village member			Zaluni Mboro	Village member
	Ramadhani Mpitapa	Village member		KIVINJA "A"	Abrahamani Ali	CCM Secretary
	Hamisi Mpanganya	Village member			Bakari Mbonde	Village leader
	Hamisi Kanda	Village member			Masudi Mpemba	Village leader
	Seif Jeta	Village member			Hamza Ally	Village leader
	Sultani Bakari	Village member			Salama Mbonde	Village leader
	kiborieani	Village member			Nahodha R. Bora	Village leader
	Hamisi Mseto	Village member			Idi Kisa	Village leader
	Mohamedi Mpuka	Village member			Yusufu Aburu	Village leader
	Limbatike	Village member			Harufani Buyu	Village leader
	Sultani Masunda	Village member			Hija A. Mngombe	Village leader

	Hamisi Shabani	Village member			Abrahamani Alli	Village leader
	Mandikili	Village member			Ally Hababuu	Village leader
	Rajabu Mkopi	Village member			Ally Salumu	Village leader
	Juma Lipitile	Village member			Hasani Kisi	Village leader
	Mbonde Kasimu	Village member			Kasim N. Magalambwe	Village leader
	Mzee Kipilili	Village member			Hamidi W. Mpoge	Village leader
	Mshoma Masunda	Village member			Mohamed M. Msema	Village member
	Matoywa	Village member			Twalha O. Mtambo	Village member
	Shuwali Seif	Village member			Yahaya A. Toto	Village member
	Masudi linamwane	Village member			Ally Mlanzi	Village member
	Mohamedi Juma	Village member			Said y. kalam	Village member
	Makua	Village member			Juma A. Mjambo	Village member
	Seifu Mugalo	Village member			Bakari O. Dijas	Village leader
	Hemedi Baku	Village member			Hasani Hamidu	CUF Secretary
	Mkali Mtoto	Village member			Mohamede H Namwe	Village leader
	Masudi Mandami	Village member			Mohamed A. Twahili	Village leader
	Mtope Seifu	Village member			Yusufu M. Mkungunikie	Village leader
	Mzee Machipi Ngunge	Village member			Mwaharami Habagu	Village leader
	Hamisi Nguyu	Village member			Hasan H. Toto	Village leader
	Like	Village member			Masudi Baka M.	Village leader
	Motisha Hamidu	Village member			Kasimbila	Village leader
	Kikwata Amili	Village member			Mwarami M. Msena	VEO
	Hamisi Hidi	Village member			Asia Shabani	Village leader
	Juma Sabili	Village member			Ziada Ally	Village leader
	John Matunda	Village member			Sijali A. Msena	Village leader
	Matimbwa	Village member			Zakia Shamte	Village leader
	Kaimu Ngakula	Village member			Binti Ally	Village leader
	Mohamed Mugalo	Village Chairman			Abrahamani Athumani	Village leader
	Haruna Mpendu	Village member			Adam Y. Tulango	Village leader
					Ally S. Lukale	Village member
MJAWA	Muharami Ngatoma	Village chairman			Sutani Tulango	Village member
	Mohamed kitimla	VEO			Zuberi A. Jongo	Village member
	Hassani Mbale	Village member			Wage Juma	Village member
	Issa Songana	Village member			Said Omari	Village member
	Yosako Bogoma	Village member			Haruna R. Mketo	Village member
	Shabani Bwaki	Village member				
	Hatibu Lochwa	Village member		UPONDA	Omary Mtunga	Village leader
	Yusufu Mtolilo	Village member			Saidi Said	Village member
	Zakiya Hakungwa	Village member			Omari Mtawanya	Village member
	Sultani Choma	Village member			Abiola	Village member
	Hija Mapande	Village member			Saanane Juakali	Village member
	Visenti Malembo	Village member			Charles Symon	Village member
	Patriki Mshinde	Village member			Abdallah Mussa	Village member
	Aisha Bakari	Village member			Mwalami Jongo	Village member
	Magrethi Haule	Sub-village chairperson			Omari Mssanga	Village leader
	Bakari Choma	Sub-village chairman			Abdallah Mwaye	Village member
	Hemedi Ndete	Village leader			Sevelin Chiled	Village member
	Kassimu Mkomba	Village leader			Salum Nanyalika	Village member

	Exavery Matukuta	Village leader			Salum Shibe	Village member
	Bakari E. Ndombo	Village member			Nadhilu Monero	Village member
	Alliy Melopa	Village leader			Mohamed Mkukumba	Village member
					Kassim Zomboko	Village member
BUNGU 'B'	Ali B. Ndambwe	VEO			Salum Matika	Village member
	Likupatile	Village member			Abdallah Plonga	Village member
	Juma Shamte	Village member			Samiya Hamza	Village member
	Ali Mohamedi	Village member			Maulidi Kitako	Village member
	Mohamedi Mtuta	Village member			Rashidi Mwaye	Village member
	Jitu Mteta	Village member			Mzee Amani	Village leader
	Abdu Salum	Village member			Moshi Simba	CCM Secretary
	Kigumi	Village member			Mohamed Nendae	Village member
	Makope Amili	Village member			Hamisi Kazimali	Village member
	Mshauli	Village member			Mfaume Husseini	Village member
	Mpanyika	Village member			Hamida Mohmedi	Village member
	Moyogani	Village member			Mohmed Nyanja	Village member
	Zuhura Ramadhani	Village member			Saidi Khery	CCM leader
	Pili Ali	Village member			Hamisi Alfani	Village leader
	Mwajuma Ndugi	Village member			Hamisi Makacho	Village leader
	Mamin Salum	Village member			Mohamed Abubakari	Village chairman
	Nyalukwili	Village member				
	Aisha Makope	Village member		NGORONGO 'A & B'	Mzee Kipoka ungando	Village member
	Mama Ngondai	Village member			Shabani Milondomo	Village chairman
	Mariamu amiri	Village member			Mzee Munija	Ward Secretary
	Shani Mtuanga	Village member			Hassan Mbembeni	Village member
	Sefu sultani	Village member			Abdallah Sakoro	Village member
	Ally miba	Village member			Mzee Mbonde	Village member
	Mohamed Mwadili	Village member			Sule	Village member
	Shabani Kigikele	Village member			Sarehe Mbamba	Village member
	Amili Lyamikono	Village member			Seyo	Village member
	Nyokora	Village member			Mzee Mkenzwa	Village member
	Mndumbo	Village member			Salumu Matimbwa	Village member
	Hamisi Mkumba	Village member			Mzee Ngabeleka	Village member
	Omari Sunga	Village member			Mzee Kalindima	Village member
	Nyangondai	Village member			Idd Mpokele	Village member
	Omari Mfifa	Village member			Hemedi Kiboyoboyo	Village member
	Mwajabu Beka	Village member			Musa Lulo	Village member
	Tol Kikalikinya	Village member			Shamte Ngabeleka	Village member
	Yasini Kilindo	Village member			Fikiri Manogerwa	Village member
	Maulidi kalo	Village member			Siwazuri Mbembeni	Village member
	Azizi Rwambo	Village member			Nyambonde Mbilinyi	Village member
	Ramadhani Saidi	Village member			Amina Mkandambwe	Village member
	Ally Nyambunda	Village member			Hasani Mkandambwe	Village member
	Mohamed Saidi	Village member			Mashaka Kigomba	Village member
	Ramadhani Musa	Village member			Seifu Ufuta	Village member
	Mzee Masanda	Village member			Yunusi Ungando	Village member
	Musa Mpili	Village member			Issa Mangwala	Village member
	Rajabu Kilindo	Village member			Maudhi Mkumba	Village member
	Omari Muba	Village member			Bakari Mtambo	Village member
	Omari Mkamba	Village member			Hasara Mbembeni	Village member

	Saidi Ngindo	Village member			Mzee Ngaengwa	Village member
					Salum Kiyumbo	Village member
KILIMANI 'A & B'	Mshamu Kindamba	Village member			Juma	Village member
	Juma Kisokora	Village member			Uwesu Mbembeni	VEO
	Selemani Mtyanga	Village member			Omari Yoghyo	Village member
	Hamisi Mtonya	Village member			Mzee Lupaa	Medical assistant
	Shukuru Dikokona	Village member			Azizi Kachoko	Village member
	Shauri Momba	Village member			Salum Kitola	Village member
	Mzee Ndumba	Village member			Salum T. Lulo	Village member
	Mzee Selemala	Village member			Hassani Mpange	Village member
	Halfani Gubwi	Village member			Abdalahaman Musa	Village member
	Abdu Idi	Village member			Mzee Kigumi	Village member
	Moshi Sambale	Village member			Ramadhani Mneka	Village member
	Juma Ndungaji	Village member			Ligogi	Village member
	Salumu Mpangandaro	Village member			Athumani Juma	Village member
	Shamte Kapungu	Village member			Nassoro mnimba	Village member
	Saidi Mikengesi	Village member			Zamoyoni Mwera	Village member
	Uwesu Bokeka	Village member			Matupu	Village member
	Abdala Nasoro	Village member			Mzee Mapande	Village member
	Moshi Ipombe	Village member			Mzee Mkumba Moshi	Village member
	Mzee Denja	Village member			Athumani Kiokile	Village member
	Seifu Kiilili	Village member			Ali Mogealiu	Village member
	Ali Msumu	Village member			Yussufu Chambo	Village member
	Mzee Mpange	Village member			Mohamedi Mikonzi	Village member
	Moshi Kisokora	Village member			Hamisi Mbembeni	Village member
	Moshi Njechele	Village member			Hamisi Ngalemea	Village member
	Shabani Mtaukila	Village member			Logolo Shrehe	Village member
	Huseni Ngaroka	Village member			Hassani Mbolombo	Village member
	Selemani Seifu	Village member			Hamisi Punzi	Village member
	Juma Matimbwa	Village member			Hashimu Kiumwa	Village member
	Shaweji Gochi	Village member			Mzee Pongwa Kiumwa	Village member
	Hasani Malisi	Village member			Hamisi Jongo	Village member
	Abdala Songo	Village member			Saidi Upolo	Village member
	Dihenga	Village member			Hassani ungando	Village member
	Sudi Bokera	Village member			Rashidi Mogealiu	Village member
	Shabani Sudi	Village member			Mtambo	Village member
	Bakari Kusia	Village member			Kasimu Kirogwela	Village member
	Ngoba Mkeyenge	Village member			Mzee Ali Jongo	Village member
	Ali Songasonga	Village member			Shabani Sakoro	Village member
	Ath Suba	Village member			Saidi Kidiamiangi	Village member
	Mzee Kisokwa	Village member			Hassani Ngabeleka	Village member
	Ramadhani Mkeleka	Village member			Mzee Kindaki Mwera	Village member
	Titili Ngwele	Village member			Uwesu Mbili Mbili	Village member
	Kasimu Makeha	Village member			Abdalahamani Kiboyoboyo	Village member
	Abdala Ngakonda	Village member			Rajabu likulo	Village member
	Hamisi Tenyu	Village member			Nyamkumba Matenganya	Village member
	Moshi Gange	Village member			Siamini Mikonzi	Village member
	Ali Mkubuge	Village member			Selemani	Village member

	Moshi Mketo	Village member				
	Babulao Sabo	Village member		RUARUKE	Mgen A. Monero	
	Shabani Kirungi	Village member			Bakari A. Ndomondo	Village chairman
	Ramadhani Mkuka	Village member			Bakeri A. Marufua	Village secretary
	Mzee Bora	Village member			Bakari R. Kilinda	Village member
	Shamte Maneno	Village member			Shaban M. Marufya	Village member
	Yaona Kisoma	Village member			Shaha H. Marufya	Village member
	Saidi Ngayoga	Village member			Mustafa M. Mwipi	Village member
	Idi Ibrahim	Village member			Saidi H. Manguda	Village member
	Maulidi Msanga	Village member			Mohamedi Mndendya	Village member
	Selemani Saidi	Village member			Abdallah S. Mandai	Village member
	Salumu Maulidi	Village member			Abdu H Manguda	Village member
	Shabani Msanga	Village member			Jumanne farahani	Village member
	Hemedi Denja	Village member			Hassani Mpendu	
	Ath Jenga	Village member			Mkalipa	
	Mzee Ali Sobo	Village member			Kudaidi Makufya	
	Mzee seifu Mbembeni	Village member			Hassani A. Mwandama	
	Mzee Saidi Mohamedi	Village member			Abdu B. Kiyumbo	
	Yahaya Mnyongia	Village member			Issa H. Tanda	
	Seifu Mtaukila	Village member			Abdu J. Mfuguji	
	Mzee Jafari Ngokoleko	Village member			Musa M. Baraka	
	Mzee Saidi Mwangia	Village member			Ally R. Kilapo	
	Mzee Mkeyenge	Village member			Musa J. Farahani	
	Juma Mkima	Village member				
	Jumanne Mninge	Village member		RUARUKE 'A'	Tunu H. Nguru	Village secretary
	Mzee Mwau	Village member			Amiri A. Kinyogori	Village chairman
	Mzee Seifu Rashid	Village member			Hija A. Onga	Village leader
	Kasimu Bombwe	Village member			Sulaimana Mfaume	Village leader
	Sudi Yusufu	Village member			Ally S. Mfaume	Village leader
	Hamisi Ngaleka	Village member			Amiri H. Mkumba	S/-village C/man
	Mzee Ali Mbiku	Village member			Saidi Ngumba	Village member
	Mzee Sudi Kiililil	Village member			Salumu Kabange	Village member
	Mzee Liutike	Village member			Rashidi Mandiba	Village member
	Mzee Mwalongo	Village member			Ally S. Milandu	Village member
	Mzee Myali	Village member			Hamisi A. Ukuluma	Village member
	Saidi Ndungati	Village member			Wazili Mafufy	Village member
	Mzee Lumu	Village member			Shirali Mjenga	Village member
	Adamu Ngakonda	Village member			Ally Mteketra	Village member
	Mzee Songasonga	Village member			Hamisi A. Kisoma	Village member
	Mzee bokera	Village member			Uwesu Njalanguru	Village member
	Rajabu Bokera	Village member			Shirali Mtorya	Village member
	Hidaya Nyangalio	Village member			Rajabu Kuchochurana	Village member
	Sunajibu Mwegio	Village member			Hasani J. Kimila	Village member
	Mzee Nyamatimbwa	Village member			Jamadi Mwandama	Village member
	Mzee Mwanaidi Mkopo	Village member			Aluna Kabange	Village member
	Pili Mwagenge	Village member			Mahadhi B.	Village member

					Nguombili	
	Mzee Nyabutwa	Village member			Mbigika	Village member
	Pili Mpingo	Village member			Amiri Mtamburura	Village member
	Mzee Mwetinrwa	Village member			Hashimu O. Kisoma	Village member
	Mzee Machale	Village member			Kasimu Kilango	Village member
	Moshi Mwetinrwa	Village member			Ramadhani Njechele	Village member
	Saidi Ndumba	Village member			Hemedi I. Mnyungu	Village member
	Abdu Mshamu	Village member			Amiri O. Msanga	Village member
	Saidi Kiame	Village member			Mwindoe Milongie	Village member
	Seifu Matimbwa	Village member			Saidi udinga	Village member
	Chepesi Mwetindwa	Village member			Saidi Chukuli	Village member
	Moshi Mdugi	Village member			Mussa Mchekwa	Village member
	Mariamu Mkeleka	Village member			Jumanne Mtimbo	Village member
	Angaisho Msafiri	Village member			Bakari Mtote	Village member
	Swaumu Kirungi	Village member			Abdallah Papa	Village member
	Mwamviga Sungura	Village member			Yusufu Timboti	Village member
	Mama Subira	Village member			Hamisi Lundu	Village member
	Mama Haji	Village member			Seifu A. Ngundai	Village member
	Mama Seifu	Village member			Njechele	Village member
	Tatu Mwangia	Village member			Hasani Mketo	Village member
	Juma Mtenguka	Village member			Abdallah Maputu	Village member
	Nyamkanzi Sule	Village member			Ally M. Mfaume	Village member
					Lipongwile	Village member
IKWIRIRI NORTH	Athumani Sudi	VEO			Rashidi M. Mpendu	Village leader
	Mohamedi S. Mlawa	Village leader			Hilali K. Mwinyikondo	Village leader
	Zuberi Mwinjo	Village leader			Ally B. Mfaume	Village leader
	Salumu A. makombo	Sub- Village leader			Kiyoki	Village leader
	Habibu Mbonde	Village leader			Hassani Shineni	Village leader
	Salum Mpawane	Village leader			Hamisi ilionza	Village leader
	Sultani Mgowengo	Village leader			Kasimu Maunga	Village leader
	Fatuma Farahani	Village leader			Shamte R. Mkumba	Village leader
	Saidi M. Mnongerage	Sub-village chairman			Jumanne R. Kimimbi	Village leader
	Cosma Muhagama	Village leader				
	Mwajuma M. Tindwa	Village member				
	Mwajuma Manyamda	Village member				
	Hemedi M. Kalelea	CCM Secretary				
	Habibu S. Ndende	Village chairman				

6.5 Appendix 6: Photograph of participants in villages visited

Woman fetching water for over 4 hours at Mjawa

Mjawa deforestation due to charcoal and cultivation

Bungu B. Village meeting

Mjawa grazing area – Mianzini charcoal behind

Mjawa Natural well called Mkadi – Chairman, elder and Mrema

Mjawa Village meeting

Ring wells at Mjawa Village

Watering point for human at Mjawa

Uponda Potential Grazing area called Uchembe

Women waiting for fetch water at Mjawa

Uponda village meeting – Blue shirt is chairman

Potential Grazing area Nyambawala

KIWANGA Village members

Kiwanga women participants with VEO Muhoro and Chairman

Lake Shella watering point

Lake Shella – area for fetching water.

MUHORO - grazing area for Mlekwa Njoro

Muhoro – Sungapwani sub-village

Mzee Masasa- Part of his herd - Mtuleke

Mzee Masasa showing poisonous forage species at Mtuleke

Mzee Zagaza former Boma

Portion of Lake Shella

Mzee Masasa's family and Mhalla