

**Livestock Resources Inventory and Mapping in Agro-pastoral area of Senani,
Maswa District, Shinyanga, Tanzania**

By

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TABLE OF CONTENTS

LIST OF FIGURES	iii
LIST OF TABLES	iv
LIST OF PLATES	v
1. INTRODUCTION	1
2. METHODOLOGY	2
2.1. Pre-field work	2
2.2. Field work	2
2.3. Post-field work.....	3
3. RESULTS.....	4
3.1. Description of the study area	4
3.2. Livestock resources.....	6
3.2.1. Grazing reserves.....	8
3.2.2. Rivers and water points	13
3.2.3. Livestock Routes	17
3.2.4. Livestock Health and market centres	19
4. CONCLUSIONS AND RECOMMENDATIONS	21
4.1. Conclusions.....	21
4.2. Recommendations.....	21

LIST OF FIGURES

Figure 1. Location of Maswa district in Tanzania	5
Figure 2. Location of Senani area in Maswa district	5
Figure 3. Livestock resources of senani area	7
Figure 4. Spatial distribution of major grazing reserves.....	9
Figure 5. Spatial distribution of private and public grazing reserves	10
Figure 6. Position of Senani relative to major dry season grazing areas	12
Figure 7. Distribution and seasonality of water sources	14
Figure 8. Ownership of water points.....	16
Figure 9. Livestock movement routes.....	18
Figure 10. Location of livestock market and dipping centres.....	20

LIST OF TABLES

Table 1. Nature of ownership and sizes of the grazing reserves of Senani area..... 11

LIST OF PLATES

Plate 1. Technical and support team members pose for a photo after field work.....	3
Plate 2. Natural vegetation of Senani area	4
Plate 3. A private grazing reserve bordering a crop field	8
Plate 4. Livestock drinking in a pond formed on seasonal river bed.....	13
Plate 5. A non-functional water pump due to sub standard concrete.....	15

1. INTRODUCTION

The agro-pastoralist economy is based on livestock and crop production. The societies practicing agro-pastoralism are equally highly dependent on livestock for their basic food, income and social needs as it is for crop production. The Agro-pastoral production system has developed in semi arid lands and is arguably the best form of land use for these areas.

In Senani area where agro-pastoralism is practiced, the agro-pastoralists tend to leave some portions of their land as grazing reserves. The herds of cattle, sheep and goats utilize the forage and water in these grazing reserves only during dry season. This system allows the set aside land to be left free from human activities and livestock grazing during rainy season, which allows natural re-establishment of pasture for re-use in the next dry season.

The sizes of the herds in Senani are relatively large such that the grazing reserves with their associated water points are by far less sufficient. This necessitates seasonal migration of some of the animals to the wider grazing lands and permanent water sources in nearby and distant areas. The movements of the agro-pastoralists are therefore very much influenced by the size of their herds in comparison to the size of the grazing reserves under their access and the availability of drinking water. They are also influenced by the factors which affect the abundance and performance of the pasture in their grazing reserves such as favourable amount and distribution of precipitation. The movements in search for pasture and water raise a lot of conflicts with other land users especially the crop growers and conservationists.

Information on the available livestock resources is very important for development players who would wish to intervene in improving livestock production. It is on that basis that the project on **“Contingency Plans for coping with Crisis Situations in Pastoral Areas of Eastern and Central Africa”** wanted to get the livestock resource information of Senani area so that it can use it for appropriate planning and implementation of sustainable livestock production and development of general management plans. The information sought by the project included the livestock migration routes, water sources, grazing reserves, livestock market centres and livestock health services. This information could be acquired, processed and presented using GIS operations.

To accomplish that goal, the Project Coordinator requested Mr. Boniface H. J. Massawe of Department of Soil Science, Sokoine University of Agriculture, Morogoro, Tanzania to make an inventory and map the aforesaid livestock resources in the agro-pastoral community of Senani in Maswa district, Shinyanga region, Tanzania by using GIS technologies. The field work was carried out between 15th and 21st May, 2011.

2. METHODOLOGY

2.1. Pre-field work

A review of literature on grazing areas in Maswa was done. Some orientation base maps were prepared and preliminary boundaries of the study area were identified and digitized from relevant topographic maps (1:50,000 scale) using ArcView GIS 3.2 software. Equipments necessary for navigation and mapping such as GPS, Topographic maps, and agro-ecological map for the study area were collected.

2.2. Field work

A meeting with local project monitors and village leadership was convened on arrival to Senani area in order to, in a participatory way, gather information and identify the livestock resources which were intended to be mapped. In the meeting a list and information on approximate position of the grazing reserves, rivers, water points, animal routes, market centres and dipping centres were collected. This information was used to plan and carry out the mapping exercise. The local project monitors and village extension officer were part of the field team who played a major role on how to access the livestock resources identified for mapping. They also provided useful information on the ownership, functionality and seasonality of the resources being mapped.

Hand held GPS sets (Garmin) were used to record coordinates of the boundaries forming the shape of the livestock resource being mapped. Water points, market centre and dipping centre were taken as points. Livestock routes and rivers were tracked using the GPS. Boundaries of

grazing reserves were also tracked to a close to form a polygon for each grazing reserve. Attribute information was recorded against each coordinate/polygon on a data sheet.



Plate 1. Technical and support team members pose for a photo after field work

2.3. Post-field work

The recorded coordinates were uploaded in ArcView GIS 3.2 software. Coordinates forming routes and rivers were used to digitize lines to come up with rivers and livestock routes themes respectively. Coordinates representing water points, livestock market and dipping centres were used to digitize point themes for each of the above mentioned resource features. Coordinates recorded for grazing reserves were used to digitize polygons representing the grazing reserves theme. Attribute data for each theme were also filled in their appropriate fields (columns) and records (rows). Calculations were done in the software using GAF tools to determine sizes of the polygons. Microsoft Excel software was used in organizing the data and calculations.

3. RESULTS

3.1. Description of the study area

The Senani study site belongs to Senani village in Maswa district, Tanzania (Fig. 1, and 2). It occupies an area of approximately 13,277 hectares, extending from 34.03⁰ to 34.11⁰E and 3.14⁰ to 3.22⁰S. The area is situated in the altitude range between 1000 to 1200 m above sea level with average annual rainfall ranging between 1000 to 1200 mm (DePauw, 1984). Apart from livestock keeping, the area is located in an agro-ecological zone which can support a number of agricultural crops including millet, sorghum, ground nuts, cassava, sweet potato, maize, rice, simsim, sunflower and cotton.

According to DePauw (1984), Ferralic Cambisols and Eutric Planosols are major soils of the study area. Some small portions of land containing most probably, Eutric Vertisols were observed during the field work.

The natural vegetation of the study area comprised of acacia trees and grasses (Plate 2). Most of the land is however cleared for agricultural and settlement purposes. Overgrazing has also been a major contributor to deterioration of the natural vegetation.



Plate 2. Natural vegetation of Senani area

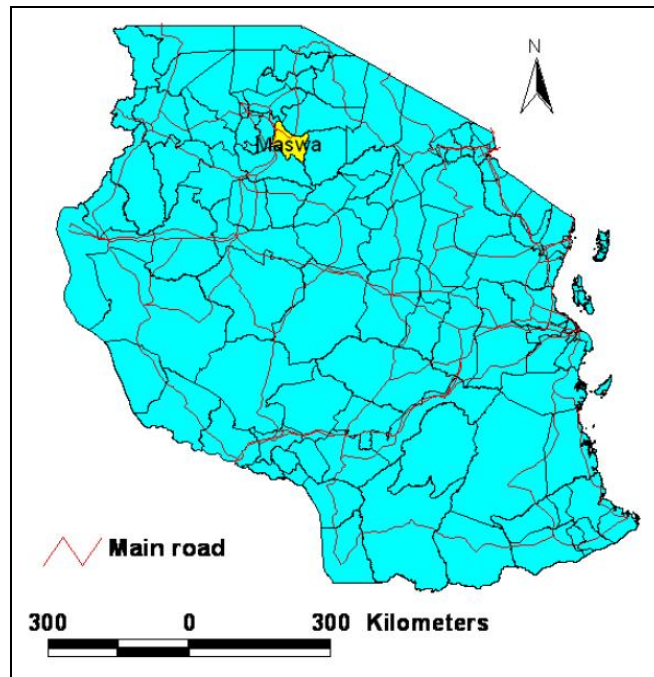


Figure 1. Location of Maswa district in Tanzania

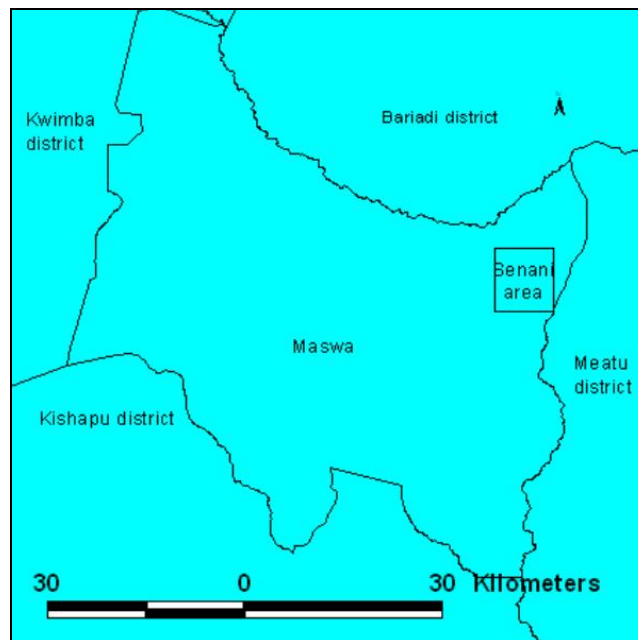


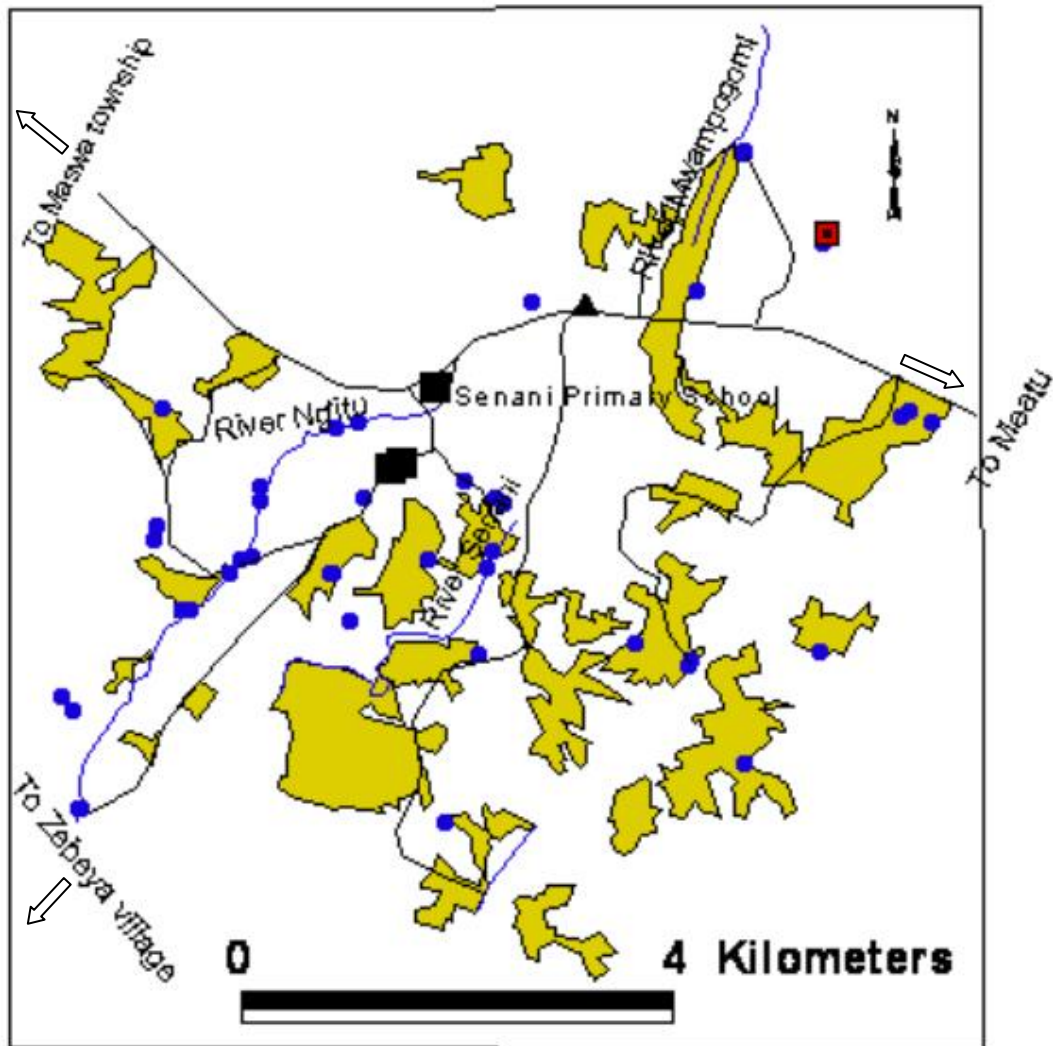
Figure 2. Location of Senani area in Maswa district

3.2. Livestock resources

The livestock support resources found in Senani area during the study are shown in Fig. 3 below.

These resources were;

- i. Major grazing reserves which are used to feed animals during dry season,
- ii. Rivers and water points which are sources of water both in dry and wet seasons,
- iii. Roads and stock routes which are used to access livestock markets, livestock health services, grazing reserves and water sources within and outside the study area,
- iv. A livestock market centre in which livestock traders from outside and within the study area buy livestock brought to the market from within the study area and the nearby villages
- v. A livestock dipping centre.



- ▲ Livestock market centre
- Livestock dipping centre
- Livestock routes
- Rivers
- Water points
- Grazing reserves

Figure 3. Livestock resources of senani area

3.2.1. Grazing reserves

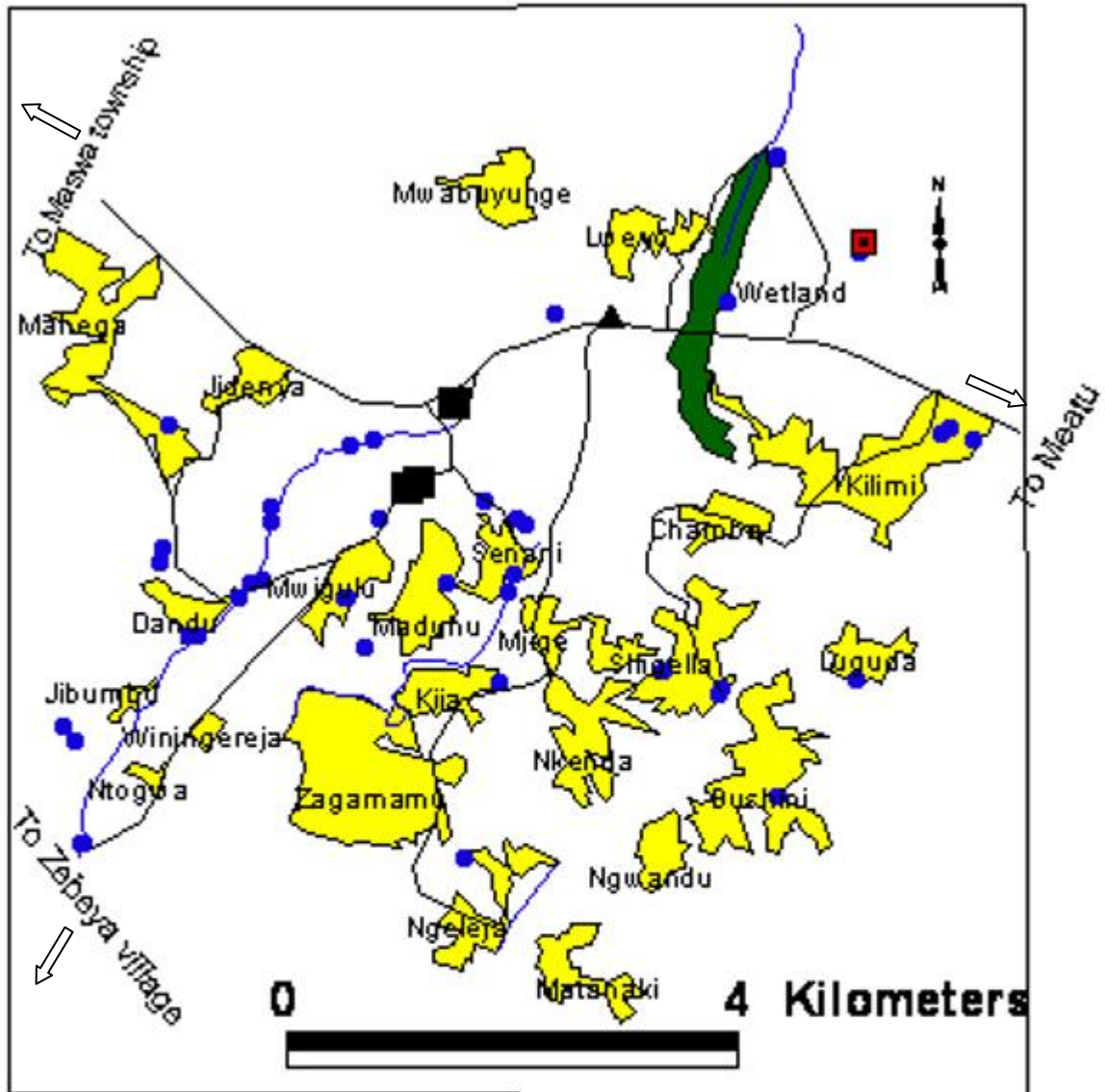
The major grazing reserves in the study area are presented in Fig. 4. Most of the grazing reserves in the area are owned privately covering about 86% of all the grazing reserves, while the rest are publicly owned under the village government (Fig. 5 and Table 1). The privately owned grazing reserves normally border the crop fields (Plate 3) of the same owner. Of the total area of Senani, the grazing reserves cover about 8%. Most of the remaining land is used for agriculture and settlement.

The grazing reserves are normally left uncultivated during rainy season to allow regeneration of the pasture. This is exceptional in a wetland area (Fig. 4) which is used for paddy rice cultivation in wet season and as a grazing area during dry season. This wetland is however highly fragmented with many individuals owning small pieces of land in it.

Generally the grazing reserves are not sufficient to feed all the livestock during dry season. This is contributed by poor dry matter which comes as results of poor pasture management, erratic weather and to a larger extent by bigger number of livestock which surpass the grazing reserves biomass and land size. As a result, many livestock owners move their animals to Wembere valley and Maswa Game Controlled area (Fig. 6). Livestock grazing is prohibited in the latter area.



Plate 3. A private grazing reserve bordering a crop field



- ▲ Livestock market centre
- Livestock dipping centre
- Livestock routes
- Rivers
- Water points

Figure 4. Spatial distribution of major grazing reserves

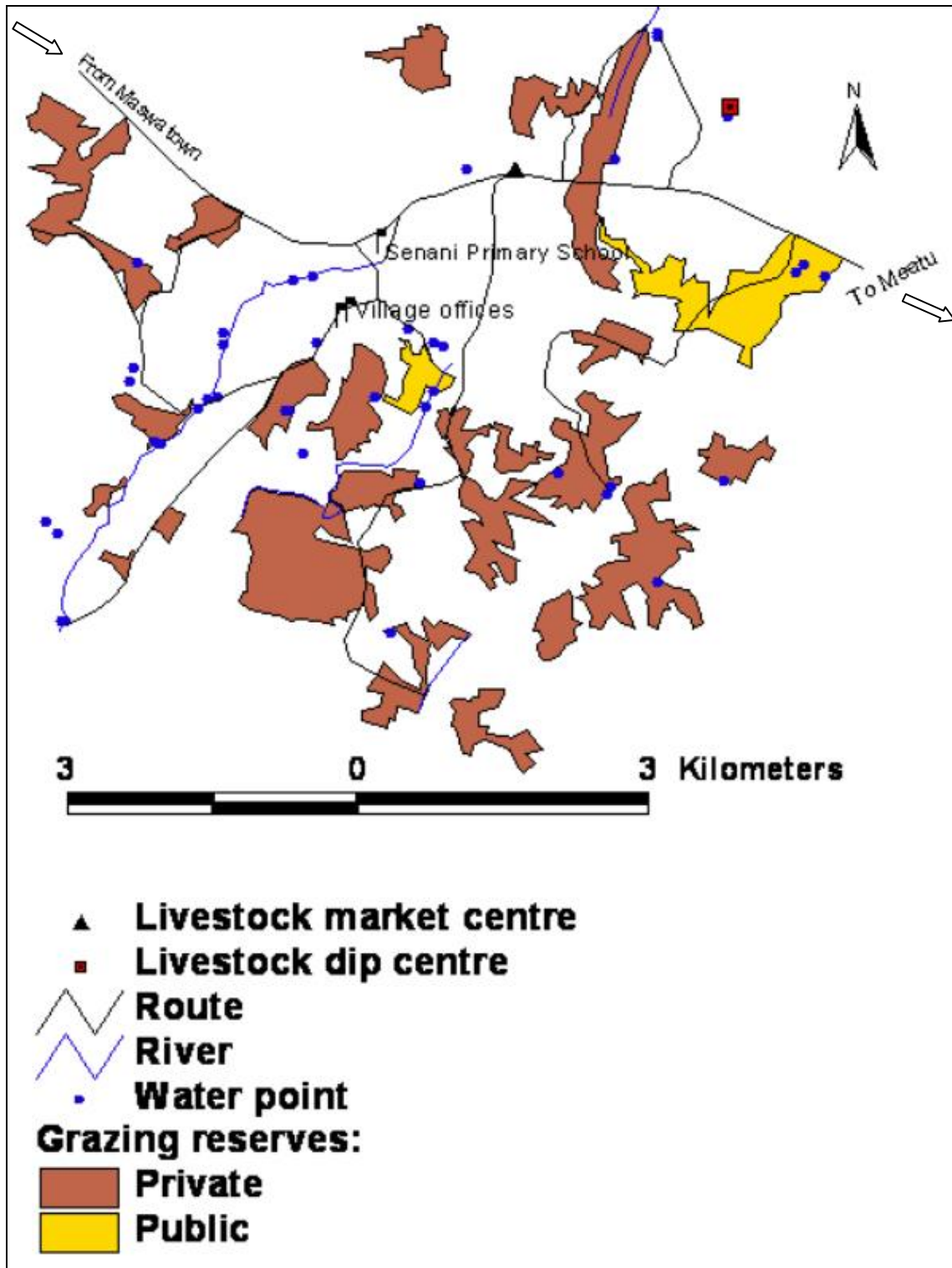


Figure 5. Spatial distribution of private and public grazing reserves

Table 1. Nature of ownership and sizes of the grazing reserves of Senani area

S/n	Grazing area name	Nature of ownership	Area (in sq meters)
1	Maselle Mahega	Private	849,460
2	Mwabuyunge	Private	281,589
3	Chambantugwa	Private	208,093
4	Deus Maheja and Maduhu Maige	Private	425,710
5	Galanka Jibumbu	Private	54,103
6	Jonas Malulu and Masunga Jidenya	Private	216,718
7	Gwesa Dandu	Private	177,385
8	Joseph Shigella I	Private	136,930
9	Joseph Shigella II	Private	591,478
10	Kija Buyombo	Private	280,282
11	Luguda	Private	214,431
12	Masanda Lweyo	Private	281,503
13	Matanaki	Private	289,098
14	Mjige Kahabi	Private	166,905
15	Zagamamu Hills	Private	1,456,811
16	Mtegwa Gadala and Mwigulu Elias	Private	282,263
17	Ngeleja Jidai and Nhiga Bufudilu	Private	377,092
18	Ngusa Bushini	Private	878,303
19	Ngwandu Malale	Private	202,084
20	Nyabila Ntogwa	Private	44,916
21	Tano and Maria Nkenda	Private	463,864
22	Winingereja	Private	61,387
23	Wetland	Private	750,905
Total area for private grazing reserves			8,691,312
24	Kilimi	Public	1,151,733
25	Senani subvillage	Public	217,770
Total area for public grazing reserves			1,369,502
Total area for all grazing reserves			10,060,814
Total area for the study area (Senani)			132,777,555
Area percentage of private grazing reserves to the total grazing reserves			86
Area percentage of public grazing reserves to the total grazing reserves			14
Area percentage of all grazing reserves to the total Senani area			8

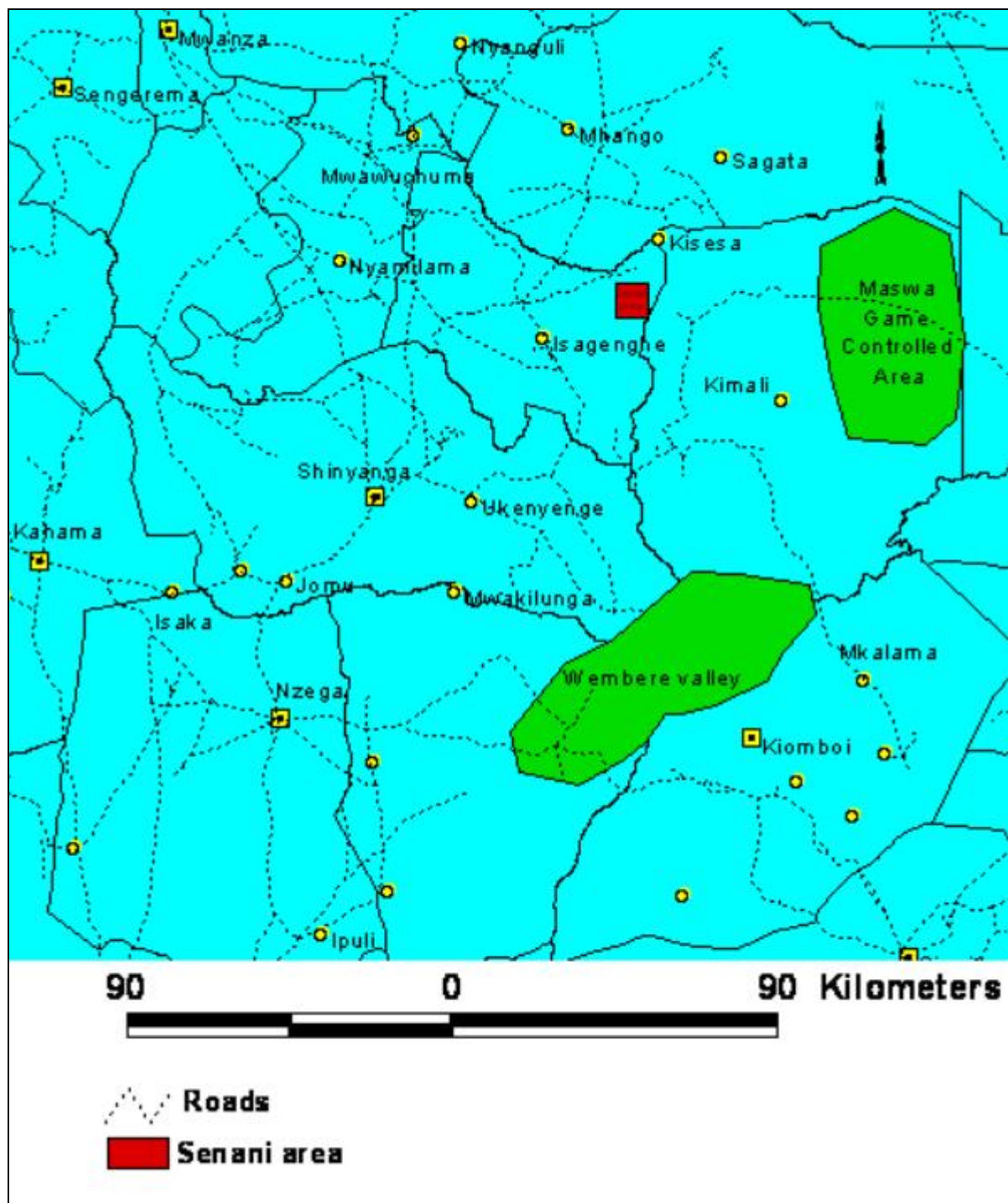


Figure 6. Position of Senani relative to major dry season grazing areas (Wembere valley and Maswa Game Controlled Area)

Note: Boundaries of Wembere valley and Maswa Game Controlled Area were not digitized in this study and therefore the sizes and position may not be very correct.

3.2.2. Rivers and water points

Water for livestock in Senani area are mainly from four types of sources: rivers, ponds, water pumps and dug wells. These sources of water are also used by human beings, leading to competitions and prioritization during the times of water scarcity.

There are three main rivers namely; Mwampogoni, Ngitu and Senani (Fig. 7). All these rivers are seasonal in nature, although they differ significantly on their seasonality behavior, which depends much on the amount and distribution of rainfall in the area. The water table is normally high in some parts of these rivers thus resulting to formation of ponds in some parts along the rivers in early dry season (Plate 4). Also due to high water table, several wells are dug along the river during dry season. However, some of these wells and ponds become dry as the season goes deeper to the dry spell. River Simiyu of which River Mwampogomi serves as a feeder located to the far north of the village is permanent and supplies water to the animals and human beings during dry season.



Plate 4. Livestock drinking in a pond formed on seasonal river bed.

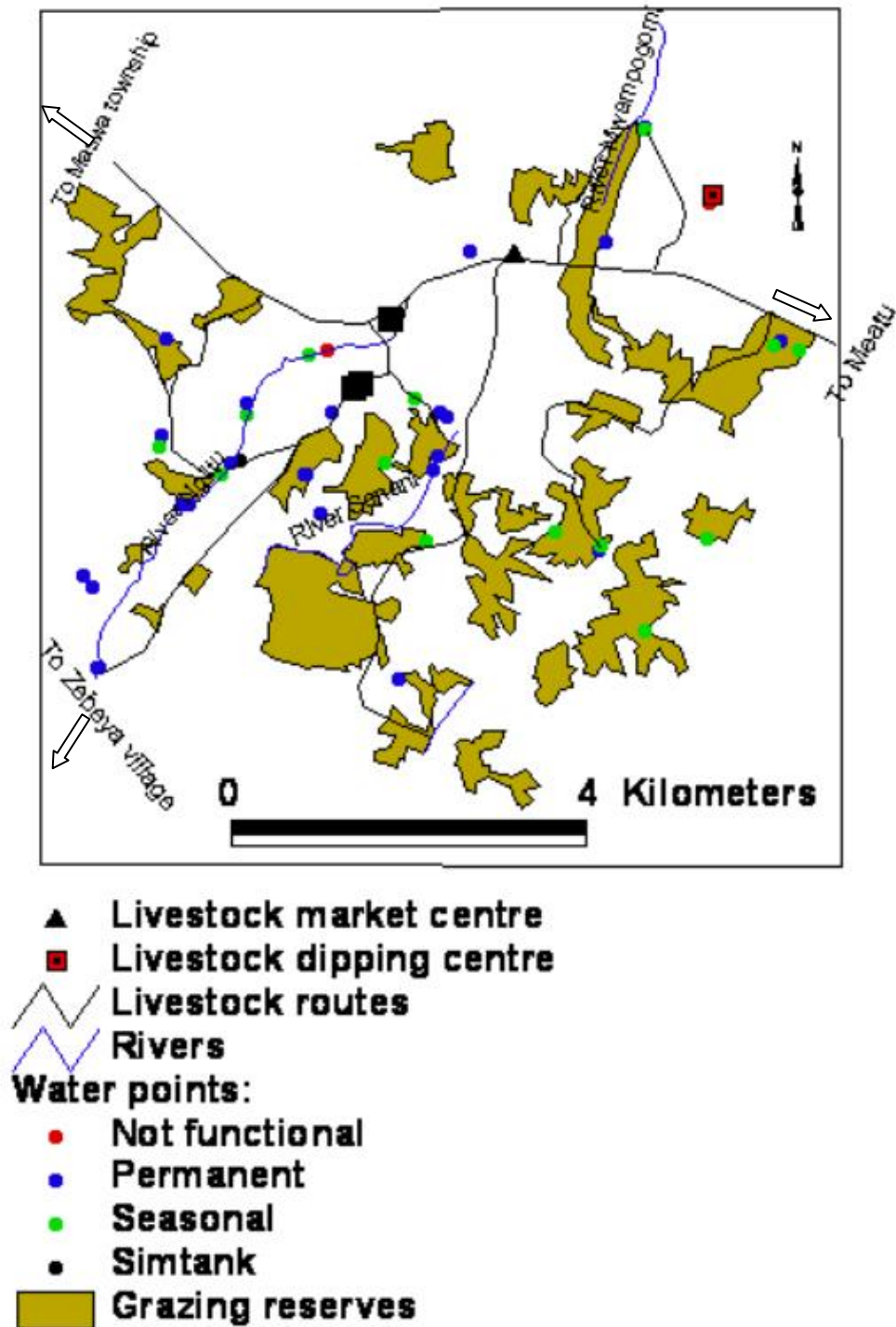
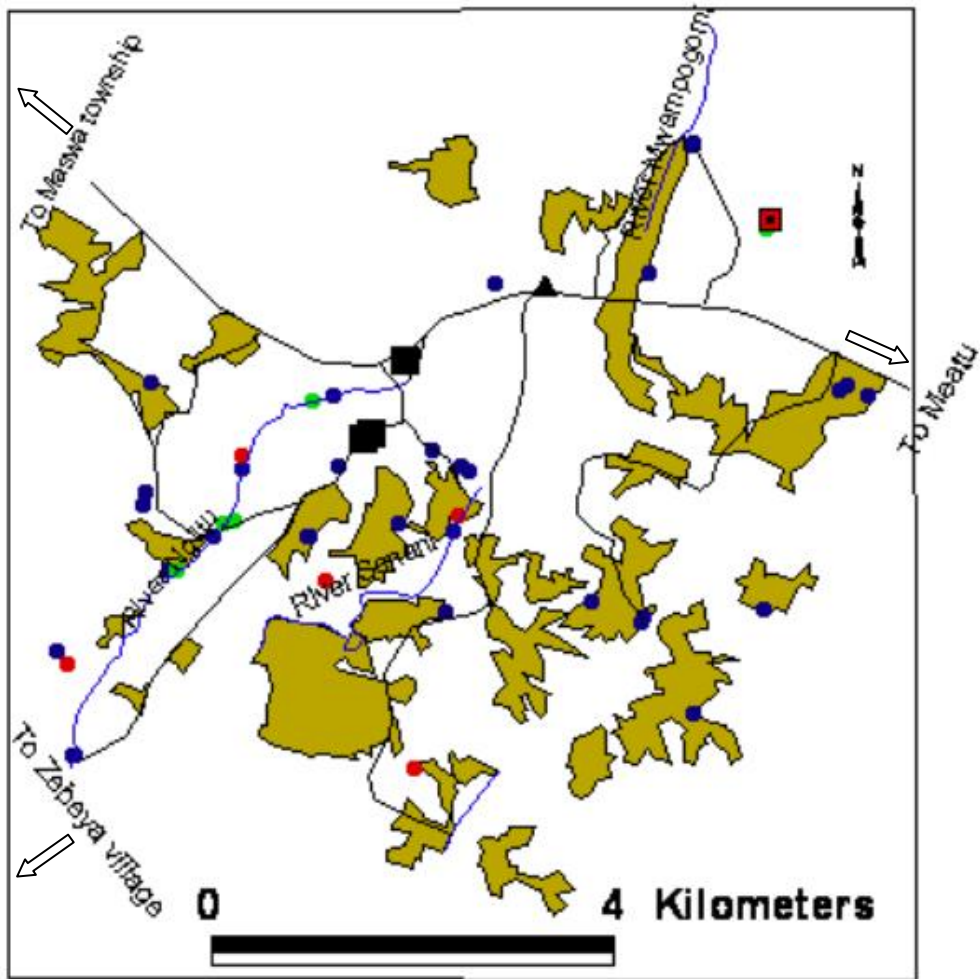


Figure 7. Distribution and seasonality of water sources

Most of the hand water pumps are owned by groups. A few are owned by individuals and village government (Fig. 8). The water pumps are primarily designed for human being water supply, but it is reported that the water is pumped and supplied to the livestock by collecting them in drinking containers. Some of these water pumps are not functional, mostly due to the weak concrete materials used to make the wall and the reinforcements (Plate 5).



Plate 5. A non-functional water pump due to sub standard concrete



- ▲ Livestock market centre
- Livestock dipping centre
- Livestock routes
- Rivers
- Water points ownership:**
- Group
- Private
- Public
- Grazing reserves

Figure 8. Ownership of water points

3.2.3. Livestock Routes

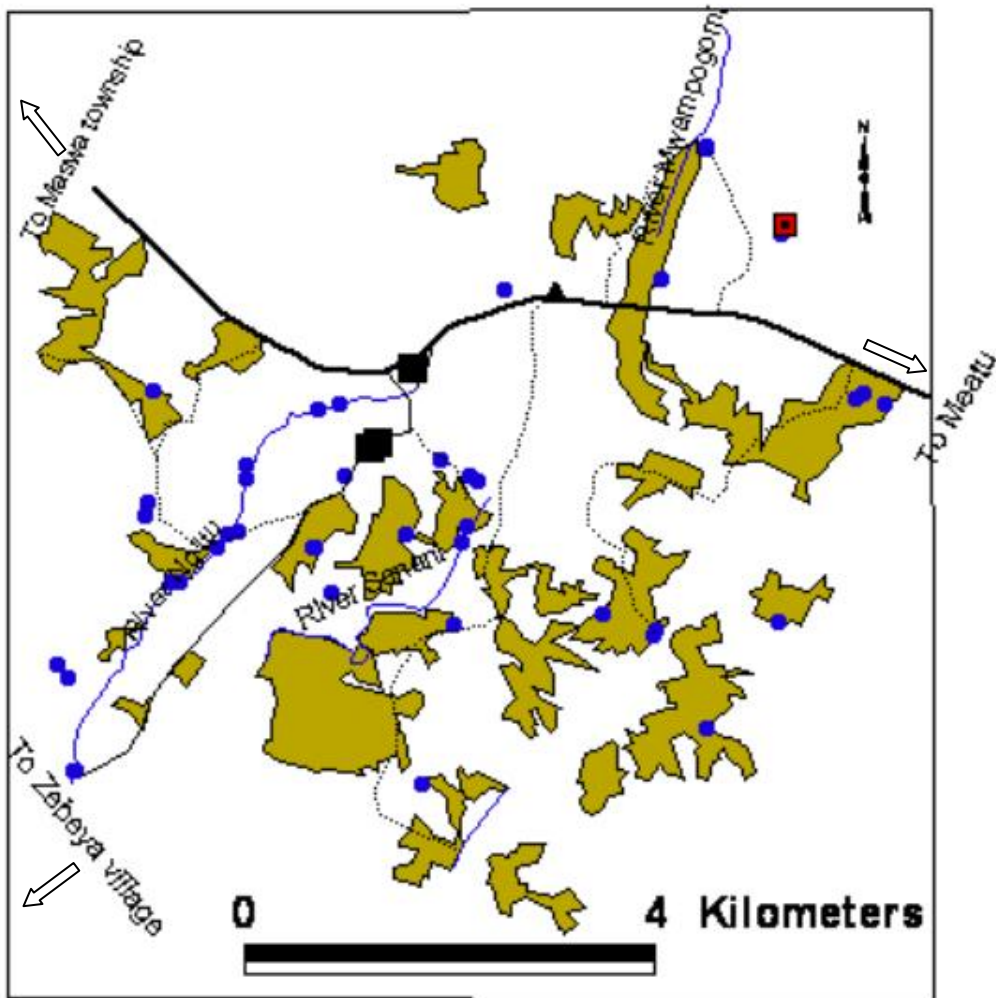
The animal routes in the study area (Fig. 9) have been classified into three classes:

- (a) the upgraded gravel roads which connect the districts and passable by vehicles;
- (b) the upgraded rural gravel roads which connect the village with others but also passable by vehicles and
- (c) the livestock tracks which in major part are used by livestock and smaller means of transport such as bicycles and motorbikes.

All these routes are used by livestock while grazing within the study area and when going out and coming from the grazing areas and water sources outside the study area. The road connecting Senani with district headquarters (Maswa township) and a nearby district (Meatu) is also used by livestock traders and livestock drug dealers when coming and going out of the study area's market centre. This route is also used when livestock are moved to the Wembere river basin and Maswa game controlled area for pasture and water (Fig. 6).

Upgraded rural roads are used by neighbouring villages to access the Senani livestock market and also by Senani villagers to access livestock markets and other services including pasture in the neighbouring villages.

The livestock tracks are in many cases but not exclusively used to access pasture, water and market within the study area. During the dry season, the number of livestock tracks increases as the harvested crop fields are also used as grazing areas.



- ▲ Livestock market centre
- Livestock dipping centre
- Livestock routes:**
- Upgraded gravel road connecting districts
- - - Upgraded gravel road connecting villages
- ⋯ Livestock track
- Rivers
- Water points
- Grazing reserves

Figure 9. Livestock movement routes

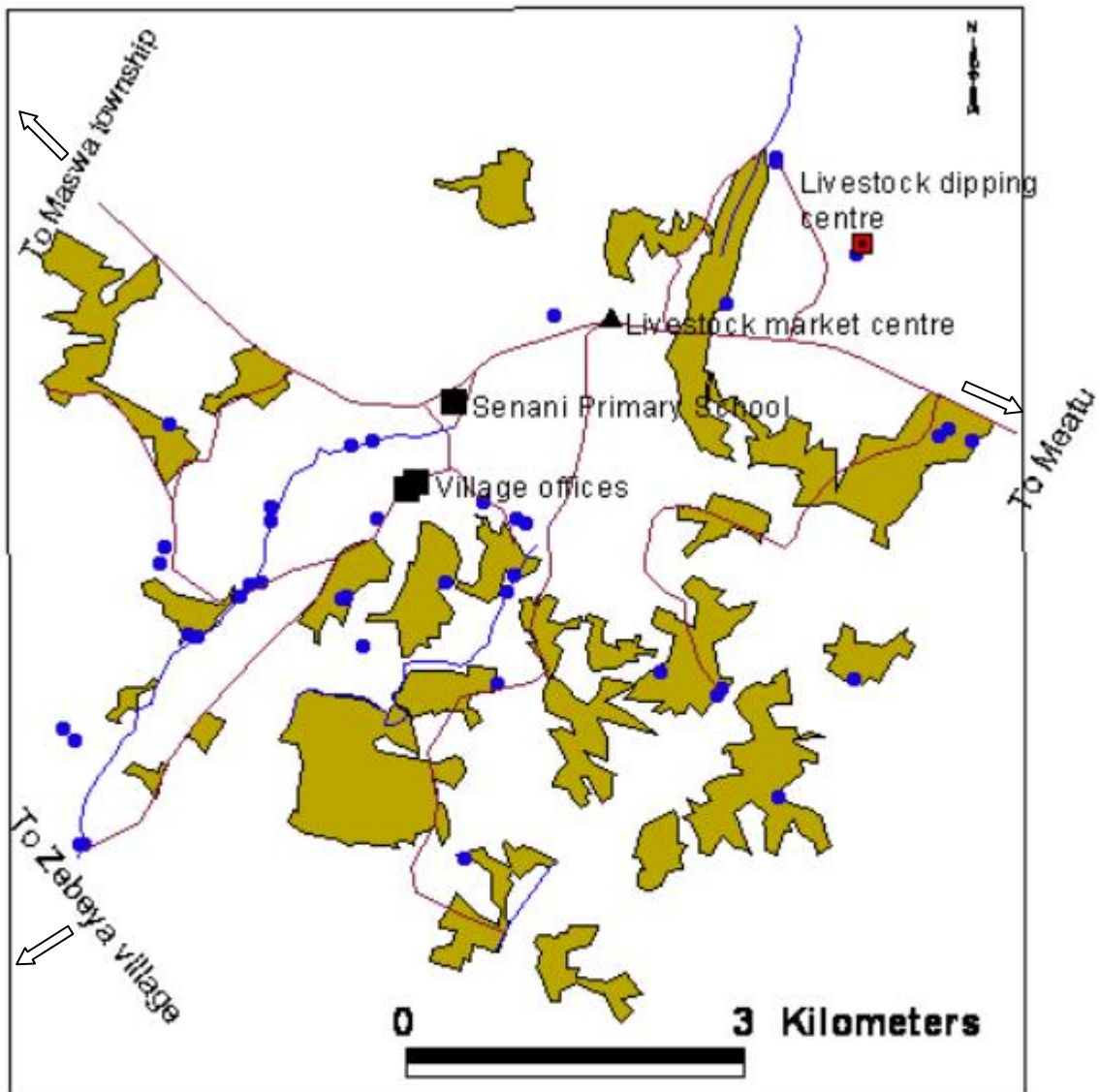
3.2.4. Livestock Health and market centres

The livestock health and market centres in the study area are presented in Fig. 10.

There was no livestock health facility found to operate in the area on daily basis. There was no any livestock drug store, and the only livestock dipping centre identified in the study area was not functional at the time this study was conducted. The local government (Maswa District Council) has allocated one extension officer in Senani village to attend to both livestock and crop production issues.

During the study, one livestock market centre was identified in the area. The infrastructure of the market centre consisted of temporary several small shelters. Permanent structures available are private shops for retail consumer goods. The market day is set to be on Saturday of every week. Livestock traders come to the area from different parts of Maswa district, and some from outside the district.

Livestock sold in the market are coming from Senani and nearby areas.



- ▲ Livestock market centre
- Livestock dipping centre
- Routes
- Rivers
- Water points
- Grazing reserves

Figure 10. Location of livestock market and dipping centres

4. CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusions

The following conclusions were drawn from the study:

1. The sizes of grazing reserves and the pasture biomass from them are far much less compared to the requirements of the livestock owned by individual grazing reserve owners and collectively.
2. Village government has failed to enforce by-laws which could stop encroachment of the grazing areas reserved for public use.
3. Water sources are mostly seasonal.
4. Most of the grazing reserves and water sources are owned privately.
5. Livestock routes are sufficient to allow transportation of livestock and livestock related services to and from the study area.
6. No sound health services are available for livestock in the study area.
7. One livestock market centre is sufficient for the study area, but need livestock support infrastructures to be put in place.

4.2. Recommendations

In order to achieve sustainable livestock production in the study area, the following are recommended:

1. More land should be set aside for grazing reserves from individual land owners.
2. The village government should increase the size of land set out as public grazing reserves and reinstate and reinforce by-laws to safeguard the boundaries of the existing and the new grazing reserves.

3. The wetland used for paddy rice growing should not be used for grazing because it will be degraded to the point it won't be able to support agriculture anymore.
4. Improved pasture species which have higher biomass, more nutritive and adapted to the environment should be introduced in the study area.
5. Pasture harvesting and storage should be advocated and practiced. Training on harvesting and storage techniques should be offered to the agro-pastoralists.
6. The number of livestock should be checked against the water and pasture availability.
7. Improved stocks are recommended to improve livestock productivity instead of relying on the bigger number of herds to meet household demands.
8. The village government should mobilize capital and labour to build bigger and better quality water points using more durable materials.
9. The livestock dipping service should be revived to help improving livestock health services.
10. The livestock market infrastructure should be improved such that permanent structures (e.g. shelters) are built.

5. REFERENCES

De Pauw, E. (1984) *Consultant's final report on soils, physiography and agroecological zones of Tanzania*. Ministry of Agriculture, Dar es Salaam