

**THE UTILIZATION OF DAMBOS IN CHIPATA: A CASE OF MWAMI BORDER
AREA**

SIMBEYE BETTY, COMPUTER NUMBER. 97106321

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DECLARATION

"I Simbeye Betty declare that this report has been composed and compiled by me and that the work recorded has been done by me, that the sources of all material referred to have been specifically acknowledged, and that the project has not been accepted in any previous application for academic award."

Signature.....*Betty*.....

Date.....*21 / 11 / 2003*.....

DEDICATION

To my family and all Geography scholars of the University of Zambia.

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Special thanks go to Dr. M.C Mulenga for his guidance through out this project course as my supervisor. My sincere gratitude also go to the members of staff of the Geography department especially Mr. E. Kapungwe for his encouragement when things were rough. To prof. Chidumayo and Dr. Chabwela of the Biology department and the World Conservation Unit (IUCN) for providing me with information and literature relevant to my study.

ABSTRACT

Dambos are a valuable natural resource on which a number of human activities are taking place. In Zambia, most dambos have been turned into agricultural, grazing and sand mining areas. This result into the degradation of the dambo ecosystem.

This study was undertaken in the dambos of Mwami border area of Chipata in the Eastern Province of Zambia as a case study. The main purpose of undertaking such a study was to identify the different activities that take place in these dambos and the impact of the identified activities on the dambo environment. This was achieved through field interviews using a non-scheduled structured questionnaire and field observations. Data obtained from the field was analyzed using descriptive statistics such as averages frequencies and percentages.

The study revealed that the major activities taking place in dambos are cultivation, livestock grazing, water extraction, sand mining, black soil quarrying and grass threshing. Cultivation is mainly done during the dry season although wet season cultivation on dambos is also possible. Livestock grazing and water extraction are also dry season activities but can continue until the early months (November to early December) of the rain season. Grass threshing is the cool dry season activity while sand mining and black soil removal is possible almost at any time of the year except during the months (January and February) of the rain season when the dambos are likely to be flooded. The major impact of these activities on the dambos is the clearance of indigenous dambo vegetation and in most cases leading to an increase in soil erosion hazards.

Dambos are used for a number of human purposes. However, these activities have impacted greatly on the dambo ecosystem leading to dambo degradation. Unfortunately this sad scenario will not halt dambo utilization under the pressure of a growing human population. The degradation of dambo environments can be reduced if only good management accompanies utilization.

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1.2 STATEMENT OF THE PROBLEM

Dambos are among the productive natural ecosystems in the Southern African region (IUCN 1997). They are endowed with a number of capital resources such as soil, water and vegetation. As such, a number of activities are taking place in the dambos. However, these activities have impacted greatly on the dambo environment leading to degradation of some of these ecosystems. Therefore, there is need to identify some of these activities that take place on the dambos and know how they have impacted on the dambo environment.

1.3 AIM

To develop greater understanding of the activities taking place in the dambos, their pattern and impact on the dambo environment, the aim of the study was to investigate the activities taking place on the dambos and their impact on the dambo environments.

1.4 OBJECTIVES

In order to achieve the aim, the following were the objectives of the study:

- a) To identify the different activities taking place in the dambos of Mwami border area
- b) To establish the seasonal pattern of the identified activities
- c) To determine the impact of the identified activities on the dambo environments.

1.5 RESEARCH QUESTIONS

- a) What are the most important activities taking place on Mwami border dambos?
- b) What is the seasonal pattern of the identified activities?
- c) What are the impacts of these activities on the dambo environment?

1.6 RATIONALE

The study provides information on the activities taking place in the dambos of Mwami area in Chipata, their seasonal pattern and impact on the dambo environments. The information enhances the understanding of the use of dambo resources and how this utilization is a threat to their survival. This information will be important for instituting conservation measures in the utilization of the dambos.

1.7 DEFINITION OF TERMS AND CONCEPTS

Dambo – a shallow, seasonally waterlogged depression at or near the head of a drainage network.

Environment – The physical characteristics of an area, which includes the vegetation, soils, drainage and morphology, and their interaction with the living organisms, which includes man.

Threat to dambos – is a potential for alteration of the structure or function of a dambo, fauna more diverse to a simple and degraded system.

Dambo degradation – a reduction in quality or decline in usefulness of dambo resources. Human causes of degradation occur when dambo resources are used in an unsustainable manner.

1.8 ORGANISATION OF THE STUDY

The report comprises of seven chapters. The second chapter is the literature review, which looks at the relevant literature related to the study topic. The third chapter gives the description of the study area while the fourth chapter outlines the research methods used in the study. The fifth chapter presents the research findings while the sixth chapter presents the discussions of research findings. The last chapter gives the conclusion and recommendations of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Dambos are endowed with a number of resources such as soil, water vegetation and associated fauna that attract a number of activities (Chidumayo 1992). These major capital resources have attracted a number of activities among which include cultivation, grazing and mining to mention but a few (Chabwela 1991). Further, Munyinda (1993), reports that dambos are an important resource that should be made use of but however, observed that over exploitation of these resources may cause damage and careful attention must be paid to their use.

2.2 UTILIZATION OF DAMBOS IN SUOTHERN AFRICA

The most widespread use of dambos is the cultivation of crops (Whitlow, 1985, Mackel, 1986). Whitlow (1985), reports that dambo cultivation with rice and 'tsenza' (*cleus esculentus*) was prevalent in Zimbabwe more than a century ago. Dambo cultivation is also common in Zambia, Malawi, Botswana and Tanzania where rural communities in communal lands make considerable use of these areas for dry season vegetable growing (Sather & Smith, 1984). Sather and Smith (1984) further points out that the rural population in Namibia rely on dambos for subsistence grain, vegetable and fruit production.

Additionally, dambos are used for grazing especially during the growing season when upland areas are planted and water supply for domestic and irrigation purposes (Matiza, 1992). Because of the favourable soil moisture regime, dambos provide excellent dry-season grazing (Chidumayo 1992). This is supported by Further, Kay (1967) and Matiza

(1992) reports that dambo environment support a vigorous quality of grasses, although the quality of the grasses depend on the PH of soil, vegetation type and the intensity and character of the grazing pressure

Dambos are also the site of the many shallow wells in most parts of Southern Africa since they have high water tables (Matiza 1992). Dambos are crucial for the provision of water for domestic use, irrigation and livestock (DRU, 1987). The study by Breen *et al* (1997) in Southern Africa showed that the other most prevalent activities in dambos are construction, sand mining, burning and grass threshing. Chabwela (1991), points out that dambos are a source of forage for most Southern African countries especially during drought years. Dambo grasses are used for roof thatching and brooms while trees on the edges of dambos provide fruit and fuel wood (DRU, 1987).

2.3 DAMBO UTILIZATION IN ZAMBIA

According to Chidumayo (1992), the most widespread use of dambos in Zambia is livestock grazing. Dambo grasses are of differing values as grazing areas but most of them do provide valuable dry season grazing and they have a vital role in the livestock economy of many parts of Zambia (Kay, 1967). Similarly, Raussen (1997) reports that dambos are a very important source of dry season fodder (and water) for livestock for small-scale farmers in Eastern Province of Zambia. Presentations at the workshop from Zambia, Malawi and Zimbabwe demonstrated how vital dambo cultivation has been during the devastating drought that struck the region during the past years (Munyinda, 1993). In many cases, the farms on the dambos provide the only source of food once the upland crops fail.

The other main form of dambo use in Zambia is cultivation based on indigenous water management techniques (Bell *et al* 1987). In many cases, this takes the form of dry season cultivation of vegetable in fenced gardens known as 'dimba' (Bell *et al*, 1987). For example, in the Western Province of Zambia, dambos are widely used for crop cultivation

like maize, vegetable, sweet potatoes, onions rice, millet and cassava (Yerokum and Mukhala (1995).

Dambos have also been used as sources for construction material (e.g. grass for thatching and clay for smearing walls and floors of buildings) to Zambian rural Communities (Chabwela, 1999). In many parts of the country, some dambos have been used as settlement sites and as site for solid waste dumps (ECZ, 2000) especially in the urban areas where the population is high resulting into shortage of land for settlement.

Sather and Smith (1984) mention that dambos provide water for rural communities and irrigated agriculture. Water scarcity has been a major problem in most rural areas of Southern Africa and dambos have been used to provide water for domestic purposes in order to alleviate the problem (Mackel, 1986).

2.4 THE IMPACT OF HUMAN ACTIVITIES ON DAMBOSIN SOUTHERN AFRICA

Human use is threatening many dambos with degradation (Whitlow, 1985), Mackel, 1986) in Southern Africa. A number of studies have been conducted in dambos in many parts of Southern Africa concerning the effect of human activities on dambo environments. One of such studies was undertaken by Breen *et al* (1997) in which eleven countries were studied including Namibia, Lesotho, and Zimbabwe. The same study by Breen *et al* (1997) revealed that the main human activities in dambos include grazing, mining, cultivation and construction. The major impacts highlighted by the study were clearance of vegetation leading to the alteration of the vegetation cover and soil degradation. The most affected dambos in Southern Africa are found in Zimbabwe where they have been extensively used for agriculture (Breen *et al*, 1997).

Human impacts in dambos are mostly manifested on the vegetation and soils of the dambos (Adams, 1993). The impacts are mainly the alteration of the natural vegetation of the dambo (Mackel, 1986). This alteration of the vegetation arises due to the clearance of the natural vegetation to pave way for activities such as cultivation construction and mining (Chabwela 1999, Breen *et al*, 1997). For cultivation purposes, the natural vegetation is cleared and replaced by permanent building and for mining purposes; the cleared vegetation is replaced by scars such as ditches, bare lands and pits (Breen *et al*, 1997). Other causes of change in the dambo vegetation are burning and grazing (Mackel, 1986 & Whitlow, 1984). Though fire is an important method for dambo vegetation management, frequent burning of dambos could lead to the appearance of fire tolerant species of grass in the dambo enrichments (Robinson, 1978). Dambos that have been extensively grazed normally result in the appearance of palatable species of grass in the environments (Mackel, 1986) changes in the vegetation coverage result in the loss of flora diversity and the fact that the fauna diversity of the environment mostly depends on the flora diversity, the fauna diversity is also affected resulting into disturbance of the whole biological diversity of the dambo environments (Scoones & Cousins, 1991).

The impact of activities on the soil result in erosion and compaction of the dambo soils (Bullock, 1988). Agricultural modifications of the dambos result in the clearance of the natural vegetation that results into induced erosion hazards as dambo soils are exposed to erosion agents of water and wind before the crops grow (Robinson, 1978). In fact, dambos having such modifications for agricultural purposes experience extensive sheet erosion at the on set of the rains (Mackel, 1986, Chabwela, 1991). Intensive grazing on dambos also results in erosion, especially on pressure points such as water sources (Whitlow, 1984).

Mining activities result in the total removal of the soil (Breen *et al*. 1997). Burning and excessive application of fertilizers changes the chemical composition of soil of dambos (Danachue *et al*, 1983). Excessive use of ammonia fertilizer s causes the acidification the soil. The reactions of moisture with the ammonia in the ammonium fertilizers produce a weak acid, which result in the acidification of the soil (Donachue *et al*, 1983). Draining of

dambos through water extraction also make the dambo soil become so dry (Robinson, 1978).

In Zimbabwe, dambos under commercial farmers are used mainly for grazing and wetland maize production (Whitlow, 1985). Though conservation measures have been put in place to avoid erosion, the dambos are threatened by acidification, excessive gullying, lowering of water tables and general degradation of dambos due to draining and excessive application of fertilizers (Owen *et al.* 1995). The most threatened dambos are those under peasant farmers (Whitlow, 1984). According to Whitlow (1984), the threats arise due to intensive agricultural practices, which leads to the total clearance of the natural vegetation hence, enormous erosion hazards leading to soil degradation. Owen *et al* (1995) further points out that heavy human use and livestock pressure due to shortage of land and poor conservation measures has resulted in the drying up and general degradation of dambos in Zimbabwe.

2.5 THE IMPACT OF HUMAN ACTIVITIES ON DAMBOS IN ZAMBIA

The small proportion of dambos under cultivation in Zambia suggests that dambo ecosystems are not only fertile but also fragile (Chidumayo, 1991). For example, studies of ten dambos in the Lusaka area of Zambia carried out between 1970 and 1980 revealed wide spread degradation of dambo environments (Mackel, 1986). Degradation is triggered by fire, cultivation and overgrazing (Lawton, 1963). The pattern of degradation is similar in both dry and wet dambos. Clearance of vegetation and ploughing and ridging over a few years destroys soil structure with resultant sheet or gully erosion (Chidumayo, 1991). Overgrazing has similar effects (Mackel, 1986). In settled areas, uncontrolled fires degrade the woody vegetation in dambos by eliminating fire-intolerant species while promoting the dominance of fire tolerant species (Fanshawe 1971). In the 'mushitu' forest of Zambia, burning promotes expansion of palm (*Raphia farmiter*) forest at the expense of the primary forest, which has a richer biodiversity than derived secondary forest (Lawton, 1983).

In conclusion, Chabwela (1999) and Mackel (1986) in their studies, revealed that major impacts on dambo environments arise from such activities as construction, cultivation, grazing, mining, grass threshing and burning. Chabwela (1999) noted that the factors leading to such activities being highly prevalent on dambos as being high urbanization rate, uneven population distribution and lack of knowledge on the importance of dambos. Ultimately, these forms of degradation reduce the water-holding capacity of dambos (Chidumayo, 1991). The desertification of dambos marks the end of the productive and therefore, the economic and ecological life of dambo ecosystems (Chidumayo, 1991).

CHAPTER THREE

DESCRIPTION OF STUDY AREA

3.1 LOCATION

Mwami is approximately 15 km East of Chipata town. It is one of the areas that border Chipata and Malawi from the eastern side, hence, the name Mwami border. Mwami lies between latitudes $13^{\circ} 45' \text{S}$ and $13^{\circ} 50' \text{S}$ and between longitudes $32^{\circ} 42' \text{E}$ and $32^{\circ} 49' \text{E}$ (figure 3.1).

3.2 GEOLOGY AND SOILS

The area is underlain by rocks of the basement complex, the most distinctive representative of which are metamorphic granulites. The soils on the hills have ruby colours and shallow while the soils on the base of the hills are brown to grayish in colour characterized by heavy red clay loams to sandy loams. These soils are not very suitable for agriculture unless under heavy fertilization. The dambo soils consist of heavy dark brown silty clay loams. In most cases dambo soils are dark near the surface becoming browner below and are overlain by white sand at depth (Brahma, 1976). These dambo soils form the best soils for agricultural purposes.

3.3 RELIEF AND DRAINAGE

The study area lies on the Eastern plateau of Zambia. It is hilly and its attitude ranges between 1200 to 1400 meters above sea level. These hills form the watershed with several streams that flow through the entire area. It also has dambos, which are shallow linear depressions within the plateau surface into which interfluvies collect.

3.4 CLIMATE

The climate is characterized by three (3) distinct seasons; cool dry season (May – August) the hot and dry season (September – early November) and the hot and wet season (late November – April). The coldest months are June and July when the minimum temperatures can drop to 12⁰C. The hottest months are October to November when maximum temperature can range from 31⁰C to 32⁰C. The months between August and October are very dry and relative humidity is below 50%. The wettest months are January to February with mean monthly rainfall of 256mm and 236mm per annum respectively. The total annual rainfall for the area is 1020mm.

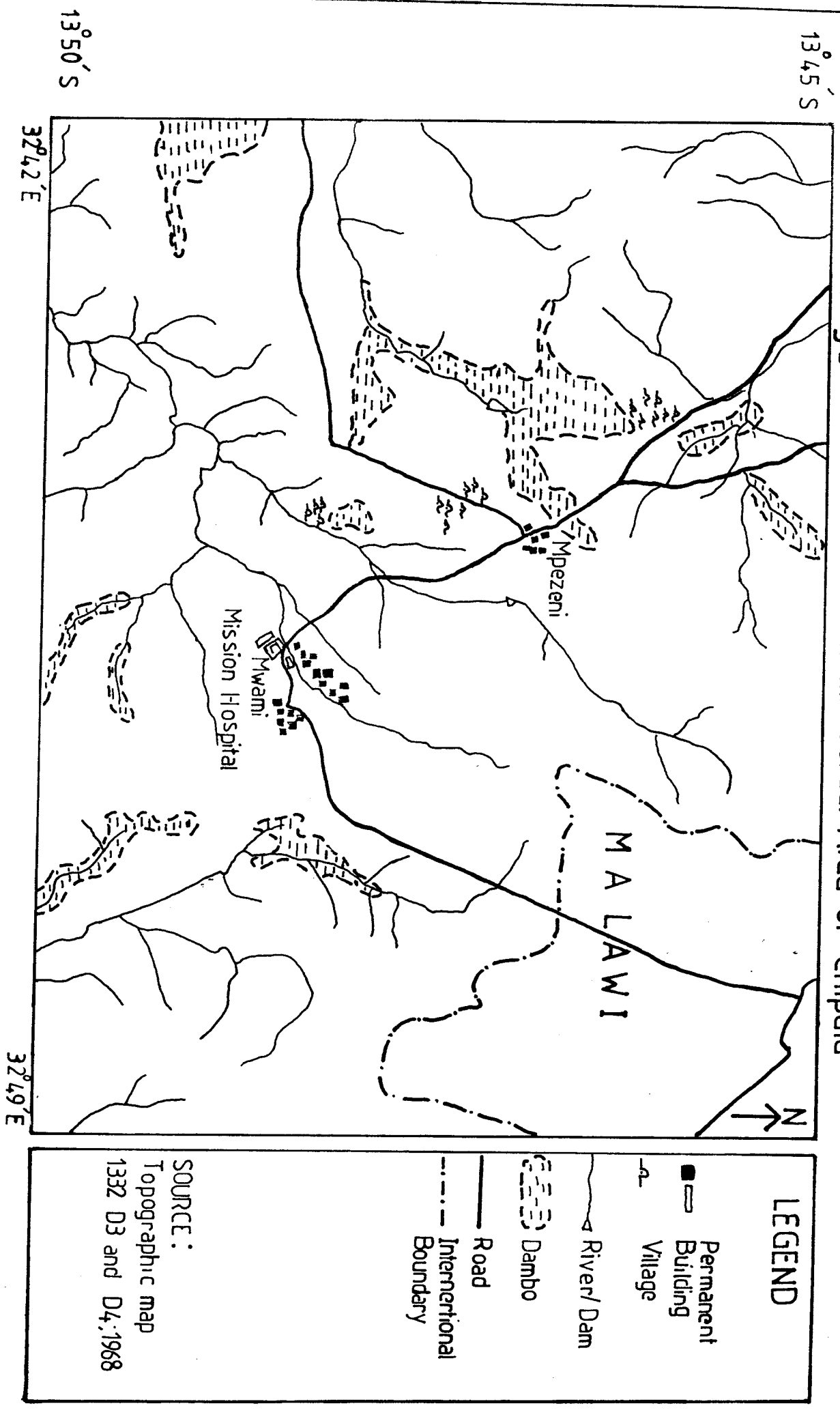
3.5 VEGETATION

The most widespread vegetation types of the study area are the Miombo, which are characterized by *Brachystegia*, *Julbernardia*, and *Isobertina* species. Much of the Miombo have been cleared for cultivation and the remaining woodlands are generally found on hilltops. Dambo lowlands comprise largely of scattered trees but predominantly grasses such as sedges and andropogons.

3.6 SOCIO-ECONOMIC ASPECT

The most important economic activity of the area is agriculture on which most people depend. Virtually, every piece of land suitable for agriculture is cultivated and crops grown include maize, groundnuts, beans, sweet potatoes and cassava. Other activities on upland areas include charcoal production and livestock husbandry. Dambos are mostly used for dry season cultivation of vegetables, maize and sugarcane to mention but a few. Dambo cultivation is mainly a source of income and food for most households in the area.

Fig 3.1 Dambos in Mwami Border Area of Chipata



CHAPTER FOUR

METHODOLOGY

4.1 INTRODUCTION

This chapter outlines the various sources of data, the methods used in data collection, the sampling methods and the sample size. It also outlines the techniques used in data analysis and presentation including the limitations encountered in data collection.

4.2 SOURCES OF DATA

Both secondary and primary sources of data were used in the study.

4.1.1 Secondary Data

Secondary data was obtained from archival and documentary sources to provide data and information relevant to the study. The purpose of collecting secondary data was to supplement on the primary data collected in the field.

4.1.2 Primary Data

Primary data was obtained through fieldwork in the study area. A non-scheduled structured questionnaire (appendix 1) was used to collect information on the activities taking place on the dambos, their seasonal pattern and impact on the dambo environment. Field observations were carried out to confirm on the activities taking place on the ground and their impact on the dambos.

4.3 SELECTION OF RESEARCH TECHNIQUES

The major research techniques used in the study include interviews through non-scheduled structured questionnaire and field observations. The research techniques are described in the order in which they were undertaken and their purposes.

4.3.1 Non-scheduled structured questionnaire

This was the first and major technique used in the study. The purpose of using this technique was to help in the identification of activities taking place in dambos, to establish the seasonal pattern of the identified activities and determine the impacts of these activities on the dambo environment.

4.3.2 Sampling procedure and sample size

A total number of 40 randomly selected households were interviewed. These were selected from three villages that make use of the dambos namely: Maulawo, Luangeni and Chanzala. Ten (10) households were selected from Maulawo, ten (10) from Chanzala and twenty (20) were from Luangeni. Forty (40) households would be enough to adequately provide information on the problems stated because the number of households per village does not exceed thirty except for Luangeni, which has more than thirty thereby making forty households adequate to represent the population of the three villages.

4.3.3 Field trips and personal observations

A number of 'foot surveys were conducted in different dambos of Mwami area to ascertain the activities taking place in these dambos. Time was spent in different localities observing the daily activities and their impact on the dambo environment. The main purpose of conducting these foot surveys was to confirm the activities mentioned by respondents in the questionnaires.

4.4 DATA ANALYSIS

Descriptive statistics such as averages, frequencies and percentages were used to analyze the data that was obtained from the interview schedules. Data was presented using tables.

4.5 LIMITATIONS OF DATA

There were a number of limitations to data collection that were encountered during the collection of data and information. Some of these include the following:

- Some respondents could not fully give the information, as it was required of them because they did not understand the purpose of carrying out the interviews. They thought it was one of the government strategies to hinder them from making use of the dambos.
- Field surveys were also difficult to achieve, as some of the people could not allow me to enter their gardens for no reason according to them. Only people who wanted to buy their crops were allowed in and they could only reach certain areas of the garden and not everywhere.
- Field surveys were going to be more meaningful with the use of photographs but the photographs that were taken in the field got destroyed during the process of developing. This makes the explanation of the research findings inadequate.

CHAPTER FIVE

RESEARCH FINDINGS

5.1 INTRODUCTION

This chapter presents the findings from the fieldwork activities. The first section presents the activities taking place in dambos, followed by their seasonal pattern and the impacts these activities have on the dambo environment.

5.2 ACTIVITIES TAKING PLACE IN THE DAMBOS

5.2.1 Dambo Cultivation

About 32 respondents out of 40 reported to be practicing dambos cultivation accounting for about 80%. 20% of them (8 respondents) said not to be practicing dambo cultivation.

Table 5.1 Number of households practicing dambo cultivation

Cultivation	Frequency	Percentage
Practicing	32	80
Do not Practice	8	20
Total	40	100

Source: Fieldwork data

5.2.1.1 Crops grown in the dambos

The respondents who practice dambo cultivation grow a number of crops and the most important crops grown include rape, beans, tomatoes, onions, sugarcane, Irish potatoes and maize. Most of these crops are grown in the dry season of the year with exception of maize, sweet potatoes and beans, which are grown both in the dry and wet seasons. The

crops are meant for selling and household consumption. Appendix 2 shows the most important crops grown, their seasonal pattern and use.

5.2.2 Livestock grazing

All the households interviewed owned livestock. The difference is in the type of livestock each household is rearing.

Table 5.2 Number of households rearing livestock

Livestock	Frequency	Percentage
Cattle	10	25
Goats	15	37.5
Sheep only	4	10.0
Cattle and goats	8	20.0
Cattle and sheep	1	2.5
Goats and Sheep	2	5.0
Total	40	100

Source: Fieldwork data

5.2.2.1 Pasture land for livestock

Both upland and dambos are used for grazing animals. The variations depend on the season of the year in which the two types of pastureland are mostly used.

Table 5.3 Pastureland for livestock

Pasture land	Frequency	Percentage
Dambo	4	10
Upland	2	5
Both dambo and upland	34	85
Total	40	100

Source: Fieldwork data

5.2.3 Water Extraction

30 households reported to have shallow wells in their gardens accounting for 75% while 25% of them reported to be using water from other sources. The water from the dambos is mainly used for garden irrigation as reported from 80% of respondents. Water is also used for domestic water supply and watering animals.

5.2.4 Other Activities

Other dambo utilization activities that are commonly done include sand mining, black soil removal, grass threshing, hunting, fishing and recreation as reported from an average number of households of 10.2 accounting for 25.4% as an average percentage.

Table 5.3 Other activities taking place in the dambos

Activity	Frequency	Percentage
Sand mining	9	22.5
Black soil removal	19	47.5
Grass threshing	25	62.5
Hunting	3	7.5
Fishing	1	2.5
Recreation	4	10
Solid waste dumping	0	0
Settlement	0	0
Average	10.2	25.4

Source: Fieldwork data

5.3 SEASONAL PATTERN OF THE IDENTIFIED ACTIVITIES

5.3.1 Cultivation

Cultivation in the dambos is done both in the dry and wet season of the year as shown in the table.

Table5.4 The seasonal pattern of dambo cultivation

Season of the year	Frequency	Percentage
Dry season only	22	55
Wet season only	4	10
Both dry and wet season	14	35
Total	40	100

Source: Fieldwork data

5.3.2 Livestock Grazing

Dambos provide pasture for livestock mostly during the dry season of the year though grazing of livestock can also be done on the dambos sometimes during the wet season.

Table 5.5 The seasonal pattern of livestock grazing

Pasture land	Wet season		Dry season	
	Freq	(%)	Freq	(%)
Upland	21	52.5	6	15
Dambo	14	35	24	60
Both upland and dambo	5	12.5	10	25
Total	40	100	40	100

Source: Fieldwork data

5.3.3 Water Extraction

Water extraction is done mainly during the dry season as reported by 92.5% (37 respondent). No water extraction activities are done during the wet season except by a

handful of respondents (7.5%) who reported to be extracting water both during the wet and dry season.

5.3.4 Other Activities

Sand mining and black soil quarrying are done both in the dry and wet season of the year, though it is mostly at their peak during the dry season. Grass threshing is mainly a dry season activity.

Table 5.6 The seasonal pattern of sand mining, black soil quarrying and grass threshing

Activity	Wet Season		Dry season		Both dry & wet season	
	Freq	(%)	Freq	(%)	Freq	(%)
Sand mining	2	5	28	70	10	25
Black soil quarrying	4	10	19	47.5	17	42.5
Grass threshing	0	0	39	97.5	1	2.5

Source: Fieldwork data

5.4 IMPACT OF THE IDENTIFIED ACTIVITIES ON THE DAMBOS

5.4.1 Cultivation

Cultivation on the dambos causes clearance of the indigenous vegetation of the dambos. This exposes the ground to agents of erosion resulting into soil erosion. Uses of fertilizers also cause the loss of fertility of dambo oils thereby degrading them.

5.4.2 Livestock grazing

Overgrazing of livestock causes severe lossof dambo topsoils that may even result into gully erosion. The loss of dambo vegetation through grazing lead to flooding during the rain season.

5.4.3 Water extaction

Water extraction lead to drying up of the dambo environment if done excessively especially during the dry season of the year. This affects the growth of dambo vegetation.

5.4.4 Sand mining and black soil removal

Sand mining activities and black soil removal create ditches and depressions on the dambos. Vegetation is in turn affected because it cannot grow in these scars especially if they are deep.

CHAPTER SIX

DISCUSSION

6.1 ACTIVITIES TAKING PLACE IN THE DAMBOS

Dambos in Mwami border area of Chipata have proved to be valuable environmental assets from which a variety of resources are harvested and a number of activities are taking place. Generally, they provide land resource for grazing and cultivation and a water resource for domestic use, livestock watering and irrigation. Other activities worthy noting that take place in these dambos include sand mining and black soil quarrying, grass threshing and hunting.

6.1.1 Cultivation

Dambo cultivation activities are most prominent in the dambos of Mwami border in Chipata. This could be attributed to the economic conditions in which most people are in this area. It is a rural area and most people are not in formal employment and as such they venture into gardening, which becomes a source of income for most households. Additionally, dambos are very suitable for agricultural activities especially in terms of fertility and this attract a lot of farming activities (Maeckel, 1986). Since dambos remain moist even during the dry season of the year (Kay, 1967), they provide good farming land especially during the dry season and drought years resulting into most people in communities practicing dambo cultivation.

A variety of crops are grown in the dambo gardens of Mwami border area of Chipata and these crops are used for both of household consumption and sale. Most common crops grown are vegetables, which include cabbages, carrots, rape, tomatoes, onions, green beans, eggplants and peas. Other crops include sweet potatoes; sugarcane, maize and Irish potatoes. Maize cultivation is especially important during the years of drought.

Dambo cultivation in Mwami area is advantageous to households in two major ways:

- Providing ready supply of vegetables and other foods *thereby providing for the nutrition* needs of the households.
- Providing an income to the household throughout the year.

6.1.2 Livestock Grazing

Grazing activities are common on Mwami border dambos. This is because most households own cattle, goats and sometimes sheep that require constant supply of fodder especially during the dry season. This is in accordance with what Raussen (1997) says when he pointed out that dambos are a very important source of dry season fodder for livestock, especially cattle for small scale farmers in the Eastern Province of Zambia. However, cattle grazing on these dambos are heavily monitored especially during the dry season when dambo cultivation is at its peak to prevent the animals from destroying the crops in gardens and not the impact of overgrazing as it was supposed to be the case.

6.1.3 Water Extraction

Shallow wells are very common in gardens and sometimes even in uncultivated dambo environments to provide water for irrigation, domestic use and animal watering. However, domestic use of dambo water is very limited since the village communities have deep-fenced wells and boreholes that supply the communities with clean water. This is in line with the findings of Sather & Smith, 1984 that dambos are used to provide water for rural communities in most parts of Southern African Region.

6.1.4 Other Activities

Other activities like sand mining, black soil quarrying, grass threshing and hunting take place in the dambos of Mwami border. However, grass threshing could not be identified through observation due to the period (rain season) in which the survey was carried out. Grass threshing is mainly done during the cool dry season.

6.2 SEASONAL PATTERN OF THE IDENTIFIED ACTIVITIES

6.2.1 Cultivation

Generally speaking, dambo cultivation in the dambos of Mwami border in Chipata is done both in the dry and wet season of the year. However, then intensity and extent of cultivation in these two seasons varies. Dambos are cultivated most intensively and extensively during the dry season of the year since the dambos are then not flooded favouring the growth of most crops. Dambo cultivation during the wet season is also done though by few households. Crops like maize, sugarcane, beans, sweet potatoes and bananas are the ones mostly grown during the wet season. The beds on which these crops are grown especially maize are raised in order to reduce on the effects of water logging.

6.1.5 Livestock Grazing

Grazing activities are mostly done in the dry season period (early April to October) and early months of the rain season (Early November to early December) when upland pasture is dry and scarce. This is contrally to the findings of Matiza (1992) that dambos in Zimbabwe are mostly done in the wet season when most of the upland areas are planted. Dambo grass is luxurious even during the dry season thereby providing dry season fodder to livestock especially cattle. This is in line with the finding of kay (1967) that dambo grasses are of differing values as grazing areas but most of them do provide valuable dry season grazing pasture.

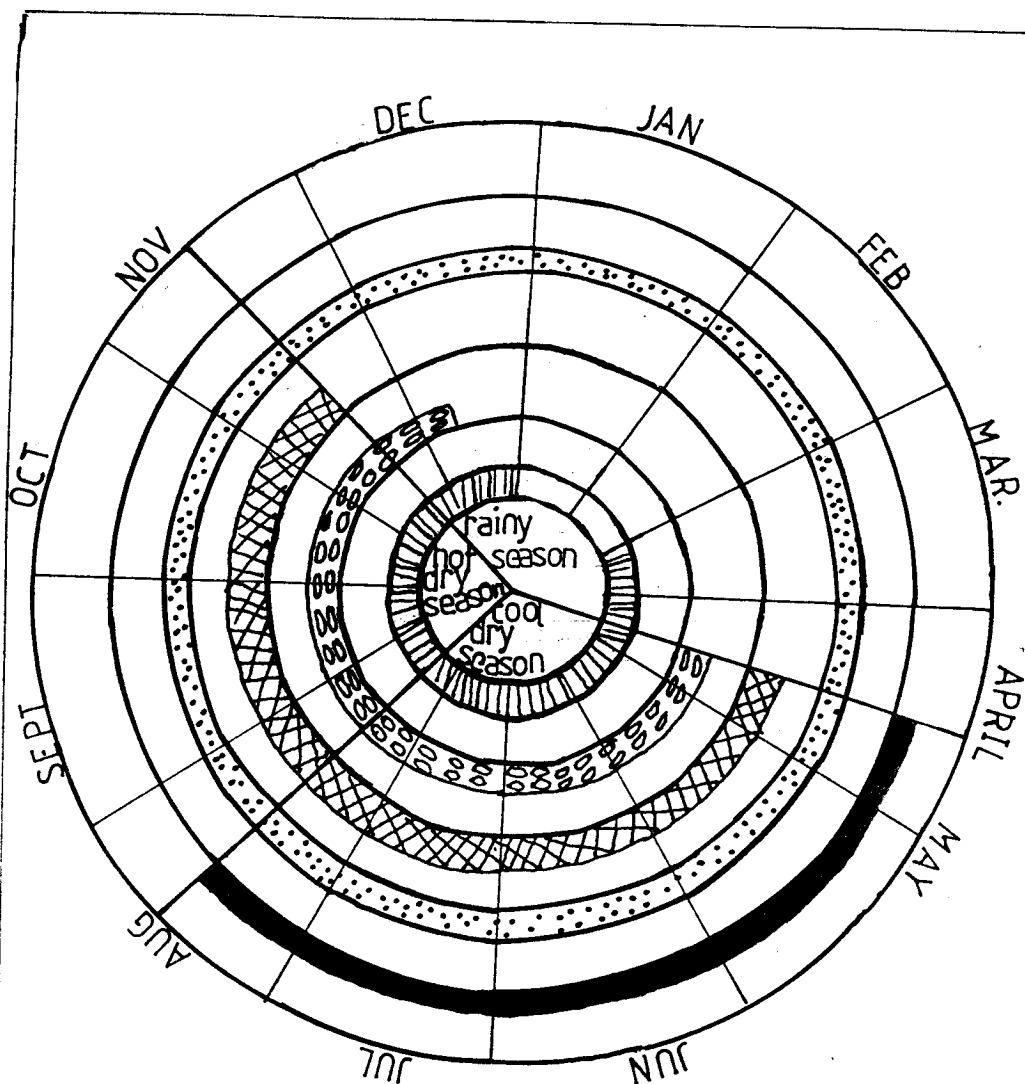
6.1.6 Water Extraction

Water extraction activities on the dambos of Mwami border are mostly done in the dry season of the year. During this dry period of the year, most upland areas are so dry to provide water and since dambos are moist during this period, water can easily be accessed for irrigation and other uses. In the wet season, water extraction from the dambos is reduced because the rains now provide enough moisture for crops in gardens, thereby

cutting down on irrigation. Additionally, there is enough surface and stream water for animals and domestic use.






Sand mining and removal of black soil are done in almost all the months of the year except during the months of January and February when the dambos are waterlogged making it difficult for such activities to take place (Chabwela 1999). Grass threshing is mainly done during the cool dry period of the year when the grass is almost dry before the burning period (August to September) comes (Chidumayo 1992). Figure 6.1 shows the seasonal pattern of these activities.

F Fig. 6.1 Seasonal Pattern of Activities Taking Place in the Dambos



SOURCE: FIELD DATA

KEY

-  Sand mining
-  Livestock grazing
-  Water extraction
-  Cultivation
-  Grass threshing

6.3 IMPACT OF THE IDENTIFIED ACTIVITIES ON THE DAMBOS

The use of dambos in Mwami border area has impacted negatively on the dambo environment. A number of these activities taking place on these dambos have contributed to the environmental degradation of the dambos. The impact has been mainly through the loss of dambo indigenous vegetation and increase in soils erosion activities (Chabwela, 1999).

6.3.1 Cultivation

Cultivation activities on the dambos mainly impact on the dambo vegetation and soils. Cultivation involves the clearance of indigenous dambo vegetation and replacing it by crops like vegetables and sugarcanes. This is in line with the findings of Whitlow (1984), which revealed that vast areas of dambos have been cleared for agricultural purposes in most of southern African countries. The use of herbicides in the gardens has also impacted on the dambo vegetation. Herbicides destroy the indigenous dambo grass, which are part of the dambo natural vegetation (Chidumayo, 1991).

Dambo cultivation affect dambo soils both directly and indirectly. Direct effect includes the exposure to direct impact of raindrops of cultivated soils especially during the rain season and to sheet erosion making them vulnerable to erosion hazards. This is because the soils have less ground cover than that provided by the natural dambo vegetation. Indirect effect include the susceptibility of the cultivated plot to sheet erosion caused by runoff from the dry land part of the catchment's above the dambo. This is in line with the findings of Mackel (1986), that cultivation of dambos exposes soil to direct raindrops and sheet erosion making it more vulnerable to erosional hazards. Continuous erosion might lead to loss of nutrients through the removal of topsoil that is rich in elements necessary for plant growth. This eventually makes the soil poor and unable to support both crops and vegetation leading to soil degradation (Breen *et al*, 1997)

6.3.2 Livestock Grazing

Casual observation suggests that overgrazing of dambos is the main factor causing erosion on the dambos of Mwami border area. Serious erosion is most often associated with loss of ground over caused by overgrazing. This leads to severe loss of dambo topsoils. Sometimes livestock grazing causes gully erosion especially along the trails where animals walk. Dambo vegetation (especially grass) is also cleared through over grazing and this may cause flooding during the rain season as dambos tend to lose their spongy function (Whitlow, 1984).

6.3.2 Water Extraction

Water extraction activities especially irrigation tend to cause a problem of drying up of dambos. This is evident from the drying up of shallow wells in the gardens at some point during the dry season. This results in the drying up of grass making it susceptible to other human activities like burning. This is in line with the findings of DRU (1987) that water extraction from dambos of Zimbabwe lowered the water table leading to drying up of the ecosystems.

6.3.3 Impacts of sand mining and black soil Quarrying on dambos

Sand mining and removal of black soil create depressions in the dambo environment. The depressions can either be permanent scars or can cause re-growth of vegetation later. This greatly depends on the depth of the depressions. Deeper depressions are likely to become permanent thereby hindering the re-growth of vegetation. Sand mining and removal of black soil results into removal of topsoil leading to change in the dambo landscape. This is according to the findings of Chabwela (1999) that sand mining as one of the activities in the dambo environments damages the landscape of these environments.

Generally speaking, the different types of activities that take place on the dambos have affected the dambo environment in a way or another. However, the impacts are not so much to hinder the utilization of these valuable ecosystems.

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

The main purpose of this chapter is two fold: firstly to summarize the major research findings and secondly, to provide both policy and environmental recommendations that would help to improve the practices of human activities on the dambos to reduce their impacts on the dambo environments.

7.1 CONCLUSION

Dambos, like most environmental resources in rural Africa have multiple uses. They fulfill three main purposes that include cultivation, livestock grazing and water supply. Dambo cultivation is crucial to the livelihoods of most households in Mwami border communities providing food and income and, in dry years, food security. They provide a ready supply of vegetables throughout the year and household food is guaranteed.

Dambos also provide land for grazing since they support a vigorous growth of grasses when other forms of grazing are short. Consequently, Grazing of cattle and other forms of livestock is one of the common forms of land use on the dambos of mwami. Additionally, dambos represent a reliable near surface water supply for irrigation, domestic use and animal watering.

Sand mining and black soil removal are also common on these dambos. Sand mining is an important activity for income generation and as a source of building material for most households in these communities. Black soil removal is used for smearing walls and floors of houses and other buildings. Grass harvesting is used as a source of grass for thatching.

This indicates that dambos have been an important part of the socio-economic life of the rural communities in Chipata and in particular, mwami area.

However, these activities have impacted significantly on the dambo environments. The impact has been mainly on the dambo natural vegetation and soils. For instance, cultivation activities lead to loss of indigenous vegetation hence loss of biodiversity in favour of selected crops. It also leads to increased soil erosion and affects the nutrient status of the dambo soils especially through the use of fertilizers and. The major impact of livestock grazing is exposure of dambo soils to erosion hazards while water extraction lowers the water table of the dambos leading to drying up of dambo environments. Sand mining and black soil removal creates derelict land that at a certain extent do not support the growth of dambo vegetation. All these impacts can lead to significant degradation of the dambo environment making them less valuable.

Unfortunately, this sad scenario will not halt the expansion of dambo utilization under the pressure of a growing human population in Zambia. But even with expanding dambo utilization, the degradation of dambo environments can be reduced and the useful life of dambos extend if, and only if, good management accompanies dambo utilization. Good management will depend on our better understanding of the functioning of dambo ecosystems.

7.3 RECOMMENDATIONS

In order to ensure sustainable utilization of the dambos and reduce on the impact of these activities on dambos, the following recommendations have been suggested as the way forward:

- In order to maintain the natural fertility and organic content of dambo soils, the application of cow manure or compost in dambo gardens should be encouraged by local authorities other than the use of fertilizers. People should also be encouraged to use certain farming strategies such as contour ploughing across the dambo to reduce the threat of soil erosion.

- There is need to carry out environmental awareness campaigns in communities around the dambo areas. The main aim of the campaigns would be to sensitize the local communities on the importance, of the dambo environments.
- There is need for further research to establish the dynamic nature of dambo ecosystems. These researches may take the form of the geophysical and hydrological dynamics of these ecosystems. Research on management techniques is also essential to ensure the sustainable use of these resources.

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APPENDIX 1

UNIVERSITY OF ZAMBIA
SCHOOL OF NATURAL SCIENCES
GEOGRAPHY DEPARTMENT

Non-Scheduled Structured Questionnaire

Date..... Location..... Serial No.....

Section A: Personal Data

1 Sex.....

1 Age.....

2 Household size.....

3 Length of stay in settlement.....

4 Educational level

[] No education [] lower primary [] upper primary [] junior secondary
[] senior secondary [] college level

5 Occupation.....

Section B: Activities taking place in the dambos and their effect on the dambo environments

6 Do you practice cultivation on the dambos?

☐ yes ☐ No

8 If 'yes' to Q 7, what are the most important crops do you grow in the dambos?

.....
.....

9 What is the main use of the crops you grow in the gardens?

☐ selling only

☐ household consumption only

☐ selling and household use

10 During which periods of the year do you practice dambo gardening?

☐ wet season

☐ dry season

☐ both dry and wet season

11 What do you think is the effect of cultivation on the dambo environment?

.....
.....
.

12 Do you own any of the following livestock?

☐ Cattle only ☐ Goats only ☐ sheep only ☐ Cattle and goats ☐ Cattle and sheep

☐ sheep and goats

13 Where do your livestock graze;

(a) During the dry season?.....

(b) During the wet season?.....

14 What is the effect of overgrazing on the dambo environment?

.....
.....

15 Do you have shallow wells in the dambos?

☐ yes ☐ No

16 If 'yes' to Q15, what is the use of the water you get from the wells?

.....
.....

17 During what period of the year do you mostly use the water from the wells in the dambos?

☐ wet season

☐ dry season

☐ both wet and dry season

18 Do the wells in the dambos get dry in some parts of the dry season?

☐ yes ☐ No

19 If 'yes' why do you think this is so?

.....
.....

20 What other activities, apart from the ones mentioned above, take place in the dambos?

.....
.....

21 During what period of the year do the mentioned activities in Q19 take place?

.....
.....
.....
.....

22 What are the effects of these activities you have just mentioned on the dambo environment?

.....
.....