

https://dspace.org/

Vulnerability to climate variability in Botswana 1972-2002

Babugura, Agnes A

2006-02-08
http://hdl.handle.net/10539/160

Downloaded from a DSpace repository. https://dspace.org/

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.1 Introduction

This chapter sets the context of the study. The main research problem, the objectives, and rationale are outlined. Botswana's country profile and a brief description of the thesis structure are also provided.

1.2 Study Background

Over the past years, there has been an increase in public attention regarding climate variability and change (e.g. IGBP, 2002; IPCC, 2001; Cutter, 2001; Bohle, 2001; Leon, 2001; O'Brien, 2001; UNEP, 2000; Kates, 2000; O'Brien and Leichenko, 2000; Kelly and Adger, 2000; Smit et al., 1999; NRC, 1999; Klein and Nicholls, 1999; Handmer, Dovers and Downing, 1999; Watson *et al*., 1996; Ribort, 1996; Karim, 1996, Maunder 1989). This attention resulted from concerns associated with the impacts of climatic variability and change in potentially worsening the lives of people, especially the poor people in the developing world. This stated linkage has made climate change discourse engender considerable international debate that has dominated the environmental agenda since the mid-1980s (Middleton, 1999).

As illustrated from the literature (IPCC, 2001; UNFCCC, 2000; Finberg, 1997; Miller, 1996) on climate change, clearly three schools of thought emerge. One group of scientists argues that global warming is not a threat to humanity. A second group of scientists, dominated by economists propose to wait until more knowledge is gathered about global climate systems and its possible effects of global warming, before any action can be taken. A third group contends that, even though spending money researching on the possibility and effects of global warming will not provide the certainty decision makers want, they cannot afford to wait until global temperature rises to a point whereby it exceeds normal climatic fluctuations. This group are of the view that when dealing with risky, far reaching and often ultimately irreversible environmental problems such as

global warming, it is safer to take action, even before there is enough knowledge to justify the action (Miller, 1996).

While scientific evidence has shown that the world is warming, scientists have also debated on how much of the warming is caused by natural climatic cycles and how much can be linked to human activities (Finberg, 1997). Scientists such as the IPCC, AGU, and the UCS have agreed that climate change is mainly attributed to human activities. Human activities such as the burning of fossil fuels and deforestation are believed to have increased atmospheric concentration of carbon dioxide, which is the main greenhouse gas responsible for climate change (UCS, 2003; IPCC, 2001). It is estimated for example, that 60% of the global warming is attributed to carbon dioxide produced by human activities (Miller, 1996).

Studies by the US National and Atmospheric Administration have shown that the concentration of carbon dioxide has increased by 31% since 1950 (WWF, 2004). Due to increased carbon dioxide in the atmosphere, the earth's average surface temperature has risen by about 0.6ºC in the last century. The warmest years in the 20th century were recorded in the 1990s, with the warmest year being 1998. By the end of the 21st century, the average surface temperatures are estimated to rise by a further 1.4ºC to 5.8ºC. The continuing rise in temperature is likely to trigger serious consequences for humans and ecosystems. These consequences include prolonged heat waves and droughts that could have serious effects on human lives (IPCC, 2001). In 2003 for example, heat waves in Europe resulted in the death of 35 000 people (UCS, 2003). Other consequences include rise in sea level, which is estimated to rise by 9 to 88cm by the end of the 21st century and changes in food production. The rise in sea level could endanger coastal areas and small islands by flooding them while changes in food production could drop, resulting in food shortages (IPCC, 2001).

Given the possible consequences of climate change, nations have been called on to reduce their emission of greenhouse gasses (WWF, 2004; UNFCCC, 2000). The plea is especially made to developed countries, as they are the main emitters of carbon dioxide. The amount of carbon dioxide for example, emitted in Africa is insignificant when

compared with Europe or America. A typical European country emits roughly 50 to 100 times more than a typical African country while America emits 100 to 200 times more (IPCC, 2001).

Although Africa has contributed the least to potential climate change, it is predicted to be the most vulnerable continent to climate change. This may be due to its low capacity to respond and adapt to climate change. A warming of approximately 0.7ºC was noted over most of Africa during the 20th century (IPCC, 2001). Natural disasters such as droughts are predicted to be more common and severe in Africa. Food production, water supply, plants and animals that make the continent different from other continents, are threatened by future climate change (WWF, 2002).

Africa being a home to many of the world's poorest nations, has already demonstrated how vulnerable it is to the effects of climatic events such as droughts and floods. The continent therefore faces the challenge of dealing with the possible consequences of future climate change. The continent however, is not only facing climate stress, it is also exposed to multiple stressors, which serve to exacerbate climate stress events (Drinkwater, 2003; Frankenberger *et* al., 2003; O'Brien and Leichenko, 2000). The ways in these stressors serve to aggravate climate stress are explored further in this thesis. Future climate change is therefore likely to be a tragedy for the African continent. This is the time that African countries need to work together as one, to find ways in which they can deal with the problems of climate change. Developed countries being the main emitters of carbon dioxide will also need to assist the African continent with resources that can enable Africa to deal with the impacts of climate change.

With Britain taking over the presidency of the G8 there might be hope for Africa. Tony Blair (Britain's prime minister) has acknowledged that two tasks face the world's rich nations. These are to provide Africa with the opportunity to better manage and adjust to climate change and variability with possible assistance from G8 nations. Tony Blair sees Britain's taking over as an opportunity to influence the international agenda of some of the world's most prosperous and powerful countries (Blair, 2004). Hopefully these

countries will be influenced to do more than just provide Africa with humanitarian aid but also to assist with long-term mitigation measures to deal with climate change impacts.

Tony Blair talks of a comprehensive programme of action with sustained commitment to implementation by Africa and by the international community. The plan involves intensive action to improve opportunities and growth, to reduce debt, to tackle HIV, malaria and TB, to fight corruption and to promote peace and security. The plan also includes the need to tackle trade barriers, which push up prices for consumers and prevent African countries from exporting their products (Blair, 2004). At the moment this is just a plan of action. Should this plan be implemented with full cooperation and commitment from all countries and not just developed countries, then there would be hope for developing countries to tackle and reduce vulnerability to climate change.

Vulnerability to climate change has become a prominent topic on the international global change arena (IPCC, 2001). This field of research has been driven by organizations such as IHDP, UNEP, SEI and the IPCC. Various authors such as Kasperson (2001), Adger *et al*. (1999), Vogel (1998), Devereux (1996), Glantz (1996), Bohle *et al*. (1994), Agarwal (1993) and Downing (1992) have also contributed to shaping a useful understanding of vulnerability to global climate change. It had become clear that most scientific research concerning climate change focused mainly on possible future changes and very little attention to how these changes may endanger societies. Questions concerning vulnerability of social and natural systems are now emerging in climate change research.

While trying to address questions of vulnerability to climate change, problems of climate variability must not be ignored and overshadowed by future climate change. Despite the efforts made by scientists to understand the Earth's climate system, a large amount of uncertainty regarding the scope, timing, and the magnitude of future climate change remains (Miller, 1996). There is a possibility that scientists may never be able to predict accurately the frequencies of climatic events.

Climate models for example predict that the global temperature will rise by about 1-3.5°C by the year 2100. This projected change is said to be larger than any climate

change experienced over the last 10,000 years. The projection is based on current emissions trends and also assumes that no efforts are made to limit greenhouse gas emissions. This uncertainty is can be attributed to uncertainties about future emissions, climate feedbacks, and the size of the ocean delay (Acosta *et al.*, 1999).

Regional and seasonal warming predictions are said to be much more uncertain. Given that most areas are expected to warm, some will warm much more than others. The largest warming has been predicted for the cold northern regions in winter. The reason being that snow and ice reflect sunlight, therefore less snow means more heat is absorbed from the sun, which enhances any warming. By the year 2100 for example, parts of northern Canada and Siberia are predicted to warm by up to 10°C in winter, but less than 2°C in summer (Acosta *et al*., 1999).

Different climate models (e.g. atmosphere-ocean general circulation models) on which climate change projections are made, are also known to produce significantly different projections of climate change in response to increases in greenhouse gases and aerosol concentrations in the atmosphere. The difference in projections is mainly due to differences in the sensitivities of the models to external radiative forcing and differences in their rates of heat uptake by the deep ocean. Despite the differences in projections, a broad range of acceptable model characteristics remains, such that climate change projections from any of the models should be treated as only one of a range of possibilities (Forest *et al*., 1999). The climate system is therefore extremely complex. There is no easy way of determining how much the climate will change in response to rising greenhouse gas levels. (Acosta *et al*., 1999)

Apart from the impacts climate change is likely to have on the physical environment, it is also expected to affect the livelihoods, food security and the health of people. (Sear *et al*., 2001; http://www.oxfam.org). Climate change will especially have a great impact on the poorest people in the world, many of who live in marginal environments or depend directly on natural resources for their livelihoods. For small farmers for example, disruption of rainfall patterns represents not just an economic inconvenience, but also a potentially disastrous impact on livelihoods. (http://www.neweconomics.org).

For Africa, projecting climate beyond the time scales of a few days has long been of great importance and at the same time presented a significant challenge. The most viable approach is through the use of climate modeling to simulate the earth system processes. (Hewitson, 2003). In southern Africa region, Global Climate Models (Canadian Climate Centre, CCC; Geophysical Fluid Dynamics Laboratory, GFDL; and UK Meteorological Office, UKMO) have suggested a warm season increase of 2° C to 4° C over southern Africa, with the doubling of CO_2 and the predictions of precipitation changes being much more variable (IPCC, 2001). The climate models used to predict the temperature change for southern Africa show that the region will not escape the effects of global warming. Southern Africa will be affected by warming in both summer and winter, rainfall may diminish in certain areas, and soil moisture will probably decrease more generally with a doubling of CO_2 (Kinuthia, 1997).

Although one of the more viable research techniques into global climate change is based on the use of general circulation models (GCMs), they are currently unable to reliably predict the regional climate change resulting from global warming (Hewitson, 1997). The climate system is therefore extremely complex. There is no easy way of determining how much the climate will change in response to rising greenhouse gas levels. (Acosta et al, 1999) This makes it urgent for the southern African inhabitants to be adaptive in the face of uncertain trends in climate-related socioeconomic activities of the region. Nations must learn to cope with climate variability and then cope with climate change ((Kinuthia, 1997).

While it is important to continue research on climate change, more attention should be given to the present problems of climate variability. These are problems that may get worse under conditions of climate change. Unlike climate change, the impacts of climate variability have already been highlighted by events such as droughts and floods. The impacts of climate variability (e.g. reduced crop yields, livestock losses, water shortages, hunger, loss of human life) are not hypothetical, but are already real and known (Ribot *et al*., 1996). Vulnerability assessments could be more helpful in providing useful reliable data, which will assist in understanding climate variability and its impact on human welfare (Kasperson, 2001). The advantage of focusing on vulnerability to climate

variability is that it reduces dependence on uncertain results of climate models and at the same time points out the many potential ways to reduce impacts of climate variations both today and in future (Liverman, 2001). Vulnerability is discussed further in chapter two.

This thesis therefore focuses on vulnerability to climate variability in Botswana. Like many African countries, Botswana has been affected by climate variability. It is faced with recurring droughts, which are the most common consequences of current climate variability. Droughts in Botswana are known to be a major risk factor for sustaining livelihoods. Statistically, one in three years is a drought year (Kruger, 1999). A major part of the country's food and economic security is therefore at risk. The poor population is likely to be the most vulnerable to drought (Mooka and Mokone, 1993), largely as a result of reduced ability or capacity to cope with drought.

1.3 Problem Statement

As already mentioned in the introduction, research on future climate change consists of uncertainties regarding the scope, timing, and the magnitude of climate change. Due to the uncertainties of future climate change, it is essential to fully understand social and biophysical vulnerability, as well as the process of social adaptation to current and past climatic impacts. This will enable us to develop new, as well as improve on existing coping strategies, so as to cope better with possible future changes in climate. Vulnerability to climate variability is an issue that cannot be ignored as recurrences of floods and droughts continue to affect societies. Floods in Mozambique for example, have claimed thousands of lives and livelihoods. In 1997/8, the El Niño resulted in extensive floods in Somalia and Kenya causing damage to property, crops, as well as outbreaks of malaria and rift valley disease. Malaria caused hundreds of human deaths while rift valley disease led to livestock deaths (DFID, 2004).

Droughts continue to affect thousands of people in southern Africa (DFID, 2004). In 2002 for example, southern Africa experienced a regional food security crisis. The crisis was attributed mainly to drought. The worst affected countries included Malawi, Zambia,

and Zimbabwe (U.S Agency for International Development, 2002). During the 2002 drought, Zimbabwe crop production was severely reduced. Out of 57 districts, 36 produced less than 25% of their average production. The maize harvest was estimated to be 500 000MT compared to the requirements of almost 2 million MT (Save the Children, UK, 2003). Reduced crop production therefore had a negative effect on food security putting people at the risk of hunger.

Although studies on vulnerability to climate variability have been conducted in Africa (e.g. Dilley, 2000; Downing *et al.*, 1997; Hulme, 1996; Ribot, 1996; Scoones *et al*., 1996; Vogel, 1994; Downing, 1992; Downing, 1991; Rasmusson, 1987; Bratton, 1987; Campbell, 1984), there is limited and insufficient knowledge on:

- How socio-economic, political and biophysical factors heighten or weaken people's ability to cope and adapt to climate variability?
- How people have coped and adapted in the past and whether these strategies have strengthened or weakened over time?
- Which coping and adaptation strategies have been successful and how they can be improved on or made more effective to reduce vulnerability to climate variability?
- Whether there is a difference in coping and adaptation strategies among societies living under different climatic conditions when faced with the same climatic event?

1.4 Objective

This study, aims to examine vulnerability of rural societies and the configuration of forces that shape peoples ability to cope and adapt to climate variability. The study compares vulnerability of two rural societies in Botswana, living in two different climatic zones. The two rural societies are situated in Matsheng (driest part of the country), which is located in the Kgalagadi district (southwestern Botswana) and in Kasane (wettest part of the country), which is located in the Chobe district (northern Botswana), (**Figure 1.1**). The two zones experience different extreme climatic conditions therefore enabling an understanding of how different rural societies, living under different climatic conditions,

shape their livelihood systems to buffer against climate variability. A variety of factors shaping coping and adaptive capacity in these two communities are examined.

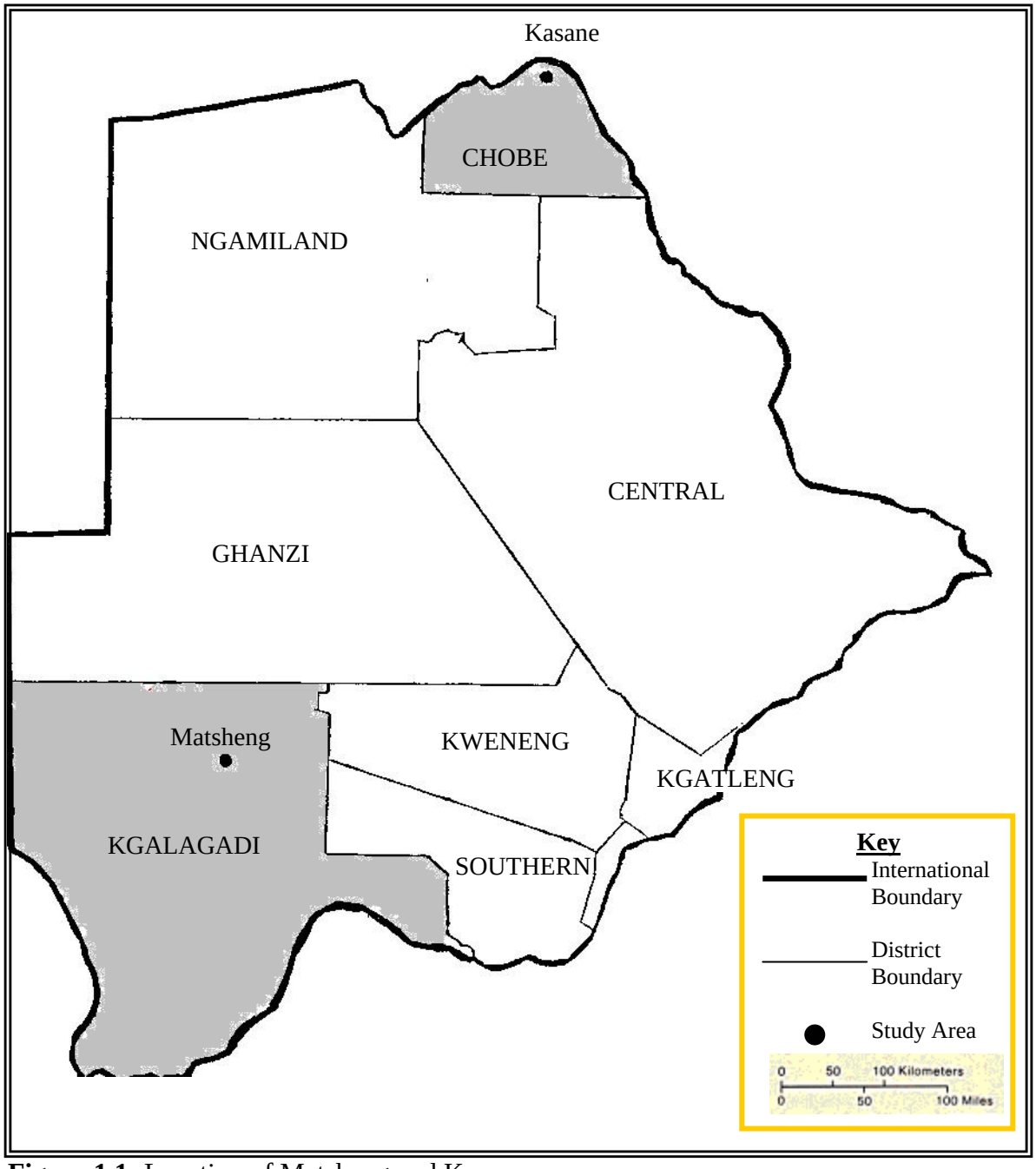

Figure 1.1: Location of Matsheng and Kasane

1.5 Research Questions

The broad objective has been broken down into the following research questions in order to address the issues stated in the problem statement:

1. What is the history of climate variability in the southwestern and northern parts of Botswana (over a period of 30 years)?
2. How has such climate variability affected rural societies living in the southwestern and northern parts of Botswana?
3. How have the rural societies coped and adapted to climate variability in the past and how are they currently coping and adapting?
4. What factors (biophysical, socio-economic, cultural or political) have heightened or weakened people's ability to cope with and adapt to climate variability?

Having set the context of the study, Botswana's country profile is presented below to provide a general background of the country. The profile includes a brief description of Botswana's physical features (location, vegetation, soil), natural resources, population structure and economic status.

1.6 Country Profile

1.6.1 Location

Formerly the British colony of Bechuanaland, Botswana adopted its new name upon independence in 1966. Botswana is a land-locked country situated in the Kalahari basin of the Southern Africa Plateau that is located in the center of southern Africa (**Figure 1.2**). It shares borders with Zimbabwe, South Africa, Namibia and Zambia. Botswana has a land area of approximately 582 000 square kilometers and the mean altitude above sea level is approximately 1000 metres (Ministry of Finance and Development Planning, 1997).

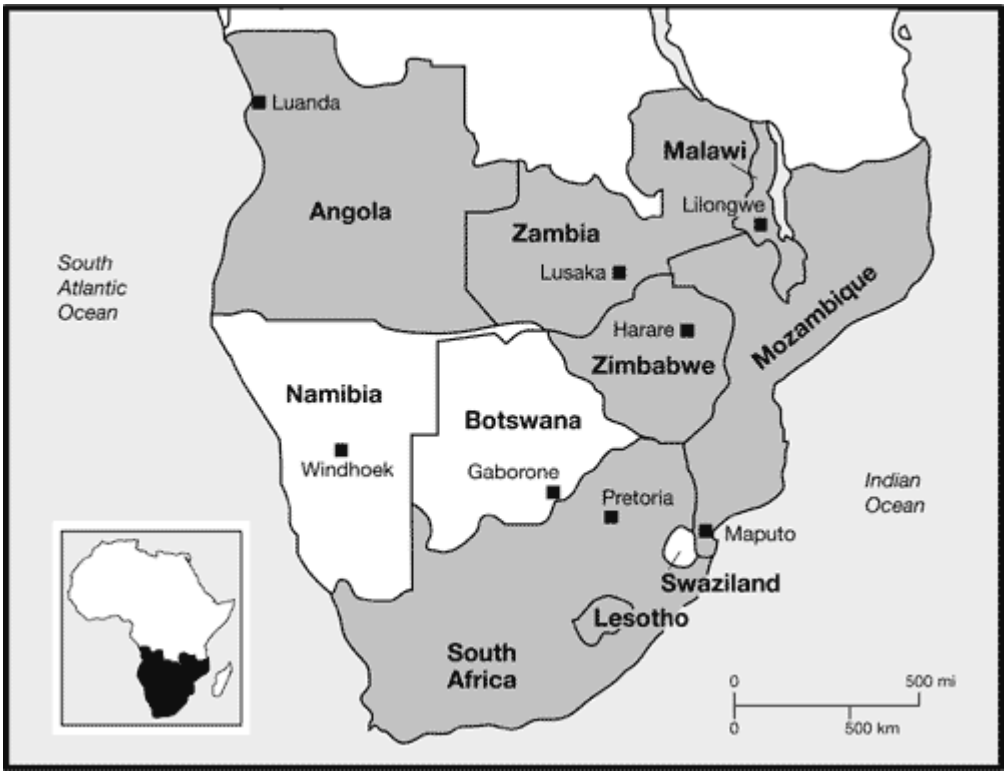

Figure 1.2: Botswana's location in Southern Africa

Source: Department of Maps and Surveys, Botswana

Most of the country is flat, with gentle undulations and occasional rocky outcrops. In the North-West, the Okavango River drains inland from Angola to form the Okavango Delta. The central North-East is a large area of calcrete plains. In the east, adjacent to the Limpopo drainage system, the land rises above 1 200 metres, and the Limpopo Valley gradually descends from 900 metres in the south to 500 metres at its confluence with the Shashe River. The eastern region has a less harsh climate and more fertile soil than else where in the country. This is where most Batswana live. The rest of the country is covered with thick sand layers of the Kalahari Desert, which accounts for more than two thirds of Botswana's land area. The Kalahari supports a vegetation of shrub and grasses, but there is an almost complete absence of surface water (Ministry of Finance and Development Planning, 1997).

1.6.2 *Vegetation and Soil*

Away from the bush swampland of the Okavango Delta, the vegetation has to withstand long dry periods each season and has to cope with recurrent drought. Belts of indigenous forest and dense bush characterize the north, while the south is dominated by treeless grass savanna. More than half of the country supports shrub-tree savanna, with the mopane tree dominating in the northeast and the hinterland of the Okavango (Ministry of Finance and Development Planning, 1997).

Soils are relatively poor throughout Botswana. The Sandveld is predominantly covered by arenosols of poor water-retention capacity developed from the Kalahari Sands. The Hardveld is dominated by highly leached ferruginous tropical soils. The soils are mostly from granite rocks. Poor soils result in grasses of low productivity; therefore the rangelands support a low density of livestock and wildlife (Arntzen and Veenendaal, 1986).

1.6.3 Natural Resources

Botswana's main natural resources include, land, wildlife and minerals. About 25% of the total land area is categorized, as state land. This comprises mainly of national parks, game reserves, wildlife management areas and forest reserves. Communal land forms 70% of the total land area while the remaining 5% accounts for freehold farms (Mogotsi, 2002). Most of the best arable land is found in the freehold farming areas in the east. Much of the land is suited to extensive beef production. Due to the development of boreholes, there has been a tendency for cattle ranching to push further west into the Kalahari. Exploitation of the fragile Kalahari rangeland, however, increases the likelihood of livestock losses when drought recurs (Ministry of Finance and Development Planning, 1997).

Some of the last great populations of wild animals left in Africa are found in Botswana. Wildlife therefore forms an important resource for both tourism and hunting. Wildlife makes an important contribution to the subsistence economy of the country. Although large areas of the country are designated as National Parks and Game Reserves, a

considerable number of game are found outside the reserves. As a result livestock, agriculture and game often represent competing uses of marginal land (Ministry of Finance and Development Planning, 1997).

Mineral exploration has been undertaken in recent years and much continues to be discovered about Botswana's mineral resources. With the discovery of gold deposits in the country, reserves of approximately 795, 000 ounces of gold have been confirmed. This can be extracted in a period of at least five years. Other minerals mined in the country include copper-nickel, coal, salt and soda ash, and diamonds (Ministry of Finance and Development Planning, 2003).

Moving onto water, it is a very scarce resource in Botswana. Surface water resources are limited. Perennial rivers occur in the north of the country while ephemeral rivers draining into the Limpopo are found in the Hardveld. The ephemeral rivers have important reserves of ground water stored within their beds. Surface drainage is limited to pans and dry valleys. Approximately 80% of Botswana's human and animal population depends on ground water (Ministry of Finance and Development Planning, 2003; Ministry of Finance and Development Planning, 1997; Molutsi 1988). In the next section the population structure is presented.

1.6.4 Population

Based on the 2001 population and housing census, (the most recent national census) the country has an estimated population of 1 680 863 million people. Compared to the population 1 326 796 million in 1991, the population grew at an average annual rate of 2.4%. Botswana's population has always been youthful and it continues to be youthful. The population aged less than 15 years for example accounts for 36.7% of the total population, while those aged 65 years and above, only account for 5%. Compared to the 1981 and 1991 population census however, the number of youths has decreased. In 1981 those under the age of 15 years accounted for 47.7% of the total population, and 43.2% in 1991. This is likely to be a result of combined effects of increasing infant and under five mortality rates due to HIV/AIDS and reduced fertility rates (Central Statistics Office, 2001).

The local population is made up of two main ethnic groups. The Tswana who make up about 66% of the population and the Kalanga who comprise of 13% (Central Statistics Office, 2001). The Tswana arrived in the country in a series of migrations between the 17th and early 19th centuries, pushing earlier inhabitants westward into the Sandveld. Few people are still known to live by means of hunting and gathering, while the majority live in settlements or work on cattle farms (Botswana Society, 1986). Having looked at the population structure, the focus shifts to the economy of the country.

1.6.5 Economy

Before independence in 1966, Botswana was one of the poorest countries in Africa. An overwhelmingly rural population depended mainly on agriculture for a livelihood. Beef production was the foundation of the economy in terms of output and export earnings (Ministry of Finance and Development Planning, 1997). Since independence Botswana has maintained one of the world's highest growth rates. Through financial discipline and sound management, Botswana has transformed itself from one of the poorest countries to a middle-income country. Diamond mining has stimulated much of the country's economic expansion. Diamond mining accounts for more than one-third of Botswana's GDP and nine-tenth of export earning. Botswana is now ranked as the best credit risk in Africa (Ministry of Finance and Development Planning, 2003).

Although Botswana has experienced and enjoyed economic boom the government faces problems of high unemployment rates, poverty and HIV/AIDS (Ministry of Finance and Development Planning, 2003; Ministry of Finance and Development Planning, 1993). These problems threaten the countries impressive economic gains. In addition to these problems agriculture has continued to slow down due to recurrent and prolonged droughts and poor soils. This makes Botswana dependent on international markets, as domestic food consumption has to be met by cereal imports. During drought periods, for example, food imports increase to 90%. Unfavorable climatic conditions have resulted in the country's failure to be self-sufficient in basic staple commodities such as sorghum and maize (Alverson, 1999). Vulnerable populations are therefore faced with the

challenge of formulating coping and adapting mechanisms to deal with such climatic consequences of drought.

1.7 Thesis Structure

The general organisation of the study is as follows:

Chapter One provides the general background to the problem under research by discussing the aims and objectives, rationale and key research questions of the study. The chapter also provides a brief background of Botswana.

Chapter Two focuses on relevant literature and theoretical underpinnings surrounding vulnerability to climate variability. For example the chapter covers literature concerning the concept of vulnerability, literature on climate variability and climate change, vulnerability to climate variability, and various coping strategies.

In **Chapter Three** the methodological framework and various methodological components adopted to achieve the objectives of the study are described. The choice of methods was influenced by the nature of the problem and by the availability of time. The methods include both primary and secondary methods of data collection.

In **Chapter four**, focus is shifted to the physical and human environmental setting of the studied areas. The physical environmental setting provides information on location, climate, soil conditions and vegetation. The human environmental context is also given. This includes population size, livelihoods and socio-economic characteristics of household respondents.

Chapter five deals with the effects of climate variability on rural societies in Matsheng and Kasane. **Chapter six** examines coping and adaptive strategies of rural societies in Matsheng and Kasane. In **Chapter seven** the major constraints affecting coping and adaptation to climate variability in Kasane and Matsheng are discussed. These include socio-economic and biophysical factors. **Chapter eight** comprises the conclusion and recommendations.

* *

In this chapter, the topic of the study was introduced. The objectives of the study were outlined and the structure of the following chapters was briefly described. Using Botswana as a case study, the aim in this thesis is to examine vulnerability of rural societies to climate risk and the configuration of forces that shape their ability to cope and adapt to climate variability. Two rural societies situated in Matsheng (driest part of the country) and Kasane (wettest part of the country) are used to examine and answer the research questions. In the next chapter, literature including the theoretical underpinnings surrounding vulnerability to climate variability is presented.

CHAPTER TWO

LIVING WITH CLIMATE VARIABILITY, ADAPTATION AND COPING

2.1 Introduction

This chapter consists of literature and theoretical underpinnings surrounding vulnerability to climate variability. The literature and the theoretical background provide useful conceptual links, which were used in constructing the methodologies of this study. The chapter begins with the definitions of vulnerability, adaptation and coping. Issues concerning climate variability, vulnerability to climate variability and the mechanisms used to cope and adapt to climate variability are then discussed.

2.2 Defining Vulnerability, Adaptation And Coping

2.2.1 The concept of vulnerability

The term vulnerability can be traced back to the analysis of famine, hazards and entitlement (Blaikie *et al.*, 1994; Burton, *et al.*, 1993; Sen, 1981). The term was applied in describing the state of individuals and societies coping with climate variability and stress (Adger, 1999). Over the years, the concept has become more prominent in the studies of global environmental change (IPCC, 2001; Adger, 1999; Watson *et al.*, 1996; Dow and Downing, 1995; Downing and Watts, 1994; Dow, 1992; Liverman, 1990). Although there has been more than a decade's worth of research experience regarding the concept of vulnerability, capturing the meaning of the concept is still very difficult. Several attempts have been made to define the concept of vulnerability (IPCC, 2001; Adger and Kelly, 1999; Vogel, 1998; Ribot, 1996; Dow and Downing 1995; Blaikie *et al.*, 1994; Cutter, 1993; Watts and Bohle, 1993; Smith, 1992; Liverman, 1990; Mitchel, 1989; Bogard, 1989; Kates, 1985; Susman *et al.*, 1984; Timmerman, 1981; Sen, 1981; Gabor and Griffith, 1980). The discrepancies in meaning seem to emerge as a result of different epistemological orientations (political ecology, human ecology, physical science, special analysis) and subsequent methodological practices (Cutter 1996).

In the context of livelihood security, Chambers (1989) views vulnerability as exposure to contingencies and stress, and difficulty in coping with them. Thus seeing vulnerability comprising of two sides: an external side and an internal side. The "external" dimension refers to exposure to risks and hazards. The "internal" dimension refers to coping and action to overcome or at least mitigate the negative effects of a hazard (Bohle 2001; Bohle and Watts, 1993; Chambers, 1989).

Bohle *et al.* (1994) define vulnerability based on the human ecology of production, expanded entitlement in market exchange and the political economy of accumulation and class processes (see **Figure 2.1**). In this case vulnerability is viewed as collective measures of human welfare that incorporate environmental, social, economic and political exposure to a variety of destructive perturbations (Bohle *et al.*, 1994).

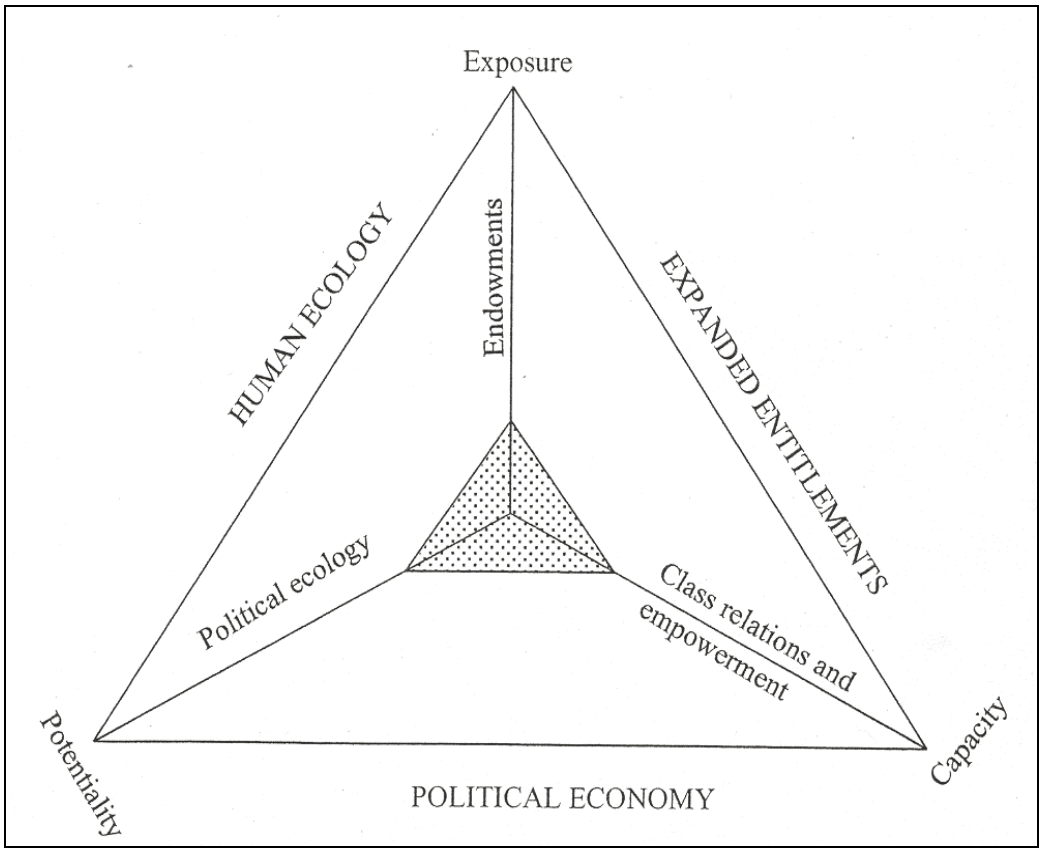

Figure 2.1: Casual structure of vulnerability
Source: Downing and Patwardhan, 2003:23 (after Bohle *et al.*, 1994)

Vulnerability is a state of well-being. Vulnerability also differs among different populations living under different environmental conditions as well as different political institutions and resource endowments, technologies and inequalities (Watts and Bohle, 1993). Moss *et al*. (1999) argues that vulnerability relates to the consequences of perturbations, rather than its agent. Therefore people are vulnerable to loss of life, livelihood, assets and income, rather than to specific agents of disaster such as floods, windstorms, and droughts.

Following Kelly and Adger (2000) and Chambers (1989), vulnerability in this study is defined as the ability or inability of individuals or social groups to respond to, cope with, recover from or adapt to, any external stress placed on their livelihoods and well-being. A combination of social, economic, ecological and political factors that shape the ability or inability of households and social groups within a rural community were taken into account to assess vulnerability to climate variability in Botswana.

Given the various definitions of vulnerability, three distinct clusters of definitions are identified in vulnerability studies: as risk of exposure to hazards, as a capability for social response and vulnerability of places (Cutter, 1996). In some cases vulnerability is viewed as an aspect of risk as well as a probability of a hazard. Downing (1999), however, separates hazard and vulnerability based on the argument that together hazard and vulnerability add up to risk, with disaster as the realization of risk. Kasperson (2001) argues that risk is closely tied to vulnerability and may be viewed as a joint production of environmental stress, human and ecological vulnerability. Kasperson further argues that communities that are most vulnerable may also be the most at risk to shock or disturbance to normal daily life.

Differentiating between vulnerability and hazard has been necessary based on the view that there is a difference between extreme events in nature, which are not automatically hazardous to people, and the character of hazard events. The natural ‘events’ system is seen to function independently of human activities. It is also acknowledged that large parts of social systems may be regarded as operating independently of natural events. Resources are created when the two interact. Hazards or negative resources may also be

created (Burton *et al*., 1993). In the case of climate studies the definitions of vulnerability focus on concepts such as risk, adaptability, susceptibility, resilience, marginality and fragility (IPCC, 2001; Ribot, 1996; Watson *et al*., 1996; Tiffen, 1995; Dow, 1992; Rasmusson, 1987; Jodha and Mascarenhas, 1985; Schneieder and Temkin, 1978).

Resilience is another concept that emerges often when discussing the concept of vulnerability. Like vulnerability, resilience is also a complex concept especially when dealing with social processes. Resilience of peoples' livelihoods according to Chambers and Conway (1992) depends on their capabilities to adapt to internal and external shocks and stresses. In its simplest form resilience is basically the opposite of vulnerability. Resilience is defined as:

> *The amount of change a system can undergo and still retain the same control on function and structure; the degree to which the system is capable of self-organisation; and the degree to which the system expresses capacity for learning and adaptation (Walker, 2003: 12).*

The definition clearly illustrates that resilient systems are capable of coping with destruction and have the capacity for re-organisation. Less resilient systems become increasingly vulnerable to disturbances that were previously within the coping limits of the system (Quinlan, 2003). Although there has been no single approach to capture the meaning of vulnerability and resilience, climate change and variability continue to capture the desire to understand the ability to cope, adapt and recover from perturbations that substantially disrupt the normal functioning of a system.

Vulnerability has proved to be a complex concept and as long as different epistemological orientations exist, there will always be discrepancies in meaning. Regardless of the discrepancies in meaning, it is important to address vulnerability and resilience. This can only be done through understanding why individuals, households, nations, and regions are vulnerable and how they buffer themselves against various changes (e.g. climatic fluctuations).

2.2.2 Coping and adaptation

Coping and adaptation are terms that cannot be separated from the concept of vulnerability. The capacity to cope and adapt are usually the main concern during a disaster, rather than the severity of the damaging agent. When disasters occur for example, the focus is usually particularly upon who is affected and their capacity to withstand, mitigate and recover from damage (Hewitt, 1997). Although the aim of both coping and adaptation strategies is to reduce vulnerability, the two terms differ in definition.

While adaptation involves longer-term shifts in livelihood strategies to respond to change in the environment, coping involves temporary adjustment to respond to change or a short-term modification of livelihood activities in the face of a shock or stress (de Stage *et al*., 2002). Coping is defined as the manner in which people act within existing resources and range of expectations in a given context to achieve various ends (Blaikie *et el*., 1994). Adaptation refers to adjustment in natural or human system in response to actual or expected climate stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC, 2001: 982). More definitions of adaptation can be found in the climate change and climate variability literature (e.g. IPCC, 2001; Smit *et al.*, 2000; Stakhiv, 1993; Smit, 1993; Burton, 1992).

Both coping and adaptation are complex and often involve several sequenced strategies for obtaining resources in times of hardship. The strategies are a result of exposure to the risk of an occurring event. Given that coping strategies focus on short-term survival rather than long-term success, they are viewed as alternatives to adaptation. Coping strategies are critical aspects of rural systems (e.g. selling of assets and temporary migration) and adaptations to an unpredictable production environment that are subject to modification as the development context of the village is altered (Campbell *et al*., 1989).
Based on the explanation that coping involves short-term strategies that allow a person to manage an immediate issue on a temporary basis, it can be argued that coping may prevent a person from addressing the actual cause or causes of his or her problem. Sale of livestock and assets during drought for example, provides income for immediate use but

does not enable communities to cope in the longer term. In cases such as these the ability to cope in future is compromised because the ability to recover is affected. Recovery is usually slow and difficult (SADC, 2002). Should another drought occur before recovering from the previous drought people might fail to cope.

Adaptation may therefore be the answer to reducing vulnerability to climate variability in the longer term. Adaptation is an important approach for protecting ecological, social and economic systems. Adaptation further enhances the resilience of vulnerable systems and reduces the risk of damage to human and natural system from climate change and variability (IPCC, 2001; Smit *et al*., 2000; Burton, 1997; Bohle *et al*., 1994; Stakhiv, 1993).

Adaptation to climate change has recently become a focus of policy debates (Adger, 2003). There is now more emphasis on how to increase adaptation capacity of communities, regions and countries to respond to a range of possible impacts of climate change (IISD, 2005; El Raey, 2004; Koshy, 2004; Beg *et al* 2002; Sokona and Denton, 2001; IPCC, 2001). Effort on characterizing and understanding adaptation is therefore now underway. Analogues of adaptation in the past are being complemented with policy and social science research on the present adaptive capacity of governments, civil society and markets to deal with climate perturbations. One of the key issues is to identify successful adaptation in the developing world where the greatest risk and physical vulnerability persists (Adger, 2003).

The focus on adaptive capacity has led to a growing recognition of the links between adaptation to climate change and sustainable development. There is acknowledgment that increasing adaptive capacity requires promoting many activities associated with sustainable development. Lessening pressure on natural resources, improving environmental risk management and increasing the social well-being of the poor for example not only reduces vulnerability to climate change, but also puts communities, regions and countries on a solid path towards sustainable development (International Institute for Sustainable Development, 2005)

The determination of countries around the globe to take on the challenge of sustainable development was evident in the 1992 United Nations Framework Convention on Climate Change by linking the issues of greenhouse gas emission and development (Sokona and Denton, 2001). Agreements on mitigation and adaptation under the convention will however need to recognize the diverse situation of developing countries with respect to their level of economic development, their vulnerability to climate change, and ability to adapt to or mitigate it (Beg *et al.*, 2002). Developing will need to be supported in exploring ways to achieve development objectives in a more sustainable manner (Sokona and Denton, 2001).

Even though adaptation has been recognized to have the potential to reduce adverse impacts of climate change and enhance beneficial impacts, it will incur costs and will not prevent all damages. The term maladaptation is therefore created to separate certain actions as being more unproductive when compared to others in creating resilience to adverse effects of climate change and variability (IPCC, 2001).

Maladaptation refers to actions that increase the vulnerability to climate change. This includes making development or investment decisions while neglecting the actual or potential impacts of climate or climate change (Burton *et al*., 1998). The actions may include responses taken in the short term to satisfy an immediate need that may not be productive in the longer term. This may occur at both governmental and individual levels (Burton *et al*., 1998). It is important that interventions necessary to enhance adaptive capacity implemented without becoming more vulnerable or shifting towards maladaptation (Adger, 2003).

Apart from maladaptation, scientific communities and policy-makers are particularly concerned about adaptation to climate change. While this is important it is arguably more important to concentrate on adaptation to the vagaries of current climate. Adaptation to current climatic conditions has the potential to enhance resilience that can result from responses well suited for current climatic shocks (Burton, 1997 and Bohle *et al*., 1994). This is especially more important for developing countries as they are currently the most

affected by climate variability. In the next section climate variability is discussed in more detail.

2.3 Climate Variability

In this section various issues concerning climate variability and the climate system are discussed. Climate is defined by the World Meteorological Organization (WMO) as the average state of the atmosphere, measured usually, over a 30-year period (WMO, 1990). Temperature and precipitation are the two most important factors that determine the climate of an area (Miller, 1996). Climate variability captures year-to-year fluctuations of climatic elements such as temperature and precipitation at several time scales (Ribot, 1996; Douguedroit, 1997). Compared to climate change, climate variability is short-term. It affects a variety and occurrence of shocks that people absorb or try to adjust (Parry and Carter, 1985).

Climate has always been dynamic and it varies at a global scale of time and space (Ribot *et al*., 1996). Current concern for climate variability has arisen because of the unprecedented pace and the extent to which expected changes in climate affect human and environmental systems (IGBP, 2002; Ribot *et al*., 1996). Climate variability affects all countries in one-way or another. For some countries the problems occur with variability in rainfall, others with temperature, and still others with snow pack and varying evaporation rates. Historical records of various countries have shown how the impacts of climatic events such as droughts and floods have affected them (Glantz, 1990). Understanding vulnerability to climate variability has therefore become increasingly important in order to develop effective measures against existing climatic events as well as to increase resilience to possible future climate change.

In this study the focus is on drought, as it is the most common consequence of climate variability in Botswana. Unlike floods, hurricanes, tornadoes and other climatic events, drought is different. It is a ‘creeping’ phenomenon and usually never kills directly. People usually die of consequent hunger (Chaffy *et al*., 1996) induced by drought. Drought has been a persistent problem affecting some of the poorest nations throughout

the world. In most countries there has been very little internal capacity to cope with most vital impacts of drought (Kates, 2000).

Similar to vulnerability there have been endless arguments regarding the meaning of drought. According to Wilhite (2000), drought is the most complex and least understood of all natural hazards, affecting more people than any other hazard. It is referred to as a creeping phenomenon because the associated effects accumulate slowly over a considerable period of time and may linger for years after the termination of the event. The onset and end of drought is therefore difficult to determine.

The absence of a precise and universally accepted definition of drought has caused confusion among scientists. Drought implies an extended and significant negative departure in rainfall, relative to the regime around which society has stabilized (Rasmusson, 1987). More drought definitions can be found in (Wilhite, 1998; Schneider, 1996; Vogel, 1994; Cook, 1978; Standford, 1977; WMO, 1975; Tunnehill, 1947). There are different types of droughts. There are 3 main types of drought known as agricultural drought, hydrological drought and meteorological drought (Meneo and Iglesias, 2004).

Agricultural drought occurs when there is insufficient water for crop development in a particular time. The availability of soil moisture falls below the normal range of variability for a prolonged period of time and results in crop failure. Agricultural drought is usually evident after meteorological drought. Meteorological drought is defined based on the degree of dryness and the duration of the dry period. Meteorological drought is region specific as atmospheric conditions that result in lack of precipitation are highly variable from region to region. Hydrological drought is associated with the effects of periods of rainfall shortfalls on the water levels of rivers, reservoirs and lakes, and aquifers. This type of drought is usually noticed after meteorological drought (Meneo and Iglesias, 2004).

Given that there are various arguments regarding the definition of drought, Cook (1978) points out that the key unchanging factor in defining the term is water availability, or rather a lack of it. The difficulty in defining drought is mainly due to the fact that it is not

dependent solely on rainfall but also on evaporation rates, run-off of water, ground water supplies, surface storage, extent of re-cycling, cultivation practices and vegetation cover (Cook, 1978). There is also the fact that due to numerous and diverse disciplinary views, each discipline tends to incorporate different physical, biological and socio-economic factors into the definition of drought (Glantz and Katz, 1977). This has resulted in the existence of considerable confusion among scientists. Having discussed climate variability, specific attention is now given to describing climate variability in Southern Africa.

2.3.1 Climatic variability over Southern Africa

The mean circulation of the atmosphere and the perturbations from the mean, influence the climate of Southern Africa. The location of the region in the subtropics ensures that the climate is affected by circulation systems prevailing in both the tropics to the north and temperate latitudes to the south. At the same time the, climate is dominated by high-pressure systems that, together, constitute the semi-permanent, subtropical high- pressure cells of the general circulation of the southern hemisphere (Tyson and Preston-Whyte, 2000).

Rainfall periodicity is determined by disturbances in the mid-latitude westerlies. The westerlies account for 39% of the total rainfall in Southern Africa (Harrison, 1986). Another major determinant of rainfall variability is the tropical, quasi-permanent trough and lows in the easterlies. The low-level convergence to the east of the waves facilitates cumulus convection, while divergence to the west inhibits it and promotes aridity (Tyson and Preston-Whyte, 2000).

The primary annual rainfall patterns are strongly influenced by the Inter-Tropical Convergence Zone (ITCZ). The zone is close to the equator where large rain-bearing clouds form when the South East Trade Winds meets the North East Monsoon Winds. The ITCZ changes location throughout the year, oscillating between the Equator and the Tropic of Capricorn. Its southward movement normally marks the beginning of a rainy season. In a typical rainy season, the ITCZ uses pressure between mid Tanzania and Southern Zimbabwe, which is associated with favorable rainfall. The Botswana High is

another pressure system, that often tends to push the ITCZ away, resulting in periods of drought (Tyson and Preston-Whyte, 2000). **Figure 2.2** further illustrates the dominant circulation patterns over Southern Africa.

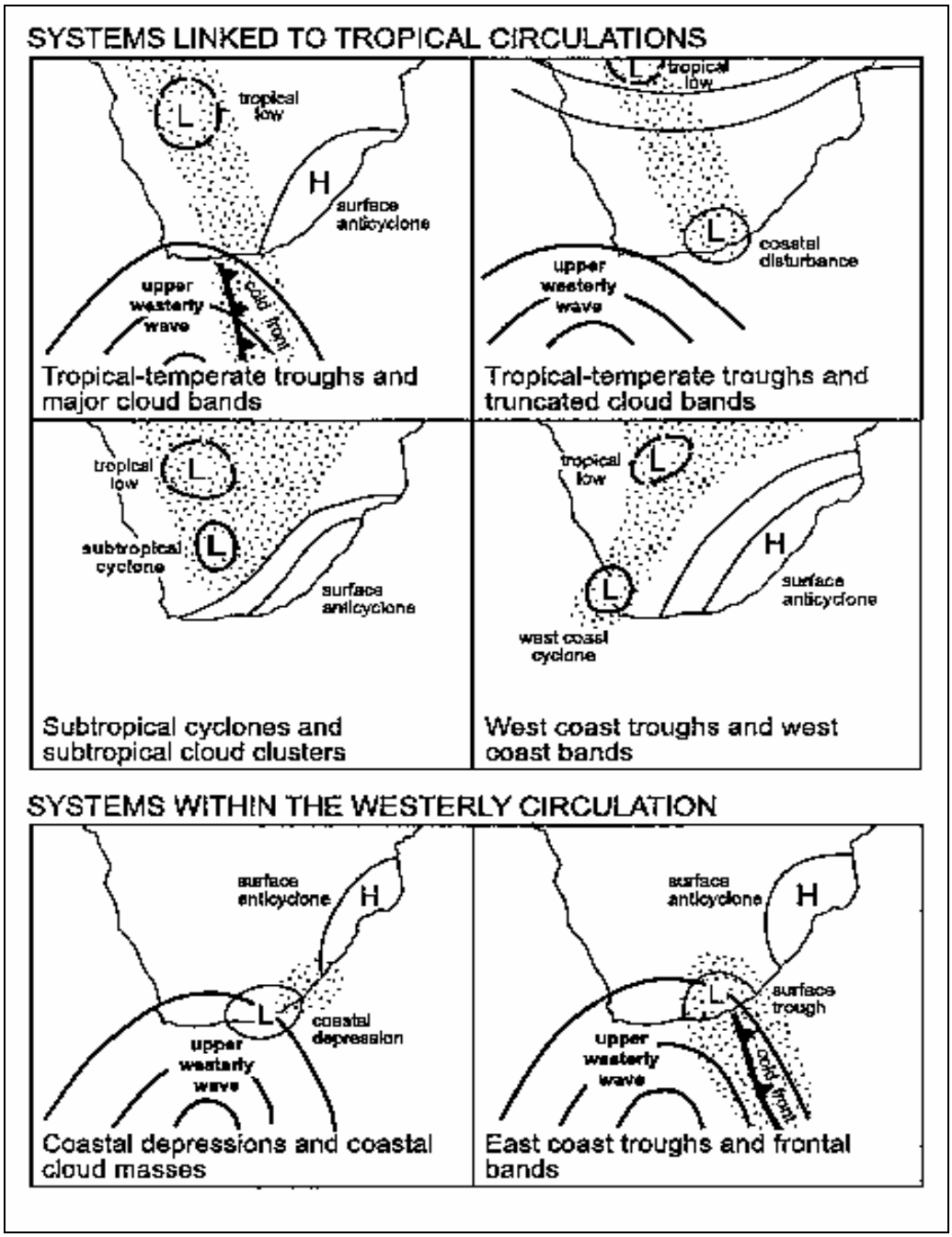

Figure 2.2: Circulation patterns over Southern Africa.

Sources: (after Tyson and Preston-Whyte, 2000: 214)

Southern Africa's climate is also influenced by the El Niño Southern Oscillation (ENSO), which may bring either heavy rains often accompanied by severe floods or drought. Normal rainfall in the wet season ranges from 50mm to over 1000mm. Recently the climate patterns have been erratic with severe droughts recorded between 1967 and 1973, 1981 and 1983, in 1991 and 1993. In 1999/2000, for example, floods were extensive, across most of Southern Africa. Mozambique was the most affected (National Drought Mitigation Center, 2000; WMO, 2000; Chenje and Johnson, 1994). The 1999/2000 floods in Southern Africa, affected about 150 000 families and devastated Mozambique. The floods caused physical damage worth 273 million US dollars, 295 million US dollars in lost production and 31 million US dollars in food imports (Mozambique National News Agency, 2000).

Given the climatic conditions of Southern Africa, the occurrences of flooding and droughts arising from climate variability are of major concern. These climatic events may also increase in severity and magnitude (IPCC, 2001). There is reason to be concerned, as these climatic events have shown to have serious impacts on the environment and the human society. The climate of Botswana is discussed below providing a background to the country's climatic conditions.

2.3.2 Botswana Climate

Botswana's climate is semi-arid with low, unreliable rainfall that is unevenly distributed and highly variable from year to year (Ministry of Finance and Development Planning, 1997). The climate is strongly influenced by two major factors. One is its position in the middle of southern Africa and the second is its latitudinal position, particularly in relation to the main world distribution of pressure and winds. In terms of atmospheric pressure distribution, the country lies in a zone of descending air that compresses, causing the air mass to warm up. This brings about high pressures resulting in dry air. During the winter months, from April to September, the climate is warm with dry air in the daytime, but cold at night. There is no rain during the winter season. In summer, the sun is overhead on the Tropic of Capricorn. Botswana lies at the western and southern limits of rain-bearing air masses, subjecting the countries rainfall to great variability in both space and

time. More reliable rains are usually experienced in the north and eastern part of the country between October and March (Botswana Metrological Centre, 2001; Ministry of Finance and Development Planning, 1997).

Rainfall Patterns

Rainfall over Botswana is affected by the ITCZ to the north and by the south easterlies to the east and southeast. Much of the rainfall in Botswana (90%) occurs in the summer season between October and March. During the summer season, a low-pressure system develops and is centered over southern Africa allowing in flows of moist air from the Indian Ocean to reach eastern Botswana, while air from the Atlantic may move over Angola and the Congo Basin to reach northern Botswana. Rainfall in the northern part of Botswana is likely to be affected by the southern extension of the ITCZ (Botswana Metrological Centre 2001).

The rain is of very poor quality in that it usually falls in heavy showers of short duration. Sixty percent of the total rainfall may fall in showers of more than 10mm, but these may account for only 10% of the total rainfall occurrences. The rainfall patterns tend to show that the incidence of drought is not the same in all parts of the country (Ministry of Finance and Development Planning, 1997; Arntzen and Veenendaal, 1986).

Average annual rainfall

Annual rainfall varies from a maximum of over 650mm in the extreme northeast to a minimum of less than 250mm in the extreme southwest of the country **(Figure 2.3)**. Most of the rain is from convection processes such as instability showers and thunderstorms, which are several orders smaller in magnitude than the synoptic systems, which control the air masses supplying the moisture. This makes rainfall in Botswana highly variable from place to place, from time to time and sometimes in both space and time (Ministry of Finance and Development Planning, 1997).

Temperature

Botswana experiences very high temperatures. Due to high temperatures, most of the surface water evaporates at a rate of approximately 1.8 cubic meters per year. Temperature extremes can reach 43°C in the summer and below 5°C in winter. The

highest temperatures occur in October in the north, beyond latitude 21ºC while the lowest monthly temperatures are in June and July. During the winter period, frost occurs in most parts of the country. More frost days are experienced in the western part of the country, decreasing towards the northern and eastern parts. These climatic conditions create adverse climates for agriculture and other food production efforts (Botswana Metrological Centre, 2001).

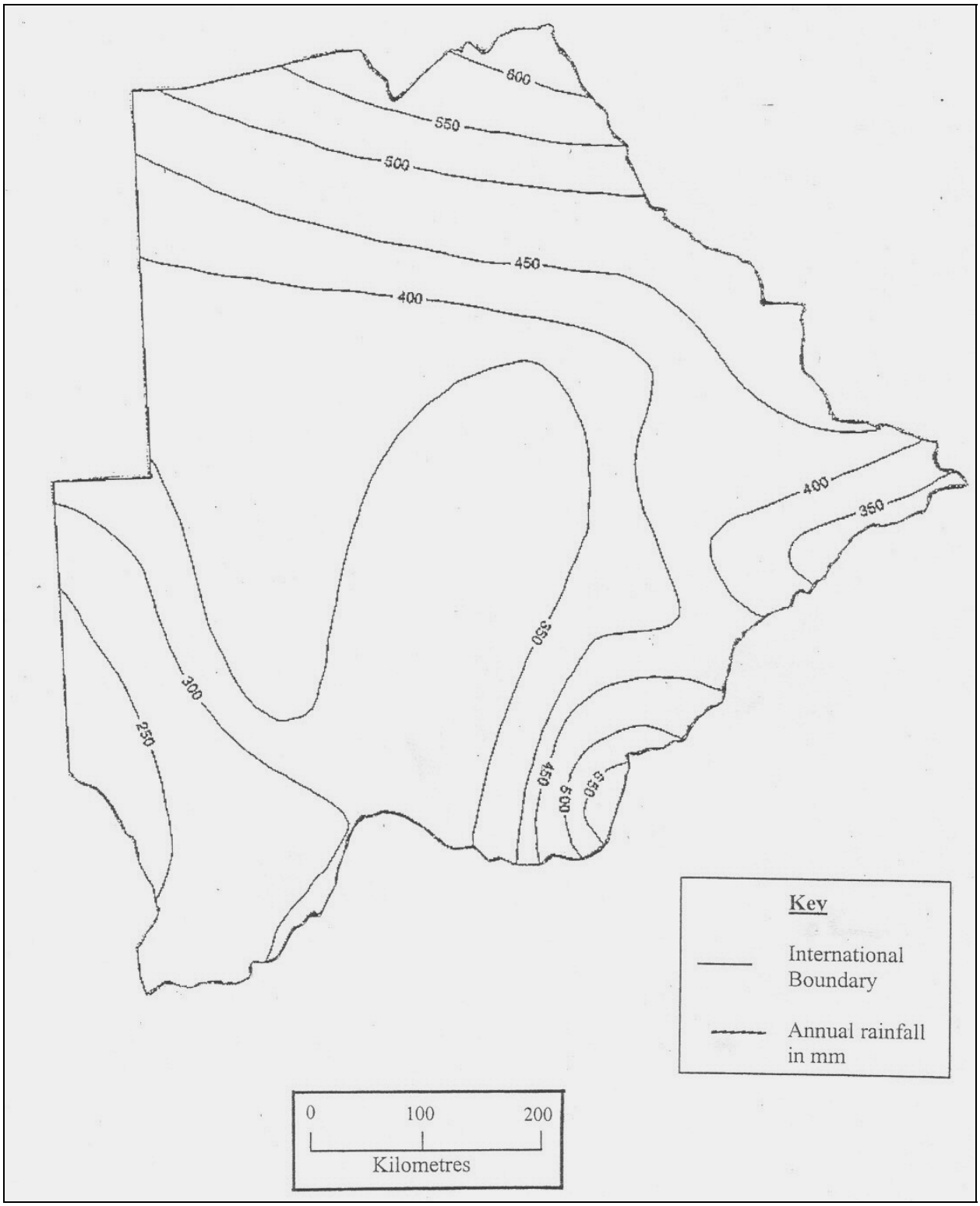

Figure 2.3: Average annual rainfall in Botswana
Source: http://www.botswana.tourism.gov.bw

Drought in Botswana

Drought is known to be a major risk factor for sustaining livelihoods in Botswana. It has been a hazard in Botswana since historic times. In every three years, one is usually a drought year (Kruger, 1999). The earliest recorded drought was the 1845 to 1851 drought period, other early droughts were recorded in 1862, 1879, and1896 (Hitchcock, 1979). The early 20th century was characterized by a series of droughts. The 1933 to 1935 drought was very serious and a number of cattle losses were recorded in many parts of the country. The 1933 to 1935 drought period was followed by three years of good rain resulting in the increase of livestock. Although no serious droughts were recorded for twenty years after the 1933 drought, from 1954 there was increased variability in rainfall (Hitchcock, 1979). Areas such as the eastern part of the country suffered intermittent periods of poor rainfall. Eventually the poor rainfalls led to the drought in 1960, which was coupled to a range of consequences (Campbell, 1979). The country lost a third of its national herd (Wily, 1979). The drought reached its climax in 1965 and was recorded as the worst drought period for 30 years. Very little pro-active planning had taken place to alleviate the impacts of this drought period (Campbell, 1979). There after, several droughts were recorded in the late 1970s and early 1980s (Hitchcock, 1989).

Droughts in Botswana have repeatedly impacted on the countries different sectors. The main affected sectors include are agriculture, livestock, water resources and rangelands. The 1991/92 drought, which impacted a great part of southern Africa (Tiffen, 1995), was widely portrayed as the worst in the 21st century (Kinsey *et al.*, 1998). The drought devastated crops and caused a sharp deterioration in rangeland. The rainfall was 50% to 70% below normal throughout Botswana (SADCC, 1992). The impact of drought on several sectors is discussed in more detail below.

Agricultural Sector

The agricultural sector is the most vulnerable to drought, given that for the rains to be effective they must be restricted both in space (fields) and time (growing season). Susceptibility to drought is made worse by the fact that most of Botswana's land is unsuitable for agriculture and most of the soils also lack essential plant nutrients. It is

estimated that of the land suitable for cultivation only 15% is actually cultivated (Alverson, 1999).

As indicated previously, the most severe drought in Botswana's history occurred in 1992, where the total agricultural production was a mere 9000 metric tons compared to the annual basic cereal requirements of over 100 000 metric tons in the early 1990s. During the period of 1971 to 1992 domestic production barely met 50% of the country's basic cereal requirements, including staple commodities such as sorghum and maize. Other factors such as poor soils have also contributed to insufficient agricultural output needed for the consumption of the population. In a normal year, Botswana produces about 30% of its cereal annual requirements, mainly maize, and sorghum. As a result of drought coupled with poor soil conditions, the economic importance of agriculture to the national economy has declined over the years, from 45% of GDP in 1968 to 12.2% in 1980 (Alverson, 1999; Tabor, 1983).

During the 1965 drought, crop production of sorghum and maize declined to a total of 5000 tons. With adequate rainfall in 1967, crop production (sorghum, maize, millet, beans, pulses and ground nuts) rose to nearly 42 000 tons which later declined to a total of 2 000 tons. The recommencement of rain in 1980 brought about an increase of the total production of the crops to just under 45 000 tons. In 1982 this had declined again to 17 000 tons (Ministry of Finance and Development Planning, 1993). Crop production continues to decline to date and will always be vulnerable to drought for as long as the phenomenon exists.

Water Resources

Generally water is a scarce resource in Botswana. During drought periods the limited water resources are threatened. Currently (2004), the Gaborone dam which, supplies water to Gaborone residents is drying up. The rural population relies mainly on surface and ground water. During drought periods there is a significant drop in surface and ground water. Decrease in surface water further affects the ability of recharging ground water resources. For this reason boreholes become unproductive, as ground water resources are not replenished at the rate proportionate with that at which they have been

harvested. Unproductive boreholes and lack of surface water have resulted in massive livestock deaths as well as movement of animals to areas where water may be available (Setshwaelo, 2000; and Peters, 1984). During drought periods animals are usually more likely to die from dehydration rather than lack of feed.

Rangelands

Semi-arid ecosystems in southern Africa are experiencing change due to rainfall variability and changes in the type and intensity of land use. Issues of land degradation have been widely debated in all countries of southern Africa but mostly in Botswana, where beef production is the second most important economic activity after mining (de Queiroz 1993, White 1993). Attempts to assess the extent of degradation in Botswana have been limited by a lack of data and absence of a methodology designed to cope with the characteristic spatial and temporal variations of nonequilibrium rangelands. While rainfall, variability produces large changes in cover over time; the impact of land use is significant and is probably growing (Dube and Pickup, 2001).

There has been no evidence that drought alone affects rangelands (O'Connor, 1985). However there has been increased reduction of plant density, plant cover, and reduced plant diversity and species replacement during drought periods. Studies undertakes by Ringrose, Vanderpost, Kwerepe and Mulalu, (1997) have shown significant differences between rangelands before and during the drought periods, as well as after the return of rains. Changes in vegetation have shown to correspond with rainfall cycles. Species and vegetation elimination due to drought is usually temporary. Plants recover rapidly from short-term drought, allowing the rapid recovery of herbivores. The impact of drought on rangelands was particularly pronounced where overgrazing had occurred prior to the onset of drought. Thus rangelands that were seriously overgrazed were found to be more vulnerable to drought. According to Campbell (1978) the 1960s drought affected overgrazed rangelands so much that by the middle of drought period, grazing was almost non-existent.

As climate in arid and semi-arid regions is expected to change towards longer and more severe moisture deficits, as well as high ambient temperatures, plant species will also

change as the ecosystem's adaptive mechanism to the climatic conditions change. There is likely to be increases in plant species that can better tolerate the drought and high temperature conditions (Setshwaelo, 2000). It is, however, better to manage the rangelands and reduce the degree of human-induced stress so as to increase the ability of rangelands to adapt to climatic disasters. Having focused on vulnerability of different sectors, attention is now focused on the vulnerability of rural societies.

Impact on rural societies

Drought is known to expose the extent of poverty, particularly of rural communities. Its effects are usually determined by their livelihoods and incomes. The effects of drought are also determined by the extent to which their livelihoods and incomes depend on rainfall and by the options they have, to seek alternatives when their primary sources of income collapse (Hay *et al*., 1985).

One of the impacts drought usually has on rural society is the loss of rural employment among farmers and farm labourers. This affects food security, which has been at the heart of Botswana's National Food Strategy. Those likely to be most affected are female-headed households, households with high economic dependency ratios, owners of small herds, Remote Area Dwellers, those deriving a substantial proportion of their income from informal sector employment, and the grossly under-employed and unemployed (Ministry of Finance and Development Planning, 1993; Hay *et al*., 1985).

Most people reside in rural areas. All of them obtain their livelihood from multiple sources. Of these the most important is livestock rearing, which also provides meat and milk for household consumption. Formal employment in rural areas is limited. As a result more people are involved at some time in informal employment (e.g. selling of local beer, domestic work and construction work) (Ministry of Finance and Development Planning, 1997; Jacques, 1995; Hay, *et al*., 1985; Shepard and Vierich, 1980).

During drought periods there is a significant reduction in the availability of informal employment. During the 1981 drought for example, of the 74 700 agricultural workers an estimated 27 200 people lost their jobs. By 1985 it was estimated that more than 40 000

people, who would expect to earn an income in agricultural employment, earned nothing (Hay *et al*., 1985).

Loss of incomes for the poorest households reduces their ability to obtain food. Rural households are vulnerable to the effects of drought as rain-fed agricultural activities contribute to household incomes. Drought places such households temporarily below the poverty line. Loss of income is likely to force households to sell their assets as a survival strategy. This may culminate in a situation where temporary poverty becomes permanent, as the sale of asset to supplement current income reduces future earning potential (Jacques, 1995).

Beer brewing, which is common in rural households in Botswana, is often affected by drought. Due to a shortage of sorghum (the main ingredient in beer brewing), beer brewing becomes less frequent and less profitable during periods of drought. Informal employment, in exchange for cash or in-kind payment, is also affected by drought. Better off households which employ members of poor households often want to minimize their obligations during drought periods as a result they cease informal employment. As a result jobs are lost (Vierich and Sheppard, 1980).

In order to have a sustainable livelihood, societies must be able to cope with and recover from stress and shocks. Those who are unable to cope or adapt are vulnerable and less likely to achieve a sustainable livelihood (Scoones, 1998; Davies, 1996; Chambers and Conway, 1992). With the declining of rural employment during drought periods, rural households have difficulty in coping with stresses caused by drought. Rural households find themselves vulnerable, as they do not have access to income, which is a very important buffer against drought related stresses.

In conclusion, climate variability throughout Africa is common. Rainfall variability has shown to be a key feature of climate. As a result, Africa repeatedly suffers the destructive impacts of alternating periods of floods and droughts. The well being of the population is extremely sensitive to the year-to-year rainfall variations. Livelihoods, crops, livestock and infrastructure are often lost during these events and the expenditures often impact on

macro-level economics (e.g. GDP) as well the household level. In the next section the focus shifts to include the various factors that generate vulnerability to climate variability.

2.4 Vulnerability To Climate Variability

Meteorological events have occupied a central place in the preoccupation of mankind throughout human existence. Man has found himself constantly at the mercy of natural climatic hazards, often with tragic consequences (Rolando, 1981). Though this may be the case, climate variability plays a vital part in the way societies shape their livelihoods. For years, climate variability has had a key function in the accumulation, allocation and preservation of natural resources and wealth. Societies have had to cultivate and adjust their social and economic activity on a continuing basis to the vagaries of climate in order to survive and develop. Some have managed to thrive while some have failed in this regard (Hall, 2000). Societies whose livelihoods for example depend entirely on cultivation tend to be devastated when faced with the most common consequence (drought) of climate variability. Societies that are most vulnerable are usually those deprived of mechanisms and resources to prepare for and adapt to climate variation (Nobre *et al.*, 1992). This has been evident in countries such as Mexico (Liverman, 2001), Australia (Allan *et al*., 1996 and Philsnder, 1990), and Bangladesh (Karilm, 1996; Warrick and Ahmad, 1996).

Vulnerability assessments (IPCC, 2001; Olmos, 2001; UNEP, 2000; Adger, 1999; Glewwe and Hall, 1998; Dershem and Gzirishvili, 1998; Karim, 1996; Ribot, 1996; Liverman, 1994; Vogel, 1994; Hossain, 1992; Teklu, 1992; Glantz, 1990; Chambers, 1989; Worster, 1979; Cochrane, 1975) have paved a way for more research on vulnerability to climate variability. These have become increasingly important due to the knowledge that semi-arid areas, developing countries, and the poor among these countries are likely to be hit the hardest by climatic changes. A large number of the population in semi-arid areas and developing countries is believed to be vulnerable to climatic shocks such as droughts and floods. This is attributed to various factors that may affect their ability to anticipate, prepare for and respond to these climatic events. These include socio-economic, political and environmental factors. Their livelihoods are often

shaped by chronic job and food insecurity, inadequate or none-existing health care, low wages, unemployment, underemployment and illiteracy, all of which tend to intensify the social consequences of natural phenomena (Ribot *et al*., 1996).

Based on the above knowledge, it can be concluded that climate variability is one factor that exposes people's vulnerability to change. Critical factors that require greater understanding are the consequences associated with climate variability. These include hunger, economic loss, devastation of livelihoods, and loss of ecological assets. These consequences have far reaching impacts on societies.

Generally the African continent is particularly vulnerable to climatic events such as drought because of factors such as poverty, inequitably land distribution, and over dependence on rain-fed agriculture. While adaptation options, including traditional coping strategies, are theoretically available, in practice, the human infrastructure and economic response capacity, may be beyond the economic means of some countries (Watson *et al*., 1997).

Historically, colonialism is seen as the main root cause of vulnerability to climate variability. Past colonial rule is responsible for a systematic process of impoverishment through discriminatory policies such as homeland systems, contract labour system and influx control (Devereux *et al*., 1995). Before colonialism societies employed a nomadic pastoral regime and made use of available natural resources. Daily living involved migrational herding of livestock. Lives were well adapted to the difficult environmental conditions (Boonzaier *et al*., 2000). The advent of colonialism drastically altered people's livelihoods, making them more vulnerable to harsh climatic conditions.

One of the most destructively persistent historical legacies of Africa's past has been the subversion and destruction of indigenous coping strategies. Colonial dispossession of traditional pastoral and agricultural lands marked far-reaching colonial interventions, which have significantly contributed to Africa's current state of vulnerability. The loss of pasturage and farmland to colonial settlement and insecure land tenure for the native population further undermined traditional coping strategies. In Eastern and Southern Africa, in particular, indigenous Africans were confined to marginal and increasingly

degraded and unproductive lands. The impacts of settler agriculture, colonialism and subsequent changes in traditional land tenure exacerbated negative environmental change after independence (http://www.grida.no).

Apart from the effects of colonialism Africa faced with other problems, which make its people more vulnerable to climate variability. These problems include poverty, unemployment, environmental degradation, political instability and health issues. These issues are well documented by organizations such as the CARE, United Nations, United Nations programme on HIV/AIDS, World Bank and Save the Children UK. All these are problems that are likely to heighten people's ability to cope and adapt to climate variability. Below is a detailed review on how these factors may make coping and adaptation to climate variability difficult.

2.4.1 Poverty

Poverty is believed to increase vulnerability to climatic events such as drought because of its association with dependence on sources of income affected by rainfall, and its association with lack of assets to act as a buffer during drought (Ministry of Finance and Development planning, 1991). Poverty is among the major factors that need to be taken into consideration when evaluating vulnerability. It can affect people's ability to cope and adapt with climate variability, especially those in rural areas.

In general, poverty is a rural phenomenon in Southern Africa. More than 75% of the poor are rural people who obtain their livelihoods from agricultural or non-farm activities (Lado, 2001). Poor people are usually more vulnerable to risks and lack ways to cope and adapt to climatic shocks. In Malawi (Frankenberger *et al*., 2003) for example, poor households are exposed to a large number of repeated shocks. This has led to an on going decline of rural livelihoods. Over 60% of the population experiences chronic poverty every year (Frankenberger *et al*., 2003). In the case of Botswana, 47% of the population is reported to live below the poverty line, with limited access to economic opportunities and some still without essential social services (Ministry of Finance and Development planning, 1997). This is in spite of the Government's effort to eliminate rural poverty through rural development.

In most cases (Frankenberger *et al*., 2003; Kunfaa *et al*., 2002; Okunmadewa *et al*., 2002; Kadzandira *et al*., 2002, Mukherjee, 2002; Ministry of Finance and Development planning, 1997) poverty is characterized by deep inequality. Botswana, for example, has a disturbing range in the distribution of national assets and income (Good, 1999; Jefferis, 1997; BIDPA, 1997). The top 20% earn nearly 24 times as much as the bottom 20% (Ministry of Finance and Development planning, 1993). Malawi is in a similar situation whereby the richest 20% of the population consumes nearly half of all goods and services, whereas the poorest 20% consume only 6.3% (Frankenberger et al, 2003).

Among the poor population in Africa, the majority are female-headed households (Frankenberger *et al*., 2003; World Bank 1996). Their poverty is mainly attributed to roles they are assigned and the limits placed by societies on their access to control of resources (Anderson, 1994). This has created a problem of gender inequality. Gender inequality tends to intensify the unequal distribution of resources amongst men and women, making female-headed households more vulnerable to the impacts of climate variability. Inequality further contributes to lack of security, opportunity and empowerment resulting in lower quality of life for female-headed house holds. Women, for example, are disproportionately employed in unpaid, underpaid and non-formal sectors of the economies. Culturally inheritance laws and traditions, marriage arrangements, banking systems and social patterns that reinforce women's dependence on fathers, husbands and sons all contribute to their unfavorable access to resources and their luck of power to change things (Anderson, 1994).

More than a third of rural households in Botswana, which are female-headed households, are affected by poverty (Molutsi, 1992). This is due the uneven income and resource distribution between sexes. Female-headed households have generally lower incomes than male-headed households. Cattle, which is particularly a form of wealth in rural areas, is also unevenly distributed. Cattle ownership among female-headed households is lower than male-headed households (Ministry of Finance and Development planning, 1993). Female-headed households usually have more dependents but fewer means to

obtain food. As a result they face the greatest risk of poor nutrition among children, nursing mothers and the elderly (SADC, 1993).

Another group of people known to be vulnerable to climate variability are the Remote Area Dwellers (RADS). This group of people consists of the poorest of the poor. Their state of poverty makes them more vulnerable to drought. RADS are a scattered population and are great distances from social services and facilities. They are underdeveloped with widespread relative poverty (Hitchcock, 1992). The serious drought of the early to late 1980s, highlighted several problems faced by RADS living below the poverty datum line. Unable to plough, they were forced to find other means of getting food and income. Loss of livestock reduced their capacity for gaining income through livestock sales. Wild foods and game were seriously depleted; eliminating opportunities for them to use resources that previously served as fallback goods during stress periods (Hitchcock, 1992).

Poverty eradication is a challenge for many African countries but it is one of the important steps required to reduce vulnerability to climate variability. It is important to acknowledge that poverty and vulnerability are mutually reinforcing, each likely to worsen the other. Therefore without proper decisions to solve the problem, poverty will be self-reproducing, setting up a vicious circle.

2.4.2 Unemployment

Unemployment is a serious problem faced in nearly every developing country. Although the highest estimates of unemployment usually come from rural areas, it is a primary concern among poor people in both urban and rural villages (Kunfaa *et al*., 2002). In a study carried out in Ghana, households viewed unemployment as the leading hardship. Lack of capital was a pressing problem that made it impossible for poor households to get enough to eat and improve their livelihoods. Life was difficult for them, because one needs money in order to eat, farm, engage in petty trade, go to hospital and clothe oneself (Kunfaa *et al*., 2002). Such people are vulnerable, as they have no means to protect themselves against the impacts of climate variability.

Ability to cope with climate variability via access to cash is further worsened by inequalities in employment opportunities. Even in countries with accelerated economic growth unemployment is still a problem. In spite of Botswana's good economic performance for example, unemployment rates are very high especially among the youth and women (Central Statistics Office, 2001). This shows that accelerating growth cannot simply cure unemployment. The lack of equal employment opportunities has continued to increase the gap between urban and rural living standards (Ministry of Finance and Development planning, 1993). Economic security is therefore a threat to many livelihoods.

Apart from inequalities in employment opportunities, it can also be argued that education plays an important role in the employment sector. Through education one's ability to perform more complex tasks is enhanced. Due to lack of education most people lack the skills required to compete for employment. In rural Botswana, about 75% of the children who go to primary school, do not proceed to obtain further education (Ministry of Finance and Development planning, 1993). Primary education is not enough to compete for employment. As a result these people end up unemployed, failing to earn an income to sustain their livelihoods. These are the people who are likely to be vulnerable in times of drought.

2.4.3 Health

Health is another important factor to consider when evaluating vulnerability. Various chronic diseases such as tuberculosis, cancer, malaria, diarrhoea, cholera and HIV/AIDS threaten the well being of people. The most documented and feared disease however, been HIV/AIDS (Drinkwater, 2003; Christian Aid, 2002; Khogali, 2002; UNAIDS, 2003; UNAIDS, 2002; Westley, 1999; Topouzi, 1998; World Bank 1993). HIV/AIDS has become of great concern worldwide as millions of people are currently being threatened by the disease. About 40 million people worldwide are said to be living with HIV/AIDS. An estimated 5 million became infected in 2001 (UNAIDS, 2002). Although the HIV/AIDS epidemic is a global concern, it is in Africa where the effects of the disease

are most acutely felt. Of all the global HIV infections, about 70% are located in Africa, where an estimated 28.5 million people live with HIV/AIDS (UNAIDS, 2002).

The epidemic has far reaching impacts across all societies and represents a potentially devastating shock to household survival (UNAIDS, 2003; De Waal and Whiteside, 2003; World Bank, 1997; Loewenson and Kerkhoven, 1996; Mead and Ainsworth, 1996; Martha, 1993; Mead, 1992). This is likely to have negative consequences especially for rural agricultural households by increasing both livelihood insecurity and poverty (UNAIDS, 2003). In Zambia, for example, HIV/AIDS has decreased food production among households (Drinkwater, 2003). In Malawi, over 70% of rural households have experienced loss of labour. The loss has lead to problems such as delayed agricultural operations, affecting almost half of the households that had experienced chronic illness, change in crop mix, leaving land fallow and changes in source of livelihood (Shah et al, 2002).

At the end of 2001, 2.3 million people in Zimbabwe were infected by HIV/AIDS. Rural communities in Zimbabwe already affected by food shortages and poverty during the 2002 drought, also had to deal with the HIV/AID epidemic. This brought the communities face to face with the debilitating effects of the combination of famine, poverty and HIV/AIDS. A deadly combination like this heightens vulnerability to drought. HIV/AIDS in Zimbabwe has left a number of orphans, and several children heading households with no regular source of income. By the end of 2001, Zimbabwe had approximately 780,000 orphans (children under 15 years who have lost one or both parents). These children are dependent on the goodwill of the community to survive. Community coping strategies are therefore stretched to the limit, reducing their ability to cope with climate variability (Khogali, 2002).

In South Africa, HIV/AIDS has lead to falling incomes, forcing about 60% of the households to reduce the amount spent on food. Almost half of the households were found to have insufficient food at times (http://www.avert.org). It is estimated that in Burkina Faso 20% of rural families have reduced their agricultural work or even abandoned their farms because of HIV/AIDS. In Ethiopia, AIDS affected households

were found to spend 11 to 16 hours per week performing agricultural work, compared to the average 33 hour for non-AIDS affected households (UNAIDS, 2003). Vulnerability of households to climate variability is therefore heightened as household efforts to improve livelihood assets, capabilities, resources, and activities are reversed (World Bank, 1993).

Across all African countries HIV/AIDS has accelerated processes of rural impoverishment and the breakdown of extended family relations that have also been a foundation for traditional safety net mechanisms. An increase in household expenditures on medical care results in a decline of savings and loss of assets through the sale of both productive and non-productive assets (UNAIDS, 2003). Loss of household heads is likely to be followed by depletion of household productive assets, which results in the impoverishment of the remaining family members. For instance, rural households relying on remittances from urban households lose support and instead gain orphans (Westley, 1999). This may further lead to the breakdown of family structure (Drinkwater, 2003). In many cases, households that have lost a male breadwinner, the surviving widows and their families often have few assets to dispose of in time of need. Food security coping mechanisms may therefore disintegrate quite soon after the death of the male breadwinner (Topouzi, 1998).

Botswana is one of the countries that has been hardest hit by the HIV/AIDS epidemic (http://www.avert.org). At the end of 2002 there were an estimated 330 000 people in Botswana living with HIV/AIDS. This is in a country with a total population of 1.6 million, giving Botswana a prevalence rate of 39% the highest in the world (UNAIDS, 2002). Half of all households have at least one member who is infected with HIV. The population is estimated to be 31% smaller by 2021 than it would have been without Aids. The economy is predicted to shrink by between 24% and 38%. There are around 60 000 registered orphans in the country and it is feared that the number will increase to about 200 000 by 2010 (UNAIDS, 2003). This is likely to have a serious impact on the families who take in these orphans as well as the orphans themselves. Children raised by grandparents who cannot even afford to educate them, remain illiterate and have no skills

to compete for employment in future. The vicious cycle continues, creating more poverty and increasing inability to cope and adapt to climate variability.

2.4.4 Political constraints

A total of 26-armed conflicts erupted in Africa between 1963 and 1998, affecting 61% of the population. Some 79% of people were affected in Eastern Africa; 73% in Central Africa; 64% in Western Africa; 51% in Northern Africa; and 29% in Southern Africa (ECA, 2001). In 2001 a total of about 9.6 million people in Central Africa and the Horn of Africa were either refugees or internally displaced as a result of armed conflict (US Committee for Refugees, 2001). Refugee settlements often result in increased human vulnerability to climate variability, as livelihood options are limited.

In Eritrea, displaced Eritreans continue to suffer the consequences of war, which, have resulted in inadequate fulfillment of basic needs such as food, water, health care, shelter and education. Lack of such basic needs affects their capability to cope and adapt to climate variability. An estimated 58 953 are still internally displaced and unable to return to their home villages due to insecurity or mine infestation. With very few owning livestock, the majority depends on food aid (WFP, 2004). Due to conflict, the Burudian government forced around 300 000 rural people in Bujumbura into camps in 1999. Bujumbura, which was once densely populated, provided a market for higher-value crops and significant non-agricultural work opportunities. As a result of conflict, its people were now homeless, their livestock lost, incomes generated from coffee production and fishing were lost, and people lost access to markets and work opportunities (Levine and Chastre, 2004).

The rural people of Gulu (Northern Uganda) experienced the same situation in 1996. About 400 000 people were forced into camps by the military. Others fled into unofficial camps. By the end of 2002, nearly the whole rural population had been displaced. In a district that was a fertile agro-pastoral area, agriculture was curtailed, livestock was lost, people lost access to their fields, and farmers were forced to abandon their crops. For such a population affected by conflict, building resilience against climate variability will be difficult, as their resources have been eroded (Levine and Chastre, 2004).

Vulnerability to climate variability can also be heightened by political decisions. People are likely to be marginalized and excluded from decision-making and political processes. These people become vulnerable as they feel powerless, victimized and unable to take effective actions for their own security (Anderson, 1994). In Zimbabwe, for example, enough bags of cornmeal to feed hundreds of thousands of people were stacked in a U.N. warehouse during the 2002 drought. Cooking oil, beans and high-protein meal for porridge were also stored. Due to political decisions, aid groups could not get the stored food to vulnerable groups. As a result Zimbabweans were left increasingly vulnerable to the 2002 drought (Timberg, 2004).

Zimbabwe has clearly demonstrated the erosion of democracy. The country's erosion of democracy and the destruction of the economy have caused the suffering of its people. Political constraints such as political instability and weak governance institutions heighten people's vulnerability when their livelihoods and coping strategies are deliberately blocked or undermined (LeBillon, 2000; Keen, 1994). In Sudan, people have experienced forced transfer of assets from politically powerless victims; for powerful beneficiaries (Keen, 1994), this affects their ability to build resilience as they have no assets to help them buffer against climate variability.

Deliberate asset-transfer or asset stripping can result in the destitution of particular groups (often minority ethnic or religious groups) to the benefit of those in positions of political or economic power (Berdal and Malone, 2000; Le Billon, 2000; Keen, 1998; Collier and Hoeffler, 1998; Duffield, 1994; Alabala-Bertrand, 1993, Kent, 1948). For these people financial assets are almost non-existent. Years of political instability affect even the local agricultural market, depressing both supply and effective demand, interrupting delivery, hyperinflation of currency and severing economic linkages. This makes basic foodstuffs almost impossible to purchase due to price fluctuations (ODI, 2002).

2.4.5 Cultural constraints

Cultural practices may also affect the ability of societies to cope and adapt to climate variability. Cultural practices in marriage institutions for example have been found to heighten vulnerability to climatic events such as drought. A study in Malawi (Shah *et al*., 2002) has shown that frequent changes in marriage partners make households very fragile. Change in marriage partners was found to bring about changes in composition and location of households. The status of women and children in the patrilocal system becomes increasingly insecure. There is growing abuse of women and children's rights and the heightened extent or their vulnerability and poverty. Children and women are repeatedly displaced and predominantly being exploited for their labour. As a result their own crops are neglected and the yields shrink further. They end up consuming whatever small harvest they have and have no food for storage (Shah *et al*., 2002). Having provided some knowledge on people's vulnerability and factors that heighten vulnerability the next section focuses on coping and adapting strategies. Both past and current coping strategies are discussed.

2.5 Coping With Climate Variability

From time to time people are faced with crisis events, which call for the mobilization of resources at various levels to cope with their impact. The coping strategies usually depend on the assumption that an event will follow a recognizable pattern. In situations where the event is unprecedented coping strategies may not apply (Blaikie, 1994). Coping strategies differ enormously among regions, communities, households and even individuals, depending on the socio-economic structure, production system, and the physical environment (IPCC, 2001; Burton, 1997; Karim, 1996; Hossain, 1992; Chen, 1991; Campbell *et al*., 1989; Lee 1979; Yellen 1976; Tobias 1964). In the case of climatic events such as drought, the most common and typical responses to the risk of drought include income diversification and emergency relief. More detailed coping and adaptive strategies are discussed below. They are divided into indigenous and current coping and adaptive strategies.

2.5.1 Indigenous Coping and adaptive Strategies

Indigenous coping and adaptive strategies throughout Africa are well documented (Matiza *et al*., 1989; Sukkary-Stolba, 1989; Zinyama *et al*., 1988; Bratton, 1987; Campbell, 1986; Fleuret, 1986; Cashdan, 1985; Campbell, 1984; Cassanelli, 1982; Colson, 1979; Legesse, 1979; Raynaut, 1977). African societies developed a wide range of coping and adaptive strategies to reduce the impact of recurrent drought upon the population. These strategies were vital components of rural production systems and were often able to prevent widespread hardship in times of drought. Indigenous responses to drought conditions by rural population in sub-Saharan Africa, included: use of wild foods, dispersal and mobility by foragers, sharing networks, flexibility of local production, risk insurance dietary diversity, food preservation, dietary change, agricultural innovation, social organization and supernatural means (Fleuret, 1986).

Indigenous coping and adaptive strategies have undergone changes. Strategies such the use of wild foods, dispersal and mobility by foragers, sharing networks, social organization and supernatural means have been rendered ineffective in many instances by governmental policies and development of cash markets (Fleuret, 1986). Indigenous strategies have been replaced by cash income-generating activities; relief and market-oriented strategies, which include migratory, wage labour. Through out Africa, cash oriented responses are becoming important strategies for coping with drought. In Northern Kenya, for example, occurrences of drought have forced pastoralists to depart from rangelands and enter into the urban and peri-urban economies in search for cash (Legesse, 1989). In Niger, the search for money became a daily necessity. Self-sufficiency was diminished by participation in cash crop production. Farmers were prompted to sell grain from their domestic stocks (Raynaut, 1977). As agricultural conditions worsen during drought, off-farm sources of cash become an essential component in their survival strategies. As a result even in non-drought years there is heavy reliance on purchases of staple grain for sustenance through out the year, with local agricultural systems struggling to provide even the minimum food needs required by the population (Raynaut, 1977).

In the case of Botswana, coping and adaptive mechanisms to drought were documented mainly from studies and data collected in the late 70s and early 80s (Morgan *et al*., 1989; Morgan and Holm, 1985; Hay *et al*., 1985; Peters, 1984; Tabor, 1983; Vierich, 1982; Vierich and Sheppard, 1980; Hitchcock, 1979; Solway, 1979; Devitt, 1977; Yellen 1977; Stanford, 1977). There has been very limited literature regarding current coping and adaptive mechanisms. Various indigenous coping and adaptive strategies used to cope with drought have been documented by Vierich and Sheppard (1980), Devitt (1979), Silberbauer (1979), Hitchcock (1979), and Cook (1978). The strategies included exploiting the variety of wild foods, hunting, rainmaking and migrating to new areas. Rainmaking ceremonies and ritual exorcism were used to rid the village of drought causing spirits and was a very common practice in rural areas. These measures were called into action during drought, and were the most important means for reinforcing political hierarchy in the village. Other strategies were practiced to complement rainmaking (Tabor, 1983).

Another common coping strategy was communal work. Traditionally, harvests from communal fields, were stored in village granaries near the kgotla (traditional court). During drought years, the stored grain and other tributary offerings were sold at reduced prices or given to the poor in exchange for work (Prah, 1979). The village chief also encouraged traditional support mechanisms such as *Mafisa, Masotla, Letsholo and Majoko*. These are discussed in more detail later in this section. The traditional support system of *Mafisa, Masotla, Letsholo and Majoko* was designed to close the gap between the rich and the poor by placing the poor in the service of the well off. This was a way of improving the lives of the poor. The system also allowed some kind of mutual understanding between the disadvantaged and advantaged members of society. The system also encouraged people to work for their sustenance rather than providing handouts (BIDPA, 1997). The traditional support system worked as follows:

Mafisa – lending of resources

The *mafisa* system applied mainly to livestock. However other production resources such as fields, water points and ploughs were some times lent out. *Mafisa* was practiced on a voluntary basis. The main beneficiaries were relatives, close friends and neighbours.

Mafisa provided a social security in that the recipient had access to draft power, milk and occasionally meat (BIDPA, 1997).

Masotla – communal production

Masotla was used to support the poor and prepare the community against drought. Each family was required to provide free labour and draft power each year to plough and plant communal fields. The fields were then kept under the custody of the chief. The produce was later saved in granaries at the kgotla (traditional communal court). The food was only distributed to the poor and the community during drought years. Through *masotla* the communities were able to save and were less threatened by drought (BIDPA, 1997).

Letsholo – hunting parties

Hunting parties were used to help those who could not hunt for themselves. Occasional meat was provided for the needy. The needy were catered for during drought periods and in normal years. Their livelihoods were therefore enhanced and did not have to struggle for survival (BIDPA, 1997).

Majako – sharecropping

Majako gave the poor an opportunity to live with a relative or neighbour in return for labour. The poor were expected to weed or harvest the host's crops. At the end of the harvest, the poor were paid with crops hence the concept of sharecropping. Through this practice laziness was discouraged. Those without assets were encouraged to recognize that their own labour was an asset to survive on. Apart from sharecropping a wealthy family could also employ a member of a poor family to tend cattle. At the end of each year the employee received a beast. After seven years an employee was released to start life alone (Hitchcock, 1979). The poor were therefore given the opportunity to own cattle. By the late 1970s these traditional strategies were no longer effective. People were becoming more increasingly dependent on outside help to survive drought periods (Prah, 1979).

There are several factors, which are known to have influenced the change in indigenous coping strategies to drought. Foraging became difficult, as it was no longer easy to find wild plants and animals. This was mainly due to increasing human and livestock

densities. Hunting also became difficult because wild animals were no longer easily accessible as they had moved further away to avoid contact with human and domestic animals (Hitchcock (1979). Fences (veterinary cordon fences) which were designed to prevent the movement of wild animals and livestock from areas affected by foot-and-mouth disease also contributed to desertion of hunting and reduced the number of wild animals. During drought periods large numbers of wild animals die and pile up against the fences while moving in search of water resources. In addition to the reduced number of wild animals, there is reduced availability of meat to people who derive part of their livelihood from subsistence hunting (Owens and Owens 1981).

The use of borehole technology enabled the Tswana population to tap ground water for livestock watering purposes as well as domestic use. The ability to tap ground water allowed people to settle around boreholes, therefore bringing an end to seasonal migration. Cattle posts established near water points also provided employment opportunities, albeit for minimal returns and food (Vierich, 1981). Change in traditional coping and adaptive strategies have led to new coping and adaptive strategies. People are always trying to cope and adapt to the changing environment. More recent coping and adaptive strategies are therefore discussed below.

2.5.2 More Recent Strategies

More recent documented coping mechanisms include the purchase of food, selling of assets, remittances and reliance on government for assistance (Chanda and Magole, 2001; Ministry of Finance and Development Planning, 1996; Ntwaagae, 1993; UN and SADCC, 1992; Ministry of Finance and Development Planning, 1991). Recently, rural households have had to move away from livelihoods dependent on drought-prone resources in order to cope with drought. Rural societies are now turning more to alternatives such as income diversification. Rural societies are also more interested in alternative coping and adaptive strategies, which do not involve liquidation of essential assets. Non drought-prone alternatives (e.g. formal employment) are however limited (Ministry of Finance and Development Planning, 1991). It is therefore difficult for rural households to have access to formal employment. This makes it more difficult for rural

households to cope with drought, especially today, since most households have to purchase their food.

Formulating alternative coping and adaptive strategies is a challenge for rural societies given the various problems they face today (e.g. poverty, unemployment, HIV/AIDS and political instability). African governments and international organization (e.g. UN, CARE, Save the Children (UK), Christian Aid etc) have had to intervene as rural societies are failing to cope and adapt to drought. The Botswana government has had to take measures to assist those who are suffering from adverse effects of drought. Following the drought period of the 1960s, the government set up a drought committee with representatives from various ministries and government agencies responsible for drought-related programmes. Through the Inter-Ministerial Drought Committee, Department of Food Resources, District Drought Committees and the involvement of District and Village Extension Teams, drought programmes were devised to quickly and flexibly assist the most vulnerable to the, impacts of drought (Ministry of Finance and Development Planning, 1993). With the availability of drought programmes, most rural households are likely to rely entirely on government assistance, as it is the only way they can survive and cope with drought without having to struggle.

The drought relief programme dates back to the food-for-work scheme implemented during the mid-1960s drought. The programme has since undergone changes and improved upon. In the early 1960s, drought food relief reached about one-quarter of the population. In 1979/80 food was distributed to roughly 20% of the population. Food was able to reach 45% of the population in 1982/83. About 30 000 people also had an opportunity of receiving an income supplement by taking part in labour-based relief projects (Tabor 1983). More changes to improve the drought programme were undertaken following a comprehensive evaluation of the 1982 to the 1990 drought relief programme (Ntwaagae, 1993).

The drought relief programme consists of supplementary feeding, labour based relief programme, agricultural and livestock subsidies and the recovery programme. These are discussed further below. The main goals of the drought relief programme are to relieve

human suffering, avoid loss of life, reduce malnutrition and migration from rural areas and to avoid disinvestments in the rural economy to assist with return to production at the end of the drought.

Supplementary feeding

Supplementary feeding is provided to all those identified to be vulnerable during drought. Those that have been identified by the government to be vulnerable during drought are pre-school and primary school children, pregnant and lactating mothers, TB patients, remote area dwellers and their children, malnourished children, and destitutes (Jacques, 1995). During the recent severe drought in 1992, food was distributed by clinics. Weaning food of sorghum, soya, minerals and vitamins were distributed to mothers of children who are 5 years of age and under. Older children were given maize, milk, oil and pulses. Malnourished children received feeding at clinics and hospitals while children in primary school received lunches everyday at school. Pregnant and lactating women were given free supplementary high protein food on a regular basis (Jacques, 1995 and Thompson 1993).

Registered destitutes were provided with food vouchers every month to purchase designated items for a basic food basket. According to the National Policy on Destitutes (1980) those entitled to this kind of assistance included individuals without resources and assets, and cannot plough as a result of ill health, the physically or mentally handicapped, and the elderly and minor children with no support. To date this still applies (Ministry of Finance and Development Planning, 1997).

Although the food distribution was reported to be efficient during the 1981 drought policy evaluation, Tabor (1983) identified three major problems with the supplementary feeding programme. First, food arrived late or not at all in many areas. This was blamed on transport problems in some areas, but more often it was because of poor planning and management by food depot officials. Secondary, extending the eligibility requirements engendered substantial inflow of beneficiaries to health points. When food was available at health points, attendance rose by two to three hundred percent and dropped just as fast when food finished. People tended to depend on clinics for food and considered the

primary purpose of health points to give free food. Health points were faced with inadequate storage, over-worked staff and on child welfare days, overcrowded health facilities. Thirdly, because of the health point feeding program, destitutes were neglected in many areas.

During the 1991/92 drought similar problems were experienced. This is because the 1991/92 drought arrived prematurely, while lessons from the 1982 to 990 drought relief programme were still being internalized. Quick decisions were therefore made to respond to the 1991 drought. The challenge faced by the government regarding the feeding programme was targeting vulnerable groups (Manamela, 1993). This may have resulted in exclusion of more vulnerable groups.

Labour Based Relief Programme

The Ministry of Local Government and Lands together with the International Labour Office and the Swedish International Development Agency initiated the Labour Based Relief Programme in the early 1980s. This programme was developed in order to empower the rural poor whose only asset was their unskilled labour (Jacques, 1995). Projects selected under this programme were directed towards construction of rural infrastructure. Activities undertaken include road construction, building contraction, constriction of dams and wells, collecting litter and digging rubbish pit, gardening and brick making. Jobs were rotated amongst the workers and an estimated 30 000 workers gained employment from this programme (Ministry of Finance and Development Planning, 1993; Ministry of Finance and Development Planning, 1991).

During the 1982 drought, a wage of P1.50 per day was paid to each worker while P2.00 was paid to each project supervisor (Tabor, 1983). By the 1991 drought, workers were paid a wage of P4.50 per day. The wages were well below the daily requirements of the average family or household. The low wages were deliberate so as to avoid displacing workers from regular employment such as cattle herding, working as a shop assistant, or hawking (Jacques, 1995). During the 1980 drought, the Labour Based Programme suffered from very low productivity rates. Projects were incomplete due to problems such as unavailable technical guidance in designing of projects, minimal supervision and

delivery of pay by teams was often late. There was also poor coordination between ministries meaning that several projects were rendered useless immediately upon completion (Tabor, 1983). Projects under the Labour Based Relief Programme during the 1991 drought were still suffering similar problems. The project suffered poor technical supervisory capacity and low productivity levels (Manamela, 1993). The government is aware of the problems and making an effort to improve on projects under the Labour Based Relief Programme (Ministry of Finance and Development Planning, 2004).

Agriculture, Livestock and Water

Agricultural, livestock and water relief projects are selected by the Inter-Ministerial Drought Committee. Projects selected under this programme include sale of stock feed at cost from livestock feed centres, provision of free emergency vaccines, seed and tillage subsidies, and the cattle purchase scheme. Water relief projects include drilling emergency boreholes, repairing already existing boreholes, and provision of water bowers to dry areas (Jacques, 1995; Thompson, 1993; Ministry of Finance and Development Planning, 1991; Tabor, 1983).

Assistance to those involved in agriculture was provision of free seed for three hectares for each farmer and two modest schemes for destumping and drought power. Grants were given for clearing of trees and other obstacles from land to speed up tractor cultivation. The draught power was intended for those who had inadequate animal power to hire others, usually with tractors, to plough up to three hectors of land (Ministry of Finance and Development Planning, 1985). Though the intension of the arable assistance was good, the subsidies became an economic activity. Payments were available for farming activities and yet there was no incentive to produce crops. The main beneficiaries were those able to purchase tractors and sell ploughing services, including those from across the border. There was a lot of opportunity for abuse of the programme as it was faulty. The expenditure also exceeded far beyond the approvals each year and in the process large areas of land was damaged for no cause (Ministry of Agriculture, 1988).

Relief and recovery strategies for livestock owners were also put in place. The main idea was to retain the capital base and future incomes in the sector by avoiding reduction in

stock numbers. Assistance under this scheme included; free botulism vaccination of cattle, purchase of worn-out cattle for school feeding, funds for syndicates of farmers with small herds to develop water supplies and subsidized stock feed and hay. Due to difficulties in monitoring the distribution of the subsidized feed, the scheme failed in targeting small herds. This often resulted in relatively high mortalities of the small herds during the drought. Large stockowners were at an advantage because they had the transport and labour to secure the available supplies (Ministry of Agriculture, 1989).

Given that the agricultural programmes were not successful during the 1980 to 1990 drought period, components of the programme such as bank-loan write-offs and livestock feed subsidy were abandoned during the 1991/92 drought period. Instead the government reduced taxes at the abattoirs and the benefits passed onto the farmers in the form of higher prices. This was done to encourage higher off-take during the drought. Ploughing subsidies, which had been abandoned, were reinstated during the 1991/92 drought. The government had difficulty in coming up with alternatives to previous programmes, therefore had no choice but to reinstate ploughing subsidies. The government felt that some assistance had to be given to arable farmers, given the acute shortage and poor state of animal drought power at the start of the 1992/93 rains (Manamela, 1993).

Despite the inefficiencies of the ploughing subsides, this programme was still implemented. What is the point in implementing already failed programmes? Government resources, which should be used for other productive programmes, are wasted. Not only does this programme enrich large farmers but also it fails to assist the poor for whom the programme should target. Although it may be a challenge to come up with alternatives it does not mean that resources should be wasted on unsuccessful programmes.

Though the Government has tried to help its population, the drought relief programme has had its faults. The drought relief programme formulated a number of objectives that were not consistent. The jobs created, for example, under the labour-based relief programme worked against agricultural production by competing for labour. The pursuit of an income is believed to have reduced productivity in the agricultural and public works

programmes. The drought relief programme brought about policy conflict between relief and recovery components. Labour-based relief was a mixture of welfare and investment programmes and as a result the two became difficult to reconcile (Ministry of Agriculture, 1988). Another conflict came about when the Accelerated Rain fed Arable Production Programme was introduced in parallel to the Drought Relief Programme. Instead of subsidies, grants were awarded for up to seven hectares for each farmer. However the overlap was eventually recognized and harmonized in 1988 (Ministry of Agriculture, 1988).

The relief programme also brought about conflict between groups of people. Given that Botswana is a democratic country there was belief among several groups of people that if any one individual group is given something, then everybody else should also get. Due to this belief the original objective, which was to target the vulnerable population, was not met. Instead the government increased the size of the programmes rather than choose between the beneficiaries. This was justified as providing equal opportunities for everyone even to those who did not require the relief (Ministry of Agriculture, 1989).

There has also been increasing dependency on government support and reluctance of people to accept the Labour Relief Programme as a temporary drought measure. The need for employment opportunities has resulted in strong pressure to declare droughts (Arntzen, 2001). The government now has a challenge to create more rural employment so as to reduce vulnerability to drought.

* *

Based on the above literature, climate variability has always been part of human life in Africa. In one way or another people have been affected by climate variability. A number of non-climatic factors however, can contribute to heightening vulnerability to climate variability. Climate variability, therefore in the case of Botswana, is not the single factor contributing to human vulnerability. Factors that may lead to increased vulnerability to climate variability have been discussed in this chapter. These factors include political marginalisation, decreased food security, bias in policymaking, focus on short-term rather than long-term development, health, poverty and unemployment. Factors such as the

HIV/AIDS pandemic and poverty have also been demonstrated to have far-reaching impacts across all sectors of society. These factors have increased livelihood insecurity in a number of countries resulting in increased food insecurity for millions of households. In turn, due to loss of inter-generational knowledge, specialized skills, practices and customs coping and adaptive mechanisms are often affected. Having outlined the complex set of stresses in the region, in the next chapter attention turns to outlining the suite of methods required to examine vulnerability and coping in such contexts.

CHAPTER THREE

METHODOLOGIES

3.1 Introduction

In this chapter the methodological framework and various methodological components adopted to achieve the objectives of the study are outlined. Both primary and secondary data collection methods were employed. The choice of methods was influenced by the nature of the problem and the constraints of time.

3.2 Research Framework

Vulnerability assessment developed from the work of Sen (1981). Sen (1981; 1987) examines vulnerability to hunger and famine, at the household level with what he calls entitlements. He contends for example, that a household's food entitlement comprise of the food that the household can obtain through production, exchange, or legitimate conventions such as mutual relations or kinship obligation (Drèze and Sen, 1989). Assets which form the foundation of a household's entitlements include gifts, investments in productive assets, stores of food or cash, and claims that can be made on other households, patrons, chiefs, government and the international community (Swift, 1989). Vulnerability assessments have therefore been in existence for over a decade.

Although vulnerability assessments have been in existence for over a decade, the study of social vulnerability to climate change and variability, and the ability to adapt to changes in climate is a relatively new field of research. This field of research brings together specialists from a wide range of fields, such as, climate science, development studies, disaster management, health, social science, policy development and economics. Given that the researchers come from different fields, each brings its own conceptual framework to the study of vulnerability to climate change and variability (Brooks, 2003).

The researchers often use different conceptual frameworks to address similar problems and processes. As a result, there has been failure to develop a common framework, which allows vulnerability research to integrate the different fields in a coherent yet flexible

manner. The lack of common formal methodologies poses a challenge for this new field of research (Brooks, 2003).

In the context of social vulnerability, vulnerability assessment tries to provide an understanding of how and to what degree the combination of external (exposure to shocks) and internal (people's ability to cope) vulnerability affects people's livelihoods. The assessment takes a holistic view on how people live, the threats they face, and the degree to which they can deal with these threats (Marsland, 2004). Through vulnerability assessment, valuable information is provided in order to understand and predict likely impacts of shocks on a given population. For instance, information on the impact of drought on crop production amongst the rural people can be generated using vulnerability assessment (Marsland, 2004).

Based on the RVAC framework (Marsland, 2004), vulnerability assessment rests on linking external and internal vulnerability. This allows on-going analysis of the effects of different shocks. Social vulnerability assessment requires two sets of information; livelihood systems in the geographical area of interest and hazard information. An understanding of livelihood systems is important for explaining which people are vulnerable to different shocks, why they are vulnerable, and how they are likely to be affected. This information can be collected in several ways depending on the scope of enquiry and time available. Hazard information assists in identifying actual or impending external shocks that may affect livelihood systems. This information can be generated from different types of monitoring systems. In the case of drought, early warning systems can provide knowledge on climate change. Linking this information provides a basis on which important decisions can be made to formulate effective responses (Marsland, 2004; RVAC, 2004; Save the Children UK, 2000).

The framework (**Figure 3.1)** of this study draws on the RVAC framework and also includes similar elements to the sustainable livelihoods framework (Carney, *et al*, 1999) such as human capital, vulnerability and social capital. The research framework integrates both external and internal vulnerability. The external vulnerability refers to shocks and stresses that may threaten the well being of communities. These include:

climate stressors, in this case drought, **socio-economic stressors** (poverty, unemployment, poor health, deteriorating human capital), **biophysical stressors** (soil, vegetation, water, bio-diversity) and **political stressors** (policy implication, laws, political freedom)

The internal dimension of vulnerability specifically focuses on coping and adaptation strategies taken to over come shocks and stresses that result from external exposures. Coping and adaptation depends on various factors. These factors include:

- **Socio-economic capital**

These may be in the form of economic assets (e.g. economic assets, production equipment and markets), human capital (skills, knowledge, labour, health) and social capital (formal and informal institutions, household and social relations).

- **Ecological capital**

Ecological capital refers to natural assets. Natural resources comprise of water, land and biodiversity.

- **Political capital** (benefits from policy implementation, property rights, government institutions).

Given the above factors, people may cope, adapt and build resilience against external stressors or they could become stressed and vulnerable due to lack of these factors. From local history for example, most inhabitants in semi-arid areas know the frequency and likely consequences of drought (Ribot *et al*., 1996). Using means at their disposal, most people in extreme climatic zones should be able to prepare for cope and adapt to drought. Why then, are some rural societies less able to prepare for or recover from expected climatic events such as drought? One could argue that, there are several factors such as those mentioned above that make societies more vulnerable to different types of climatic events (Brook, 2003). With the guidance of the framework these factors will therefore be examined.

Having presented the framework of the study, the sections that follow describe the methods used to collect data and the way in which data were analysed and presented.

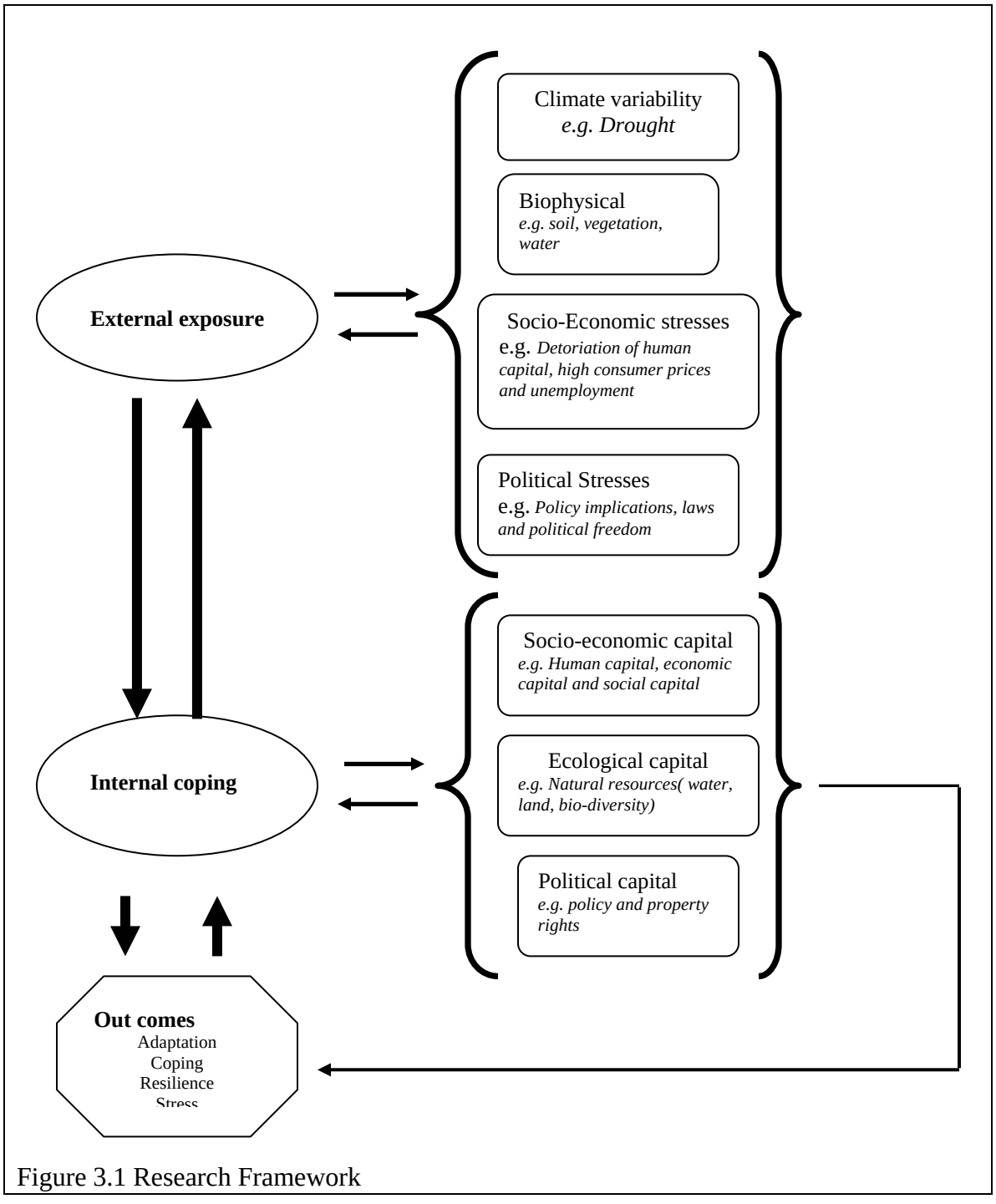

Figure 3.1 Research Framework

3.3 Secondary Data

Secondary data were obtained from a comprehensive review of existing published and non-published literature relevant to the study. Materials reviewed included the following:

1. Literature on famine, vulnerability to climate change and variability, coping with various climatic conditions (e.g. from various books, journals, internet articles).
2. Published and unpublished material on Botswana's climatic conditions and the impact climate has had on the country (e.g. pamphlets, books, news papers, journals).
3. Botswana national statistics (e.g. population, education, health, employment).
4. Botswana national policies (e.g. National development plans)
5. Climatologic data from the Botswana meteorological centre.
6. Literature on the two study areas (Matsheng and Kasane) (e.g. pamphlets, other studies done in the areas, books).

The use of secondary data made a significant contribution to the overall quality of the research. The data provided a variety of background information for the research that enabled the construction of a historical profile and baseline context for the study. The data enabled the researcher to see how particular theoretical and methodological approaches have been applied by other social scientists, the problems they have faced and the insights their approaches have provided. Data derived from all the above sources were used to compare and complement primary data. Before the collection of primary data, preparations for the fieldwork were made. These are explained below.

3.4 Preparation Before Fieldwork

Permission to carry out this research was obtained from the Botswana government (**Appendix 3)**. Once research permits were obtained the local authorities as well as the communities in each study area were informed. Meetings for group discussions were arranged and a timetable for household interviews was formulated. Appointments were also made to meet with some of the government officials. These were mainly from Central Statistics Office, Ministry of Agriculture and Policy makers. Research assistants were also identified.

Climatic data were collected from the Botswana meteorological centre. The data consisted mainly of mean annual temperatures and rainfall data. The rainfall data covered a period of 30 years while the mean annual temperature data covered a period of 15 years. This is due to lack of temperature data. The temperature data provided by the Botswana meteorological centre were found to be incomplete. As a result patterns of temperature could not be assessed. After these preparations fieldwork began. Below are the methods used while in the field.

3.5 Primary Data

Primary data were obtained through questionnaires, interviews, rural appraisal and observation. Each of these techniques is described in more detail below.

3.5.1 Questionnaire

A questionnaire was designed to collect household data (**Appendix 1**). Questions were formulated according to the objectives of the survey. Data collected addressed issues such as household demographics, income, assets, agricultural production and coping mechanisms to climatic events. Questionnaires have been documented (Babbie, 1992; Marsh, 1982, Joliffe 1986; Moser and Kalton 1993; Jackson 1995; Chacdwick, 1984) as an inexpensive way to gather data from a potentially large number of respondents. The above literature, however, also acknowledges the problems of conducting questionnaire surveys in general. Questionnaires for example are time consuming and respondents may not be patient to complete the questionnaire. Although the questionnaire proved to be time-consuming, respondents were very cooperative and questionnaires were completed.

The questionnaire comprised of both closed and open-ended questions. Open-ended questions are those that ask for unprompted opinions. In other words, there are no predetermined sets of responses, and the participant is free to answer however he or she chooses. The advantages of having open-ended questions is that they are good for soliciting subjective data or when the range of responses is not tightly defined. They provide a variety of responses that are wider and more truly reflect the opinions of the

respondents. This increases unexpected and insightful suggestions, for it is impossible to predict the full range of opinion (Chacdwick, 1984; Babbie, 1992).

This is not to say that open-ended questions have no disadvantages. Open-ended questions are known for their very nature, which requires them to be read individually. There is no way to automatically tabulate or perform statistical analysis on them. This is obviously time consuming and may not be practical for time sensitive evaluations (Chacdwick, 1984; Babbie, 1992). This problem was experienced during analysis, but with patience, answers were reviewed individually, grouped according to similarities and coded for statistical analysis. Despite the difficulty of coding open-ended questions, they provided comprehensive information. The questions also permitted respondents to give answers that were unexpected, resulting in knowledge that would not have been tapped on.

Closed ended questions on the other hand usually take the form of multiple-choice questions. These are easy to respond to and are less time consuming. By restricting the answer set, it is easy to calculate percentages and other hard statistical data over the whole group or over any subgroup of participants. Closed ended questions also allowed the researcher to filter out useless or extreme answers that might occur in open-ended questions (Chacdwick, 1984; Babbie, 1992). All these advantages made it easy to code and statistically analyse closed ended questions. They compensated for time taken to analyse the open-ended questions.

A reconnaissance survey and a pre-test of the questionnaire were undertaken before the actual data collection. The questionnaire was pre-tested using convenient sampling of 5 households in each study area. The purpose of the reconnaissance survey was to test the capability of the instrument to provide the required data. The test of the questionnaire revealed unanticipated problems such as question wording and instructions to skip questions. The test also helped to see if the interviewees understood the questions and if they were giving useful answers. After the pre-test of the questionnaire, it was revised and made more flexible. During the reconnaissance survey, key informants were also identified.

The questionnaire was administered to a total number of 100 households in each study area (Matsheng and Kasane). As indicated by literature (Babbie, 1992; Jackson 1995; Chacdwick, 1984), administered questionnaires were found to be time-consuming. This method was, however, selected based on the advantage that more response rates are yielded compared to mailed or self-administered questionnaires. The administered questionnaire allowed the interviewer to explain complex questions that might confuse the respondents. It was also ensured that questions were not missed.

The households, to which the questionnaire was administered, were randomly sampled. This was to ensure that the selected sample is representative. It also allowed each household an equal chance of being selected.

Household surveys were undertaken over a period of 6 months (August 2002 to January 2003). Over the 6 months period, 3 visits were made to each study site. Each visit lasted for 2 weeks. With the help of research assistants, households that were selected for the interviews were informed. Households that did not mind to be interviewed at the time they were being informed, were interviewed immediately. This was very convenient and time saving, as there was no need for a second trip to the household for the interview. Appointments were made with those households who could not be interviewed immediately. Although second trips were made to these households, it was worth it because at least 95% of the appointments were honoured. The interviews went according to schedule and the respondents were cooperative. The other 5% of the appointments had to be rescheduled and a third trip had to be made to these households. This was time consuming but eventually the interviews were done. On completion with the household surveys, focus group discussions were scheduled. The method of participatory rural appraisal was applied. This is discussed in more detail below.

3.5.2 Participatory Rural Appraisal

Participatory rural appraisal is a qualitative research method (Ison and Ampt, 1992; Townsley, 1992; Conway 1987; Baro, 1998; Chambers, 1992; Checkland, 1992). The methodology is designed to allow local involvement in the collection and analysis of information by outside researchers. The qualitative characteristic of the method enables

the researcher to probe the context in which a particular problem occurs. It is known to be an effective way to collect information (Baro 1998; Chambers, 1992; Townsley, 1992), particularly from those groups that cannot engage in questionnaire responses due to language or other factors (e.g. formal education).

Participatory rural appraisal emerged in the late 1970s, as agricultural developers were looking for ways to interact more effectively with local rural people (Chambers, 1992). The value of this method was soon recognized as a way to uncover the richness and value of rural knowledge and culture within which development was taking place. The researcher is able to seek out local knowledge and interact with local people. Data collected using this method allows for development plans to take into consideration the knowledge and rights of the people they claim to help. Usually people who are being helped are totally ignored and intervention strategies, such as alleviating poverty and relief policies, are discussed in capital cities, negotiated by top politicians and development professionals, and financed by international banks such as the World Bank without involving the people affected. As a result most programmes fail.

This study adopted participatory rural appraisal in the form of focus group discussions. Semi-structured questions regarding the information to be collected were pre-determined by the researcher in advance (**Appendix 2**). The questions were designed to guide the interviews which were informal and relaxed discussions.

Before undertaking the interviews, the communities were informed through community leaders. Motives and intentions were made clear to eliminate mistrust and suspicion. As a result attendance and cooperation was very good. The communities showed a great interest in the study. To make communication more effective interpreters were used to translate between Setswana and English. Through focus group discussions, affected individuals and communities were able to speak for themselves, as result providing knowledge that enhanced the capacity to understand the viewpoint of local people.

Focus group discussions were undertaken to collect historical data about the past drought experiences and coping mechanisms. The focus groups comprised of elderly members of

the community (50 years and above). The elderly members of the community were sampled using convenience sampling. It was not clear how many elderly people were in the villages and how many would willingly participate in the discussions. This type of sampling was therefore used to get as many willing elderly people involved in the discussions. A total number 110 elderly people agreed to take part in the focus group discussions in Matsheng. The participants were divided into groups of ten. Each group consisted of 10 individuals, making up to a total number of 11groups in Matsheng. In Kasane, a total number 90 elderly people agreed to take part in the focus group discussions. The elderly people were again divided in groups of 10, forming a total number of 9 groups in Kasane.

The groups were made up of both males and females. Focus group discussions were scheduled for one group per day. During the first group discussions, it was realized that the males were dominating the discussions. The females contributed very little even when given the chance. Females were later called upon to form their own group. At the end of the day, two groups were interviewed, instead of one. Groups had already been allocated dates and could not be called back for regrouping and rescheduling of interviews. The groups were allowed to come according to scheduled dates and then split into females and males. With the women separated from the men, more comprehensive information was obtained from the women. The women did not feel comfortable disclosing certain information in the presence of men. This was mainly because some of the men present were husbands, brothers and uncles to some of the women taking part in the discussions. Some of the information collected from the women in the focus groups included strategies that were used without the consent of their husbands.

Focus group discussions are usually faced with the challenge of facilitating the conversation so that the groups fully understand the objective of the interview and that all participants have a venue of expression (Babbie, 1995). It was therefore no surprise that the men dominated the discussions. Though it was challenging to engage men and women in on group discussion at the same time, having men and women in different groups was very productive. The advantages of employing focus group discussions are that they are socially oriented and capture real-life data in a social environment. They

have flexibility, a high face of validity, speedy results, and the discussions bring out aspects of the topic that would not have been anticipated by the researcher and would not have emerged from interviews with individuals.

Focus group discussions were carried out over a period of 2 months (February 2003 to March 2003). Each study site was visited once for the group discussions. The visit to each site lasted 2 weeks. During the fieldwork, the method of observation was also used. This method is explained next.

3.5.3 Observation

Observation is a primary source of data collection normally used in qualitative research. Data collected using this method represents firsthand encounters with the phenomenon of interest. Data of naturally occurring behavior seen or heard by the observer is recorded (Bogden and Biklen, 1982). Observation was employed to collect data about the state of natural environment and the behavior of the people. Field notes were taken to help the researcher reconstruct and describe specifics of events as they were observed. Another method that was used in this study was the face-to-face interview.

3.5.4 Face-to-Face Interviews

Face-to-Face interviews were conducted with key informants, so as to collect specialized data. These individuals consisted of farmers, village leaders, government officials and Local District Councils of Matsheng and Kasane. Information obtained from these individuals was used to compliment data collected from focus groups, households and secondary sources. After the completion of data collection, the process of data analysis commenced. The process of data analysis is described in the next section.

3.6 Data Analysis

Analysis and interpretation of data were undertaken after completion of the fieldwork. Data collected by use of questionnaires was compiled and coded. A codebook was developed as an outline to explain what each research question is, the labels associated with each question, and the numerical values assigned to them. Data were then entered

into the computer, using the statistical package for social sciences (SPSS) and Excel. Results were summarized and conclusions were drawn.

* * * * * * * * * * * * * * * * * * * *

This chapter provided a detailed account on the methodology used to collect data. A framework on which the study was based is described. It covers an assessment of both external and internal vulnerability. Data were collected using both primary and secondary methods. Primary data collection included questionnaires, participatory rural appraisal, observation and face-to-face interviews. Secondary data were generated through a comprehensive review of existing published and non-published literature relevant to the study. Data were then analysed using computer packages such as SPSS and Excel. In the next chapters results obtained using the methodologies described in this chapter are presented and discussed.

CHAPTER FOUR

PHYSICAL AND HUMAN ENVIRONMENTAL SETTING OF MATSHENG AND KASANE

4.1 Introduction

This chapter presents the physical and human environmental setting of Matsheng and Kasane. The physical environmental setting provides information on the location, climate, soil conditions and vegetation of the study areas. The human environmental setting includes information on population size of Kasane and Matsheng, livelihoods and socio-economic characteristics of the respondents.

4.2 Physical Environmental

4.2.1 Location

Matsheng is a rural settlement located in the Kalahari district, about 500 kilometers to the west of Gaborone, which is Botswana's capital city. The name Matsheng means "pans", several of which dominate the area. Most livestock owners rely on these pans as a source of water for their animals. During the rainy seasons, pans are the only source of surface water. Matsheng is surrounded by wildlife management areas, which have been set aside for wildlife utilization and management (Chanda and Otlogetswe, 2001).

Matsheng, like all other rural areas in the west of Botswana, has clearly lagged behind in national growth. Western Botswana is an area with limited development potential. It is far from markets, has limited agricultural potential, limited water resources, scarcity of human resources, and barely developed local economies (Chanda and Otlogetswe, 2001).

Kasane is a remote and small village. It is located in the Chobe District, which consists largely of game and forest reserves. The village lies close to the place where the borders of Botswana, Namibia, Zimbabwe and Zambia meet. Due to its strategic location along main tourist route, the village has experienced rapid expansion in recent years. Kazungula, 6km to the east of Kasane, is the border post between Botswana and Zimbabwe, and the Victoria Falls is only 80km away. The nearby Kazungula ferry

crosses the Zambezi River between Botswana and Zambia. The border with Namibia is 50km away from the northern tip of Chobe National Park. As there are no boundary fences between the park and the village, elephants are frequently seen wandering down the main street and hippos and crocodiles climb out of the river and bask on the lawns of the Kasane campsites (Ministry of Finance and Development planning, 1997; http://www.overlandafrica.com).

Kasane's location has made the village popular. For years, tourists have been using the village as a gateway to the Chobe National Park. Kasane is also near the confluence of the Chobe and Zambezi Rivers. Entrepreneurs have taken advantage of this remarkably centrally situated village. Excellent hotels and lodges have been built and are within the reach of all pockets and provide for their clients to international standards (http://www.go2africa.com).

4.2.2 Climate

The climate of Kasane is semi-arid, with hot and moist summers and, dry mild winters. This part of Botswana receives the highest rainfall. The annual mean rainfall of the Chobe District (location of Kasane) varies from a minimum of about 520mm in the extreme southwest to a maximum of over 650mm in the northeast (Kasane). The highest annual rainfall was recorded in 1993 (**Figure 4.1**). Almost all the rainfall (99%) occurs during the summer months of October to April, with the wettest period being December to March (**Table 4.1**). The wettest period accounts for two thirds of the annual rainfall (Botswana Meteorological Centre, 2000).

There is variation in both the annual and monthly rainfall (**Table 4.1** and **Figure 4.1**) of Kasane. The variability of rainfall in the mid-season (January to February) is higher than in the early season (November to December). Although Kasane receives the highest rainfall of Botswana, it also suffers drought conditions on an average of once in four years. The incidences of severe drought conditions in Kasane occur once in 16 years (Botswana Meteorological Centre, 2000).

Table 4.1: Monthly rainfall for Kasane (mm)

Month	Jan	Feb	March	April	May	Oct	Nov	Dec
Year								
1971	263.8	143.5	34.5	1.4	0	4.5	86	70.1
1972	516.1	65	103	0	0	36	0	125
1973	181	97	159	0	0	23	69	251
1974	234.5	0	0		0	0	75	224.5
1975	201	74	157	14.5	28.5	0	3	169.4
1976	106.4	70	235.9	41	13	6	147	29
1977	130	247	191.6	0	0	0	0	362.5
1978	166.2	174.5	59	0	0	70.5	96.4	77.5
1979	64	53.9	32	0	0	64	26.5	164.5
1980	17	156	49	0	0	59	161.5	36
1981	236.5	214.5	59.5	2.5	0	0	133.5	78
1982	38.5	34	2	12.7	0	106.6	23.3	160
1983	126.9	57	90.6	24.2	6	21.9	18.9	197
1984	82	74	58.4	10.5	6.2	28	81.9	65.9
1985	81.5	253.7	51.7	9	0	37.6	14.8	265.7
1986	118.7	77.2	40.3	76.5	0	71.1	131.5	58
1987	105.9	36.1	71.1	25.7	0	4.3	41.9	181.9
1988	72.2	441	172.4	1.9	5	18	16.6	171.7
1989	205.2	93.7	51.1	16	0	59.5	19	36
1990	231.1	152.8	25.5	34	4.3	40.7	11.1	99.5
1991	269.7	97.4	118.8	0	0	12.7	65.1	375.7
1992	56.8	5.5	125.3	11.2	0	3.7	32.7	135.7
1993	172.3	155.5	435	17.6	0	2.6	96.6	99.8
1994	156.9	131.1	21.7	1.7	0	28.8	50.1	76.9
1995	105.6	199.4	29.2	35.6	19.7	0.9	82.7	98.4
1996	138.4	173.8	24.3	0	2.7	1.1	119.1	43.8
1997	155.1	116.3	72.6	45.4	9	61	63.7	46.6
1998	250.8	34.1	63.7	0	0	3.5	37.3	134.6
1999	65.2	117.6	85.3	0	0	0	35.9	95.2
2000	121.5	237.3	57.7	27	4.9	1.9	80.6	72.4

Source: Botswana Meteorological Centre.

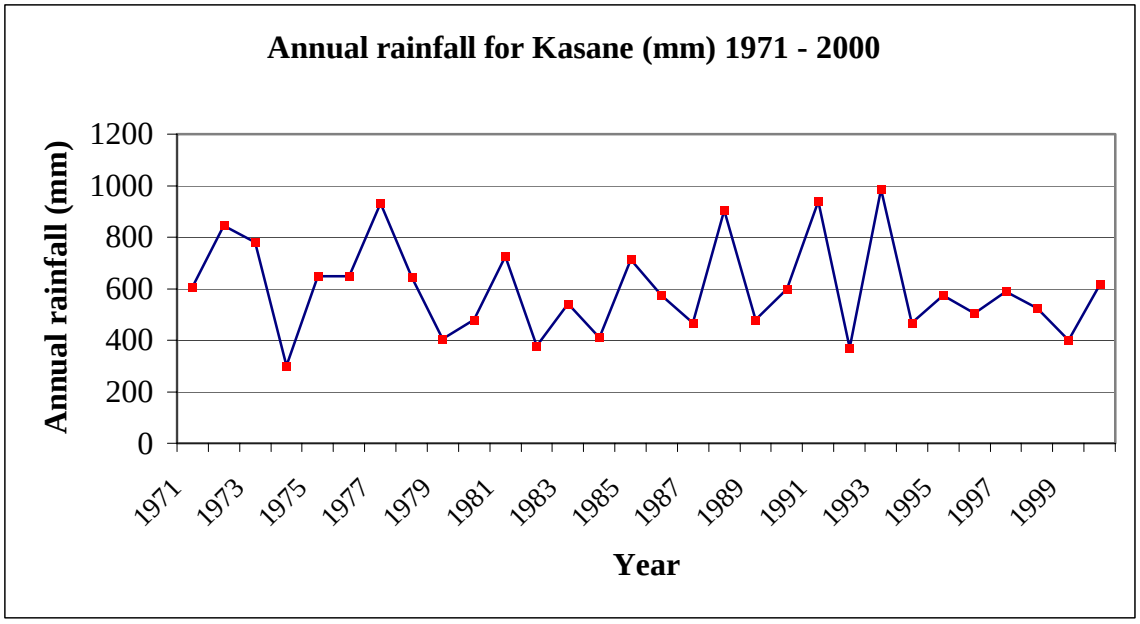

Figure 4.1: Annual rainfall (mm) for Kasane

Source: Botswana Meteorological Centre

Matsheng experiences the usual fluctuations in rainfall (**Table 4.2** and **Figure 4.2)** associated with any other semi-arid environment. Matsheng is in one of Botswana's driest region. The area receives an average rainfall of 300mm annually. Matsheng experiences high temperatures (average of 41°C) during the months of January and February. Due to extreme temperatures, the rate of evapotranspiration is higher than the mean precipitation. During the winter period (May to September) Matsheng also experiences extreme temperatures, with a minimum of -8°C in August. As a result of the low temperatures in winter, Matsheng experiences frosty, cold climatic conditions too.

Similar to Kasane, Matsheng also experiences variation in both annual and monthly rainfall (**Table 4. 2 and Figure 4.2**). Most of the rainfall in Matsheng is experienced during the period of January to March. Given that Matsheng is one of the driest regions in Botswana, it is prone to higher drought conditions as well as more severe drought conditions compared to Kasane.

Table 4.2: Monthly rainfall for Matsheng

Month	Jan	Feb	March	April	May	Oct	Nov	Dec
Year								
1971	107.2	22.5	19.9	10.2	15.6	5.3	16.9	26.3
1972	190.5	10.7	109.3	59.3	0	0	25.8	10.6
1973	31.9	66.1	56.7	83.9	0.5	67.1	17.6	84
1974	243	79.2	207.1	62	0	0	39.6	93.4
1975	93.4	31.7	129.9	50.2	9.5	7.2	12	81.7
1976	239.8	186.8	141.7	34.6	11.4	27.3	10.7	5.3
1977	78.1	86.8	80.8	43.4	24.6	14.8	36.8	32.8
1978	87.4	146.3	17.9	45.2	2.2	28.6	26.1	54.5
1979	68.3	20.7	3.8	4.6	11.3	34.2	44.2	20.3
1980	0	196.3	158.7	3.8	0	2.3	73.7	21.9
1981	98.6	70.9	16.3	1.1	0.4	35.4	33.4	65.9
1982	33.7	33.7	33.8	61	6.7	40.6	45.4	37.9
1983	77.3	27.3	65.2	25.7	20.9	42.8	55.9	90
1984	16	6	38	15.2	15.7	21.7	49.2	5.3
1985	37.3	32	36.8	0	0	23.9	10.1	63.1
1986	101.9	36.5	41.2	42.4	0	80.2	51.7	15.2
1987	22.1	62.4	49.4	42.1	0	4.6	35.8	125.7
1988	1.9	234	59.8	33.5	9.1	6.1	58.4	65.9
1989	52.1	136.2	24.6	37.6	3.1	1	22.5	12.9
1990	63.9	34	82.6	60.8	4	0	2.2	10.7
1991	174.9	68.6	26.4	0	0	8.6	21.2	60.9
1992	17.4	29.5	12.2	26.3	0	12.8	42.2	13.8
1993	6.2	70.6	27.1	16.9	5	124.5	41.4	104
1994	77.9	51.8	11.7	2.1	0	0	13.1	5.7
1995	51.1	17.3	11.4	0.6	24.2	73.3	59.1	112.2
1996	165.9	65.2	13.3	30.5	19.3	2.4	49.3	70.3
1997	79.3	55.8	43.3	4.8	25.4	65.2	15.6	21.9
1998	119.5	47.7	54.2	0	0	35.2	17.6	45.6
1999	0.6	16.2	19.9	0	29.2	47.2	10.5	110.3
2000	30	134.1	28.7	48.2	14.2	22.2	38.2	98.3

Source: Botswana meteorological centre

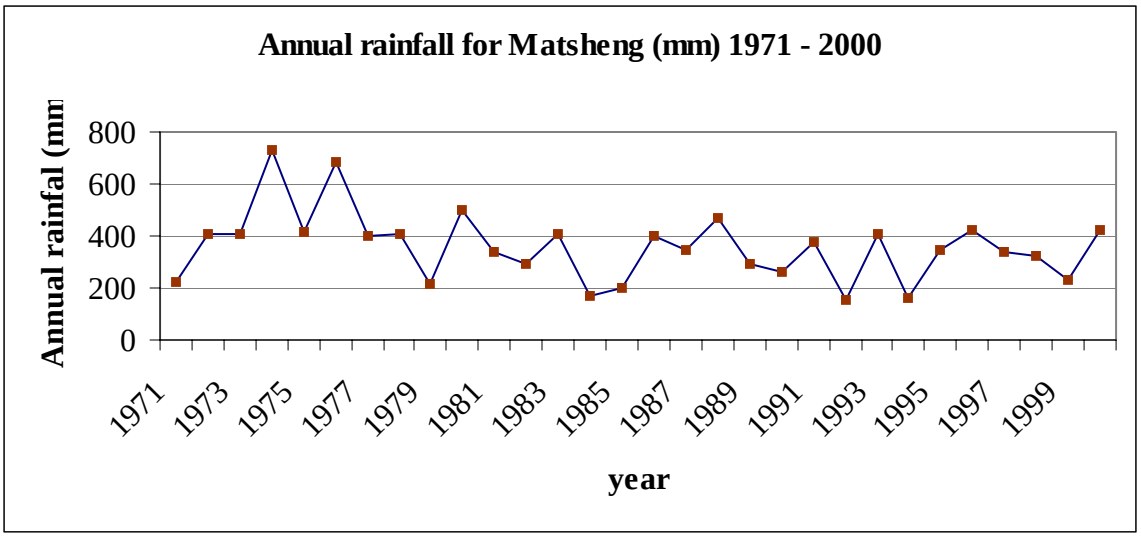

Figure 4.2: Annual rainfall for Matsheng 1971 - 2000

Source: Botswana meteorological centre

It is evident that rainfall in Matsheng and Kasane is highly variable over space and from one year to another. This comes as no surprise given that drought is a recurrent phenomena in Botswana. Drought is evidently the most important climatic issue in the country. There is no doubt that Botswana has been experiencing increasing incidence of drought spells since the beginning of the 20th century (Umoh, 2003).

Rainfall regimes of the country are generally in the form of alternating wet and dry epochs. Recorded years of increased rainfall were 1922, 1941, 1959, 1972, 1988, 1995 and 2000. Periods of marked decrease were observed for 1911 – 1914; 1932 – 1934; 1945-1946; 1951-1953; 1965-1969; 1982-1987 and 1992. There is evidence that long-term fluctuations in climate have occurred in the past. A great lake for example that once existed in the basin now occupied by Makgadikgadi pans in northern Botswana, fed by a number of large rivers from the south and the west is now totally dry (Tsheko, 2003; Umoh, 2003).

Major droughts have occurred in Botswana during the 1910's, 1940's, 1960's, 1980's and 1990's. There has been a decrease in intervals between severe droughts particularly after the 1980's. The annual total rainfall falls short of the long-term mean by as much as 58.3 % during 1985/86 drought and much more in the subsequent occurrences (Umoh, 2003).

One can therefore conclude that there has been a change in climate variability in Botswana over time.

4.2.3 Soil conditions

Matsheng is predominantly covered by arenosols soils. These soils are sandy with very low nutrient status and water retention capacity (**Figure 4.3**). The soils lack organic matter content, cation exchange capacity, phosphorous and potassium, which are all crucial for plant growth. As a result of these poor soils, both traditional and commercial arable production is very low (Chanda and Otlogetswe, 2001).



Figure 4.3: Main type of soil in Matsheng
Source: Author's field survey (2002)

In the case of Kasane the soils range from sandy to clayey. The soils are reddish brown, yellow and grey sandy soils, dark clayey soils and vertisols in depressions. Kasane is however largely covered by loamy and clay soils which are more fertile and more suitable for agricultural activities (**Figure 4.4**). This part of Botswana is more heavily populated than Matsheng (Ministry of Finance and Development Planning, 1991).



Figure 4.4: Main type of soil in Kasane

Source: Author's field survey (2002)

4.2.4 Vegetation

Vegetation in each area of study is closely correlated with climate. In the Kasane area (southern part of Botswana), there are belts of indigenous forest, dense bush, open woodlands with dense closed canopy and grasslands that are sustained by the relatively high rainfall (**Figures 4.5 and 4.6**). The Kasane area has a wider variation of vegetation compared to Matsheng. Further in the northern part of Botswana, the Matsheng area is predominantly covered by shrub savanna with tufted grasses and spatially varying abundance of woody vegetation (**Figures 4.7 and 4.8)**. Some areas in Matsheng have no vegetation at all. The areas of no vegetation include the saltpans (**Figure 4.9**), sand dunes and areas surrounding livestock water points (**Figure 4.10**). The most common species of trees found there are *acacia erioloba, acacia leuderitzii*, and *acacia mellifera* and *boscia albitrunca*.



Figure 4.5: Vegetation in Kasane

Source: Author's field survey (2002)



Figure 4.6: Vegetation in Kasane

Source: Author's field survey (2002)



Figure 4.7: Vegetation in Matsheng

Source: Author's field survey (2002)



Figure 4.8: Vegetation in Matsheng

Source: Author's field survey (2002)



Figure 4.9:Saltpan

Source: Author's field survey (2002)



Figure 4.10: Livestock water point

Source: Author's field survey (2002)

The poor vegetation in Matsheng and lack of vegetation in some areas is a result of low rainfall and poor soils coupled with overgrazing and use of fuel wood by households. Through observation and interviews it was evident (**Figure 4.10**) that areas close to livestock water points were overgrazed and therefore devoid of vegetation. It was also observed that vegetation becomes denser with distance away from the settlements and overgrazed areas (**Figure 4.7**). This suggests that apart from climate, human activities (especially livestock production) have a major impact on vegetation. The impacts of human activities on vegetation were discussed in more details during the interviews. The different views expressed by the respondents are presented below.

4.2.5 Change in vegetation

During focus group discussions, respondents in Kasane and Matsheng indicated that, there has been a decline in vegetation in their areas. Respondents in Kasane noted that even though they have more vegetation than in Matsheng, they have been experiencing a decline in the vegetation. Different causes for the declines in vegetation were given (**Table 4.3)**.

Table 4.3: Reasons for decline in vegetation

Matsheng	Kasane
Overgrazing	Overgrazing
Demand for fuel wood	Demand for fuel wood
Demand for building material	Demand for building material
Decline in rainfall	Demand for agricultural land
	Demand for settlement areas
	Fire
	Building of tourist attractions

Source: Author's field survey (2002)

Respondents in both villages shared similar views on why vegetation in their opinion was declining. They expressed that in the past they were surrounded by more vegetation than they have today. Kasane, being a tourist area, the respondents felt that the building of hotels and lodges for the tourist is taking up more land, resulting in a reduction of vegetation. To attract tourists, the hotels and lodges are made very traditional by use of wood and grass (e.g. **Figure 4.11**). As a result more woodlands and grasslands are being depleted at a fairly rapid rate. In the case of Matsheng, respondents indicated that overgrazing, demand for fuel wood, demand for building materials and decline in rainfall were the main causes of reduction in vegetation. Having given an outline of the physical environment of Matsheng and Kasane, in the next section, knowledge regarding the human environment is presented.



Figure 4.11: Dining room at one of the lodges in Kasane (use of wood and grass)
Source: Author's field survey (2002 - 2003)

4.3 Human Environmental Setting

The Botswana national population and housing census are carried out every 10 years. Based on the most recent national population and housing census held in 2001, the population of Matsheng stands at 7 688 (Central Statistics Office, 2001). The population engages in typical rural livelihood activities. These include various traditional rangeland-based activities (e.g. livestock rearing, hunting and gathering). In recent years the traditional livelihoods have had to compete with various formal and informal livelihood sources that have emerged (Chanda and Magole, 2001). The Basarwa, non-Bantu hunter-gathers also known as the "Bushmen" were the first inhabitants of the Kgalagadi. The first Bantu agro-pastoralists came in the 19th century. The area is now dominated by the Bangologa, who are semi-nomadic and hunter-gatherers (Chanda, 2000). The population of Matsheng is the most socio-economically disadvantaged group in Botswana. The government, however, has been working on improving the livelihoods of the population by trying to alleviate poverty (Chanda, 2000).

The population of Kasane has grown from 4 336 in 1991 (Central Statistics Office, 1991) to a population of 7 638 (Central Statistics Office, 2001) (most recent population and housing census). The population is almost as large as that of Matsheng. A large number of Chobe's population is concentrated in Kasane. The population also engages in typical rural livelihood activities (e.g. making of crafts and herding cattle). Given that Kasane

has better climatic and soil conditions, typical rural livelihood activities also include agricultural activities (e.g. working on farms and farming).

4.3.1 Socio-economic characteristics of household respondents and focus groups

Respondents forming focus groups

The age of elderly members of both communities (Matsheng and Kasane) that formed the focus groups, ranged between 50 and 86 years in Matsheng and 55 to 82 years in Kasane. A total number of 200 elderly people took part in the focus group discussions (110 in Matsheng and 90 in Kasane). In terms of education, they all attained primary education and very few obtained secondary (15%) and tertiary (11%) education. Most (55%) of them were pensioners, while others were either unemployed (30%) or self-employed (5%).

Household respondents

Age and sex

The age of household respondents ranged from 28 years to 84 years in Kasane (**Table 4.4**) and 30 years to 86 years in Matsheng (**Table 4.5**). The various age groups provided cross-sectional views and perceptions of climate variability and how it affects their livelihoods. In each of the areas of study, a total number of 100 households were interviewed, giving a total of 200 households for both villages. The majority of households in both areas of study were female headed (Matsheng 58% and Kasane 56%).

Table 4.4: Age and Sex of respondents in Kasane

Age	Female	Male	Total
28 – 35	4 (8%)	1 (2%)	5 (10%)
36 – 43	3 (6%)	1 (2%)	4 (8%)
44 – 51	7 (14%)	2 (4%)	9 (18%)
52 – 59	8 (16%)	2 (4%)	10 (20%)
60 – 67	4 (8%)	4 (8%)	8 (16%)
68+	10 (20%)	4 (8%)	14 (28%)
Total	36(72%)	14 (28%)	50 (100%)

Source: Author's field survey (2002).

Table 4.5: Age and Sex of Respondents in Matsheng

Age	Female	Male	Total
30 – 40	3 (6%)	1(2%)	4 (8%)
41 – 51	5 (10%)	3 (6%)	8 (16%)
52 – 62	9 (18%)	5(10%)	14 (28%)
63 – 73	7 (14%)	6 (12%)	13 (26%)
73+	6 (12%)	5 (10%)	11 (22%)
Total	30 (60%)	20 (40%)	50 (100%)

Source: Author's field survey (2002).

Various reasons were given to explain why these households were female headed. The reasons were as follows:

1. Death of male head as a result of HIV/AIDS (26%)
2. Divorce (20%)
3. Never married (24%)
4. Death of male head as a result of car accident (5%)
5. Death of male head after long illness (25%)

At least 26% of the female-headed households admitted to losing the male household head to HIV/AIDS. HIV/AIDS is a problem, as it weakens the family structure. It is clearly stated in the literature (Drinkwater, 2003; Shah *et al*., 2002; UNAIDS, 2002;

Khogali, 2002; Topouzi, 1998; Barnett and Blaikie, 1992) that, in households that have lost a male breadwinner, the surviving widows and their families often have few assets to dispose of in time of need. Food security coping mechanisms (e.g. loss of income to purchase food, loss of savings due to funeral costs) may therefore disintegrate quite soon after the death of the male breadwinner. This scenario may apply to households in Kasane and Matsheng in cases where the male was the sole breadwinner, making them more vulnerable to drought.

Death resulting from long illness was another common reason for the existence of female-headed households. These households accounted for 25%. Although questions regarding HIV/AIDS were not directly asked, these households freely talked and described the symptoms of the deceased. The symptoms included pneumonia, tuberculosis, serious skin problems, continuous flu and diarrhoea. Given the symptoms described by the female heads of these households, there is reason to believe that the long illness may have been related to HIV/AIDS. Regardless of the cause of death, be it car accidents (5%), AIDS, or any other illness, loss of a male breadwinner can bring about difficulties resulting in inability to cope with drought.

Household size

Household sizes ranged from 4 to 18 members in Matsheng (**Figure 4.12**) and 2 to 15 in Kasane (**Figure 4.13**). Most households (30%) in Matsheng have between 9 and 10 members, while in Kasane most of the households (27%) have between 6 and 7 members. There are also several households with more than ten members in both villages. This may affect the ability of some households to cope with problems of climate variability, as there are more people to feed and take care of.

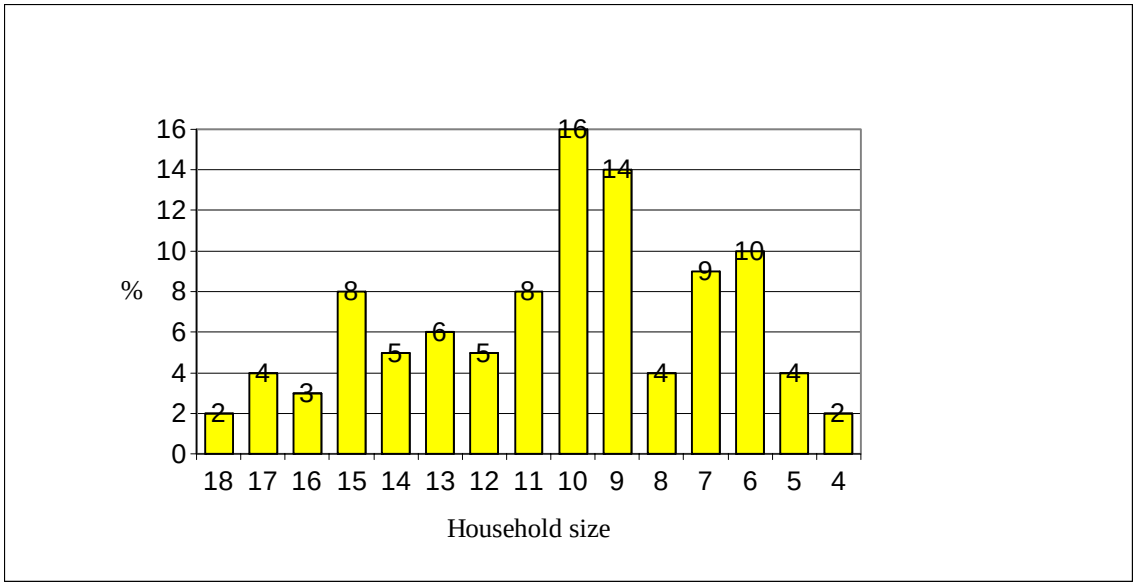

Figure 4.12: Household size in Matsheng

Source: Author's field survey (2002).

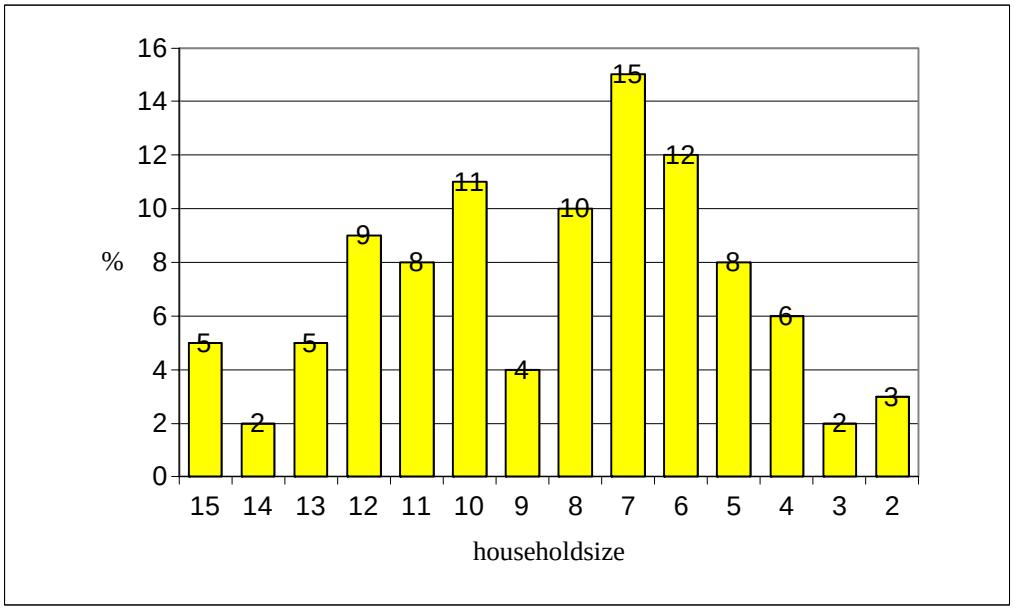

Figure 4.13: Household size in Kasane

Source: Author's field survey (2002).

Level of education

The level of education for most respondents in Matsheng (**Figure 4.14**) and Kasane (**Figure 4.15**) was primary education. Some attained secondary education and very few attained tertiary education in both villages.

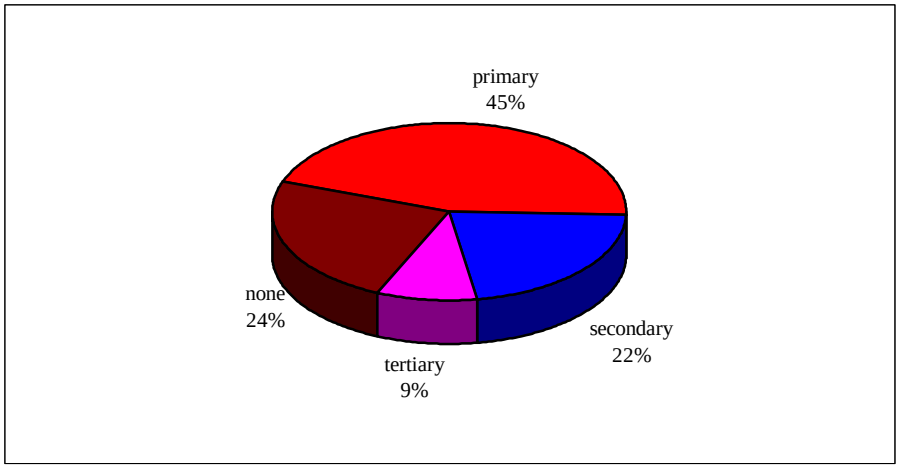

Figure 4.14: Respondent's level of education in Matsheng

Source: Author's field survey (2002).

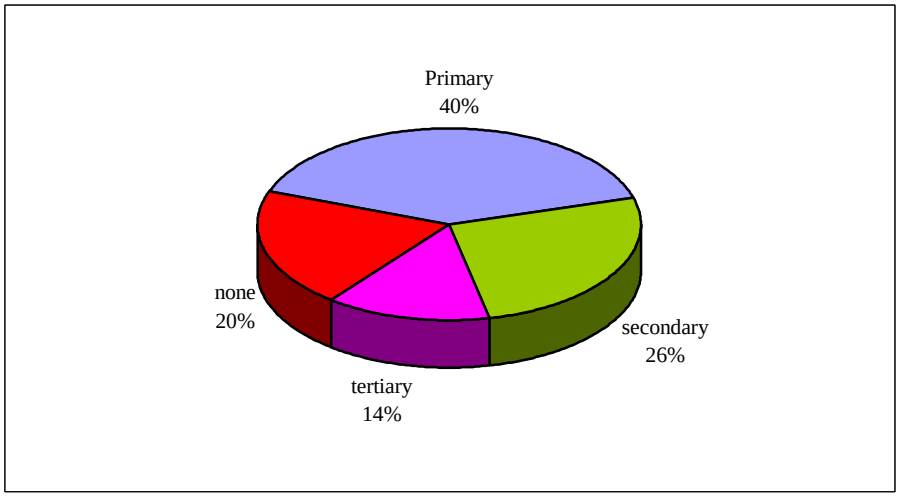

Figure 4.15: Respondent's level of education in Kasane

Source: Author's field survey (2002).

Occupation of household respondents

More than 70% of Batswana reside in rural areas. Almost all of them obtain their livelihood from multiple sources ((Ministry of Finance and Development Planning, 2003). Of these the most important is livestock, which also provides meat and milk for household consumption. There is little formal sector employment with most people being involved in informal employment at some stage (Ministry of Finance and Development Planning, 2003; 1997; Jacques, 1995; Hay *et al*., 1985; Shepard and Vierich, 1980). Given that the agricultural sector is the most vulnerable to drought and that most of Botswana's land is unsuitable for agriculture, rural populations (especially those in the southern part of Botswana) are moving away from agricultural practices (Ministry of Finance and Development Planning, 2003; Alverson 1999; BIDPA, 1997). Rural populations must therefore find other alternatives to derive their livelihoods.

Based on the survey results, more than half (52%) of the respondents in Matsheng (**Figure 4.16**) and Kasane (54%) (**Figure 4.17**) were self-employed. Self-employment consists of continuous and non-continuous self-employment. None-continuous self-employment comprises of those who are engaged in piece jobs (e.g. gathering wood, clearing fields, making fences, domestic workers and construction workers and herdsmen). Continuous self-employment includes those involved in small businesses such as selling traditional beer, operating small restaurants, selling vegetables and fruits, selling crafts and owning small shops and bars. Those involved in non-continuous self-employment account for 61% of those who are self-employed in Kasane and Matsheng. The remaining 39% are involved in continuous self-employment.

Those involved in non-continuous self-employment explained that their jobs are temporary and they do not generate enough income to sustain their livelihoods. They claimed not to be very different from those who are unemployed. In the case of those who were involved in continuous self-employment, as many as 30% said it was difficult to generate a reasonable income from their small businesses, as the market is very limited. Most rural people cannot afford to buy their products. As a result it is difficult to sustain their businesses. Despite the limitations, they continue to engage in small businesses because they have no other alternatives.

As many as 25% of the household respondents in Kasane were employed while 21% indicated that they were unemployed. In Matsheng 18% of the household respondents were employed and 30% unemployed. The unemployed in Kasane and Matsheng comprised mainly of the elderly, disabled, single mothers and housewives. Housewives were involved in unpaid household work such as gathering of wood fuel, thatching grass, washing, looking after children and cooking.

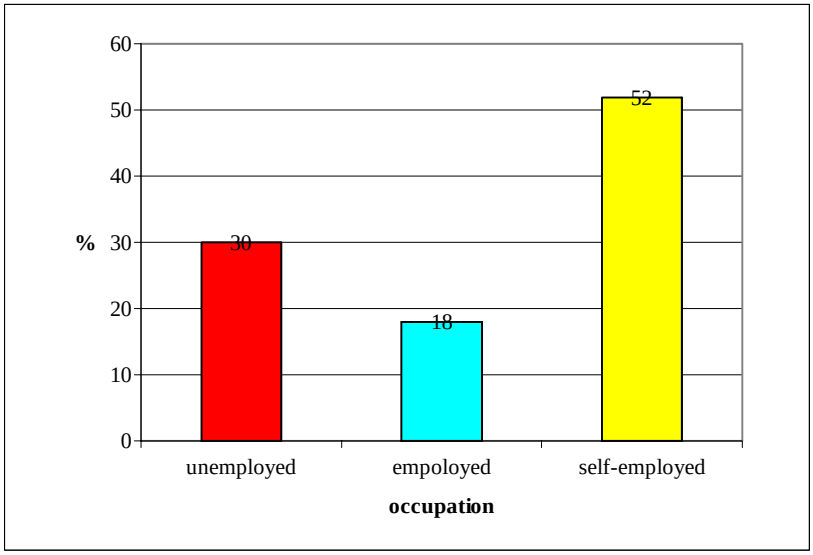

Figure 4.16: Respondent's occupation in Matsheng

Source: Author's field survey (2002).



Figure: 4.17: Respondent's occupation in Kasane

Source: Author's field survey (2002).

Wealth ranking of households

The poor account for 58% of the total households interviewed. These households do not own livestock nor do they own land. They do not have easy access to food and live in poor housing. They also have no employed household members and they have many dependents. Relatives are usually not willing to assist these households, therefore making them more vulnerable to drought (**Table 4.6**).

The average household usually has at least one household member engaged in formal employment. In such a household, the breadwinner does not earn enough to sustain his or her family, but it is better than having nothing. The average household accounts for 25% of the total households interviewed. The remaining 17% are classified rich households based on the indicators in table 4.6 and the wealth ranking. These households can afford to sustain their families without any assistance from anyone.

Table 4.6: Wealth ranking of households for Kasane and Matsheng (n = 200)

	%	**Property**	**Sex**
Poor	58%	• No livestock • No drought power • Unemployed • Many dependents • No relatives willing to assist • No food • Poor housing	Mainly female-headed households
Average	25%	• Has at least 6 cattle • Housing is acceptable • Employed but not enough income to support family • Gets no assistance from relatives	Households headed by both male and female
Rich	17%	• Employed and can sustain family • Has more than 10 cattle • Has working relatives • Has property • Good housing	Mainly male headed households

Source: Author's field survey (2002)

The above socio-economic characteristics of the respondents indicate that there is not much difference between the rural societies in Matsheng and Kasane. As elsewhere in the country, the population of women in both villages is higher than that of men. Regarding the level of education, majority of the respondents in both villages obtained only a primary education. Given that Botswana's education is free from primary school to secondary school and government sponsored at tertiary level, it was surprising that most respondents had obtained only primary education. This was attributed to the belief that, a primary education was good enough at their time.

Completion of primary school provided them with a basic education that enabled them to read, write and do basic calculations. To these people, this was enough. After primary school, children were expected to get more involved in household labour activities. Girls were expected to help with household duties such as cooking, gathering wood and looking after children while the boys looked after cattle. For households that did not own any livestock, the boys were expected to tend cattle for those who owned livestock in exchange for cash or in-kind.

It is clear that education was not among the priorities of the Matsheng and Kasane rural communities. Given that most rural households in Botswana are very poor (Ministry of Finance and Development Planning, 2003), their only concern would be how to get through another day. This has been evident in Kasane and Matsheng. Wealth ranking in Kasane and Matsheng shows that majority of the households in both villages are poor. Poor people usually have a short planning horizon and as a result they suffer in the long run. As mentioned earlier in the literature, most people today are opting for wage employment to enhance their livelihoods, it would be difficult for rural societies in Matsheng and Kasane to compete for meaningful employment due to lack of education. The rural poor will therefore continue to rely on other people and government assistance.

* *

A background to the areas from which data were collected has been provided in this chapter. Knowledge regarding the physical and human environmental setting of Kasane and Matsheng was presented. The physical setting of the two study areas is very different. The two areas (Kasane and Matsheng) have different vegetation cover and experience different climatic conditions. While Matsheng experiences very dry climatic conditions, Kasane receives higher rainfall than any other part of the country. As a result Kasane is more suited for agriculture than is Matsheng. Economically, Kasane is more developed than Matsheng. This is because Kasane is strategically located along the main tourist routes. It is therefore at an advantage. Matsheng on the other hand is far from markets, has limited agricultural potential, limited water resources, scarcity of human resources, and barely developed.

Concerning social issues, both villages share similar socio-economic characteristics. The majority of the respondents in both the societies (Matsheng and Kasane) lack tertiary and secondary education. The female population in both villages was found to be higher than that of the male population. There were also more female-headed households compared to male-headed households. In terms of wealth, the majority of households in both villages were poor and faced unemployment problems. There is therefore not much difference in the social backgrounds of these rural communities.

Having set the scene for the study areas, the remaining chapters focus on how the communities of Matsheng and Kasane have been affected by climate variability. Vulnerability to drought, adaptive and coping strategies as well as factors that shape these coping and adaptive are discussed. The next chapter examines how climate variability has affected rural societies in Matsheng and Kasane

CHAPTER FIVE

EFFECTS OF CLIMATE VARIABILITY ON RURAL SOCIETIES IN MATSHENG AND KASANE

5.1 Introduction

This chapter examines how the communities of Kasane and Matsheng have been affected by climate variability. Attention is given to the effects of drought, as it is the main consequence of climate variability experienced by the communities of Kasane and Matsheng. The chapter begins with experiences from other African countries. These experiences are later compared with experiences in Matsheng and Kasane.

5.2 Effects Of Climate Variability

The impacts associated with drought in Africa have been well documented in literature (e.g. SADC, 2002; UNICEF, 2002; Devereux and Naerra, 1996; Adkisson and Devereux, 1995; Vogel, 1994; Downing, 1987; Glantz and Katz, 1987; Campbell, 1977). Although the effects of climate variability may differ among nations, drought experiences across Southern Africa (e.g. Clay 1994; Vogel, 1994; SADC, 1993; UNICEF, 1993; Downing, 1992; Naeraa, 1992; Campbell *et al*., 1989) suggest that the impacts of drought are often similar in the region. The most immediate effect of drought has been a direct reduction in food production and food availability (Solway, 1994; Downing, 1992; Maxwell and Frankenberger, 1992; Escott, 1985). During the 1984 drought, for example, six affected countries (Angola, Botswana, Lesotho, Mozambique, Zambia and Zimbabwe) produced an aggregated estimate of 3,4 million tonnes of cereal compared with 4.8 million tonnes in a normal year. This represents a 41% loss in cereal production (Escott, 1985). Most countries experienced a serious shortage of seeds, as a result recovery-production was affected, given the more favourable rainfall in 1985.

The 1991/92 drought devastated southern Africa. It was the worst drought ever experienced by the region (UN and SADC, 1992). In Mozambique an estimated 56% of the population faced hunger and shortage of drinking water. In some areas this resulted in deaths form hunger and thirst (Fumane, 1993). In Zimbabwe, the provincial town of Mutare, with a population of 120 000, struggled to survive as water sources in the

municipality dried up. About 18 million people in Southern Africa were at risk of starvation (Rukamba, 1993).

In 2002 almost 13 million people, of whom half were children in southern Africa were at the risk of hunger as the region struggled with drought and massive harvest failures (UNICEF, 2002). Other common impacts associated with drought in southern Africa include loss of livestock, loss of agricultural employment and shortage of water. During the period of fieldwork (2002/03) the president of Botswana declared the country drought stricken. The 2002/03 rainfall was generally deficient. The communities of Matsheng and Kasane were already experiencing the impacts of the drought. Based on the findings of the study, impacts of drought experienced in Kasane and Matsheng, as described below, were not very different from what has already been documented.

The elderly members of the rural communities (in Kasane and Matsheng) that formed focus groups were able to remember years of drought going back as far as 1961. They all experienced droughts of the following years: 1961 to 1965, 1968/70, 1974/75, 1979/80, 1981 to 1987 and 1991 to 1993. Drought experiences were discussed among the focus groups and during household interviews. They all shared similar experiences (**Table 4.7**). Throughout the discussions it was evident that many people were vulnerable to the droughts, as they did not have sufficient resources to help them cope.

When asked what resources they required to cope with drought, all the respondents raised the problem of not having access to financial resources. Respondents indicated that having access to financial resources would help them cope better with drought, by enabling them to purchase enough food for their families. For those who own livestock, they would be able to buy cattle feed as well as maintain boreholes for livestock watering. They would therefore prevent loss of livestock. The respondents also indicated that they lacked the support of social networks (e.g. community support and support of extended families). Through social networks they would be able to support each other by sharing resources and helping those who cannot help themselves. Based on oral history, the respondents said that their ancestors coped better with drought because they had

strong and effective traditional social support systems (e.g. *mafisa, masotla, letsholo and majako*).

Table 5.1: Respondent's responses concerning effects of climate variability (the case of drought)

Kasane	Matsheng
Increased poverty	Increased poverty
Decline in agricultural activities	Loss of family members due to migration
Loss of income and employment	Loss of income and employment
Loss of livestock and other assets	Loss of livestock and other assets
Increased malnutrition	Increased malnutrition
Loss of family members due to migration	Deteriorating conditions of sick family members

Source: Author's field survey (2002 - 2003)

All household respondents in Matsheng and Kasane expressed that all drought years were bad, when asked in which years they experienced the worst drought. To them no drought year was better than the other. They found it very difficult to cope with all droughts. They simply said they do not have the capacity to cope with drought. As a result they depend on the government for any assistance they can get. Respondents in Matsheng indicated that even in good years they have to struggle as crop production is very poor in their village.

As many as 60% of the household respondents in Matsheng indicated that they did not own arable land, it would therefore not make a difference even if they had rains. They would not be in a position to plant anything given favourable climatic conditions (reasons for lack of access to land are discussed later in chapter 7). For those who own arable land in Matsheng (39%), 28% do not plough because of poor climate and recurrent droughts. The very few who plough (11%), plant crops such as maize, beans and sorghum. Some of these households harvested less than 15kgs of beans, maize and sorghum. They fail to produce sufficient food to sustain their families. Other households fail to get any harvest.

Households therefore need to purchase their food and to do this they need good incomes, which most households do not have.

In the case of Kasane, 65% of the households did not own arable land. Although they have better climate and soil conditions that allow them to plough, they lack arable land. As a result these households cannot even afford to store food in good years that can be used in drought times. For those that own arable land (35%) very few households plough in good years because they have draft power and can afford to hire labour. During drought years, however, their crops fail. Their agricultural activities are therefore affected during drought periods.

The communities of Kasane and Matsheng indicated that droughts worsened their ability to obtain food. They pointed out that during drought periods, food becomes expensive and because they are poor, they lack sufficient means to purchase food. Their inability to purchase food therefore threatens their food security. Food security emphasizes access to enough food by all people at all times for an active, creative and healthy life (World Bank, 1986).

In the case of Matsheng and Kasane access to food by all people at all times has been difficult to achieve during drought years. This has been the case in other African countries. Drought for example, has contributed to a dramatic reduction in production levels of maize (regions main staple food) in six countries: Lesotho, Mozambique, Malawi, Zimbabwe, Zambia, and Swaziland. In 2002 nearly half a million people in Lesotho were facing a serious shortage of food. About four fifths of Lesotho's population depends on agriculture for their livelihoods. The country started to experience erratic weather patterns in November 2001, which adversely affected agricultural production (Christian Aid, 2002).

In 2001, crop failure in Malawi left poor smallholder farmers without enough food to feed their families. Families were forced to buy maize from markets at high prices caused by general shortage. As a result many families were left with no savings to buy sufficient seeds and fertilizer for the planting season in 2002 (Christian Aid 2002). Inadequate

rainfall at the beginning of the planting season in 2002 led to severe food shortages in the southern and central regions of Mozambique. Families did not have many reserves to fall back on, as they had not recovered from the devastating floods of 2000/01.

Although drought affects a number of African countries, the magnitude of its impacts differs. Drought has more devastating impacts on countries that are heavily dependent on agricultural production. Zimbabwe, Zambia, Tanzania, Malawi, Mozambique, Malawi and Lesotho are examples of such countries (SADC, 1993).

The magnitude of drought impacts in Kasane and Matsheng cannot be compared to the above countries. Generally Botswana is a food-deficit country. The country is also prone to drought, where by in 30 years 20 are usually drought years. Apart from being drought prone a bulk of the country's land is not suitable for agriculture (Alverson, 1999). This was found to be true in the case of Matsheng. The soils lack critical minerals such as phosphorus and are also predominantly sandy (**Figure 4.3**). As a result soils cannot hold moisture favorable for plant growth. Kasane is different because it is one of the very few areas in Botswana that have high potential for agricultural production. The recurrent droughts have, however, had an impact on the agricultural system. Botswana has therefore failed to be food self-sufficient. Compared to other countries in the region, Botswana's food supply scenario is different as a large proportion of Botswana's food is imported, even in good years (Manamela, 1993).

The communities of Matsheng and Kasane further indicated that in times of drought they are forced to sell their assets in order to get extra income. Selling assets during drought periods is common throughout Africa (e.g. SADC, 2004; FAO, 2003; Barton *et al*., 2001). During the 2002 drought, southern Africa experienced a food security crisis (Agency for International Development, 2002). Such drought impacts force the rural poor sell their assets in order to purchase food. In Malawi for example, the acute shortages of maize during the drought of 2002 forced people to sale assets such as livestock. Selling assets has long-term consequences as it depletes household resources. It affects ability to recover, as was the case in Matsheng and Kasane. Households remain poor after the drought and continue to struggle for their survival. Failure to recover from climatic

shocks is common among poor rural communities. This happens especially when recurrent climatic events occur. In Botswana the recurrent droughts have taken a toll on rural livelihoods. For countries such as Mozambique and Zambia, the dry spells of 2001/02 did not allow the rural communities to recover from the 2000/01 floods, which destroyed crops (Christian Aid, 2002). In cases like these the impacts of drought are devastating.

As indicated earlier in the literature, water is a scarce resource in Botswana and most villages rely on groundwater (Ministry of Finance and Development Planning, 2003; Molutsi, 1988). Respondents in Matsheng noted that drought affects their water supply. Their water is supplied from boreholes and during the rainy season they rely on pans for livestock water. Based on the household interviews and focus group discussions in Matsheng, during drought years the pans are dry and this affects livestock. Livestock in Matsheng are vulnerable during drought years as they lack water. Very few livestock owners can afford to maintain wells that are used for livestock watering during drought. Wealthy livestock owners who have formal employment in the city, privately own the wells. Herders are employed to water the livestock every two days and to make sure that only cattle belonging to the owners of the wells may drink from them. For livestock owners who cannot afford private wells, they have no choice but to rely on communal wells. Communal well are usually dry during the drought periods.

The impact of drought on livestock is usually overwhelming due to lack of water and pasture. The 1991/92 drought for example, caused the death of thousands of livestock in southern Africa (Khumalo, 1993; Rukamba, 1993; Sejanamane, 1993 Tobaiwa, 1993). Cattle production in Africa is very important for both social and economic reasons. Farmers regarded the loss of livestock to the 1991/92 drought as a tragedy (SADC, 1993).

Herders in Matsheng explained that the cattle walk a distance of 20km or more to look for food. They then walk back to look for water. Those that are owned by wealthy farmers with private wells are watered (**Figure 5.1).** These cattle are healthier with more flesh on their bones compared to those owned by poor households (**Figure 5.2**). Livestock that depend on communal wells wait around waiting to be watered. As a result

of no water, loss of energy and dehydration, some of the animals eventually die (**Figure 5.3**). This scenario has also been experienced in other southern African countries such as Swaziland, (Khumalo, 1993), Namibia (Rukamba, 1993) and Zimbabwe (Tobaiwa, 1993) during drought periods.



Figure 5.1: Healthy cattle belonging to wealthy owners observed being watered at a private well.

Source: Author's field survey (2002/2003).



Figure 5.2: Thin and unhealthy looking cattle belonging to poor owners

Source: Author's field survey (2002/2003).



Figure 5.3: Impact of drought

Source: Author's field survey (2002/2003).

Wealthy livestock owners claimed to lose at least 1 cow in a period of two months during drought years. Poor livestock owners lost between 3 to 4 cows in a period of two months. By the time the drought is over an overwhelming number of cattle would have been lost. During the household interviews some of the poor households indicated that, by the end of the 1991/92 drought they had lost all their cows. These households had very few cows (less than 10) and have never recovered. They now own no cattle and have no financial resources to replace the cattle. As a result they have become poorer.

Respondents in Kasane and Matsheng reported that, the impact of drought on small stock such as goats is not as devastating as it is on cattle. Small stock was mainly owned by poor households. Households that owned small stock noted that they lost between 1 to 2 goats in a period of 3 to 4 months during drought years. Goats were reported to be more drought tolerant than cows, as they do not need to be watered as often as cows. Goats also prefer to browse whereas cows prefer grass, which is usually scarce during drought periods. Goats also recover more quickly after drought. Given the choice to own cattle or small stock, the majority (62%) of rural households in Matsheng and Kasane would opt for small stock. Their reasons being that, small stock is more drought tolerant and less costly to maintain compared to large stock. The remaining 38% would opt for large stock simply because it is more prestigious to own cattle.

Devastating impacts of drought on livestock have also been experienced in other African countries. In Zimbabwe for example, at the end of the 1992/92 drought, about 1.03 million cattle had died due to shortage of water and pasture (Tobaiwa, 1993). In Tanzania, shortages of water arising from the 1991/92 drought had a greater impact on livestock than people. Lack of water caused a suspension of dipping for livestock. Cattle were predisposed to diseases, resulting in poor health and deaths (Kayumulo, 1993). In the case of Matsheng, livestock was also found to be more vulnerable to drought than people. This is not to say that the people are not vulnerable to drought. The difference in the extent to which livestock and people are vulnerable, is that government supports people while livestock depend on the ability of their owners to sustain them. In other words death among people is prevented through government support.

* * * * * * * * * * * * * * * * * * * *

Based on the above findings, it is evident that drought has had various impacts (e.g. loss of livestock, water shortages, reduced food production, loss of assets) on the rural communities of Matsheng and Kasane. Following the approach of declining entitlements (Sen, 1981) one can see a trend of how drought negatively impacts on household productive assets. Livestock has been the most affected by drought due to lack of water. As a result, households owning livestock lose productive assets. Regardless of the negative impacts drought has had on rural societies in Matsheng and Kasane, with effective coping and adaptation strategies, vulnerability or negative consequences of climate variability can be reduced. As stated earlier in the literature review, meteorological events have occupied a central place in the preoccupation of humankind. People have found themselves constantly and intensively at the mercy of natural climatic hazards, often with tragic consequences (Rolando, 1981). Drought is therefore not new among the rural communities of Kasane and Matsheng. The next chapter examines how the communities of Kasane and Matsheng coped and adapted to drought in the past and how they are currently coping.

CHAPTER SIX

PAST AND CURRENT COPING STRATEGIES IN KASANE AND MATSHENG

6.1 Introduction

Having discussed the impacts of drought in chapter five, coping and adaptation strategies to such risks are described in this chapter. Past coping and adaptation strategies as well as current coping and adaptation strategies are discussed.

6.2 Past Traditional Coping Strategies in Kasane and Matsheng

For centuries societies have had to adjust their social and economic activities on a continuing basis to the vagaries of climate in order to survive and develop (Hall, 2000). This is no exception to the communities in Kasane and Matsheng. Long before the industrial revolution traditional coping strategies were generated by indigenous societies to encourage humanity to challenge nature more directly (Fleuret, 1986). Various examples of traditional coping strategies include, rainwater being stored, channeled and concentrated onto favorable cropping sites. A variety of livestock with different capacities to cope with drought were raised and moved across a broad grazing range in search of fleeting forage resources. Multiple seeds were sown to ensure some germinated. Plants with varying moisture requirements were used together for the same reasons. Plots were scattered among different terrains to ensure that at least some of the fleeting rain showers would be caught. A variety of foods were stored and preserved. Wild edible plants and fruits were tapped. Households also shared food. Past coping and adaptation strategies are many and have been well documented (Fissil, *et al*., 2001; Campbell *et al.*, 1989; Sukkary-Stolba, 1989; Bratton, 1987; Campbell, 1986; Fleuret, 1986; Campbell, 1984; Cassanelli, 1982; Colson, 1979; Legesse, 1979; Campbell, 1977; Raynaut, 1977).

In southern Africa similar past coping and adaptation strategies (e.g. use of wild plants and fruits, moving across a broad grazing range, and sharing of food) were used to deal with impacts of drought (Campbell *et al.*, 1989; Bratton, 1987; Campbell, 1986). Based on focus group discussions, in the past, societies in Kasane and Matsheng also practiced similar coping and adaptation strategies as those documented in the wider literature. In

the past, foraging among the communities of Matsheng and Kasane was very common and practiced by many families. While the men went to hunt for meat the women gathered fruits. Seasonal migration was also practiced. During drought times they moved where they could find food and water.

Informal social networks were reported to have been very important in coping with drought. Support systems such as *Mafisa*, *Masotla*, *Letsholo* and *Majoko* as outlined in chapter 2, were very helpful in coping with drought. These social networks involved drawing on extended families, friends, neighbours, and wealthy patrons for help in times of need. Households in Matsheng and Kasane used to work together on communal fields. Crops such as maize, sorghum, groundnuts, and beans were planted. During the harvesting season, some of the food was dried and kept in granaries for times such as drought years. Some of the harvest was also used for household consumption and the remaining was sold for income. During times of drought family members came together to share meals. This strategy helped many families who did not have much to sustain them through the drought years.

Rain-making ceremonies, which were very common in African countries (Fleuret, 1986), were also practiced in Matsheng and Kasane. Communities used to come together to perform rain-making ceremonies. During the ceremonies rain-makers danced while ceremonial rain drums were beaten. The rain-making ceremony was important to communities in Matsheng and Kasane as it provided an opportunity to discuss what measures they would take in case of a drought.

In both villages, respondents indicated that theft of cattle was very common in times of drought. Stolen cattle were slaughtered for meat and blood. Stealing of cattle was not only practiced in Kasane and Matsheng. In Kenya, raiding of neighboring cattle was a common coping strategy during times of stress (UNEP, 2002). As a result cattle owners did not only lose their livestock to the harsh climate but also through theft. During good years livestock owners did not experience theft of livestock, therefore all respondents agreed that theft of livestock during droughts times was caused by hunger.

Traditional coping and adaptation strategies used in the past seem to have been effective in coping with drought. Communities in Matsheng and Kasane stated that their ancestors seem to have been adapting well to their environment and its frequent drought occurrences in a variety of ways. Traditional coping and adaptive strategies appear to have been eroded in modern times (Fassil *et al*., 2001; Devereux, 1997; Davies, 1996; Corbett, 1988; Fleuret, 1986; Van Apeldoorn, 1981) and as a result most rural communities are failing to cope with today's climatic shocks. Failure to cope with drought among rural communities of Matsheng and Kasane and the erosion of traditional coping strategies has also been evident in the findings of this study.

Although traditional coping mechanisms appear to be eroding, very few societies in Africa seem to be making an effort to preserve their traditional coping mechanisms. In Ethiopia for example, the Afar and Borana pastoralists continue to use some of the traditional coping strategies such as mobility (moving to different locations in times of drought) and sharing of food to cope with drought (see Fassil *et al*., 2001). The pastoralists also have customary laws regarding natural resource management. The laws protect and conserve their vegetation and wildlife. These resources are later used in times of serious drought.

The customary laws play an important role in managing the resources and preventing conflicts regarding resource utilization. The pastoral social formations have contributed to building resilience against droughts. Rainwater is still harvested and stored in wells and ponds for livestock and humans. During good years hay is collected, preserved and stored for drought years (Fassil *et al.*, 2001). In the case of Matsheng and Kasane traditional coping strategies have been replaced by various modern strategies. These will be discussed in more detail in section 6.3.

Reasons for the erosion of traditional coping and adaptation strategies vary from blaming colonialism (Palmer and Persons, 1977 and Shillington, 1981) to external (governments and international aid) interventions, which undermine indigenous knowledge (Fassil *et al.*, 2001; Sandford and Habtu, 2000). Valid arguments have been presented for the disappearance of traditional coping and adaptive strategies. Before colonialism, land was

plentiful and population was low. African pastoralists managed their cattle effectively, through intensive herding methods. Pastoralists were able to rotate cattle around the local seasonal patchwork of sweet and sour grasses. The land was also able to support settlement cultivation and hunting. Much of this, however, changed with the arrival of missionaries (Palmer and Persons, 1977).

The arrival of missionaries in Botswana changed the Tswana pastoral society into communities of small-scale individual farmers. By 1926, the external constraints imposed on the Tswana economy, such as taxation, delimitation of land and the influence of the missionaries, were taking a toll on the societies. Decrease in availability of land meant they could not practice traditional strategies such as mobility. This also meant that societies had limited access to the lands natural foods and wild game, which were very important as a fall back in times of drought (Shillington, 1981).

Issues regarding the impacts of colonialism on traditional strategies were raised during focus group discussions in Matsheng and Kasane. Communities in Kasane and Matsheng felt that restrictive land legislation has made them more vulnerable to climate variability. They have had to develop new coping and adaptation strategies to deal with climate variability. Coping with drought became more difficult as they were allocated marginal land and the best land was kept for the settlers.

Apart from blaming colonialism for the change in coping and adaptation strategies, communities in Matsheng and Kasane indicated other causes for change. Conflicts among households and communities affected social networks. Today each household must work for its own survival. Although communal work was said to be very helpful, unequal distribution of resources discouraged households from taking part in communal work. Some worked harder than others and yet even the lazy ones benefited. Through household interviews it was also indicated that there has been a change in the structure of rural households. This has resulted in the change of kinship relations that once provided a safety net for many families during times of drought. The change in household structure in Kasane and Matsheng has been brought about by the need for economic survival (e.g. need for income to buy food, for education, for health purposes etc). Due to economic

requirements in the various rural households, families have had to acquire new social values as well as household structures. Social net works, which were once very important, are therefore no longer effective. Detailed current coping and adaptive strategies are discussed in the next section.

6.3 Current Coping Strategies In Kasane And Matsheng

With the erosion of traditional coping and adaptation strategies (section 6.2) society has had to identify new strategies that enable them to deal with advanced climate conditions. Current coping and adaptive strategies vary from cash income generating activities, market oriented strategies to relief aid (Fissil *et al*., 2001; SADC, 1993; Legesse, 1989). The most common and well-documented current coping mechanism is relief aid (e.g. Christian Aid, 2002; UNICEF, 2002; Sandford and Habtu, 2000; Fumane, 1993; Kajumulo, 1993; SADC, 1993; Tobaiwa, 1993; UNICEF, 1993; WFP, 1993; SADCC, 1992; UN, 1992). Today drought relief has become an immediate response to drought. The immediate response is the provision of large quantities of food to replace what is lost due to failure of rain (Gainey and Devereux, 2000). Current coping strategies in Kasane and Matsheng (**Table 6.1,** ranked according to the most important and common strategy) also reveal relief aid to be the most common coping strategy used to deal with drought.

Although coping strategies are not statistically disaggregated, attention is given in later discussion to socio-economic stratification (e.g. poor remote dwellers, wealthy cattle owners and female headed households).

Table 6.1: Current coping strategies reported by household respondents in Kasane and Matsheng

Rank	Coping Strategy
1	Reliance on government for assistance (food aid).
2	Remittances from family members with formal sector employment.
3	Reduced number of meals eaten per day.
4	Informal activities.
5	Begging.
6	Theft.
7	Engagement in labour for cash or in-kind.
8	Engagement in seasonal employment.
9	Formal employment.
10	Sale of livestock.

Source: Author's field survey (2002 - 2003).

Households (70%) in Matsheng and Kasane rely on government for any help they can get. This may be in the form of food aid, temporary employment, and cash in kind. It is clear that there is heavy reliance on government for help during times of drought. Other coping strategies that were found to be used by several households in Matsheng and Kasane are reduced number of meals eaten per day, engagement in labour for cash or in-kind and remittances from family members with formal sector employment. The only strategy practiced in Kasane and not in Matsheng is the sale of dried fish that is practiced by 52% of the households.

During the survey it was evident that households could not rely on one strategy for sustenance regardless of whether household members were engaged in formal employment, self-employment, unemployed or receiving remittances from family members. They all indicated that even during normal years, they are faced with the challenge of coping with expenses such as looking after sick family members, deaths and taking care of children born by teenagers. It is therefore crucial for households to have more than one coping strategy during drought times, so as to generate extra income. In many cases some strategies contribute very little to households and therefore making it

necessary to combine different strategies to sustain households during the harsh years of drought.

The various coping strategies used in Matsheng and Kasane confirms that diversification is necessary if people have to survive. Diversification of rural livelihoods involves moving away from strictly agricultural-based livelihoods (Dercon, 2001; Bryceson 1999; Czukas *et al*., 1998; Reardon and Matton, 1988). Households in Kasane and Matsheng appear to be moving away from strictly agricultural based livelihoods. They are more involved in non-agricultural activities (e.g. construction and informal business). Non-agricultural activities refer to any work that does not directly involve plant or animal husbandry (Bryceson, 1999). Non-agricultural activities are also practiced in other African countries such as Ethiopia, Malawi, Nigeria, Tanzania and Zimbabwe to make up livelihoods. These activities include making of handicrafts for local markets, beer brewing, labour migration and remittances (Bryceson, 1999).

Non-farm income activities have the potential to reduce vulnerability to drought but not all rural dwellers can have access to non-farm opportunities (Czukas *et al*., 1998). The unemployed in Kasane and Matsheng have failed to benefit from non-farm employment and they do not have access to capital to start small businesses. In the case of those who are involved in small businesses such as beer brewing and operating small restaurants, shops and bars, are limited by the market. As a result they do not realize the full potential of non-agricultural activities. For non-agricultural activities to effectively reduce vulnerability to drought, problems concerning access to assets, income capital, markets need to be addressed.

Despite the various coping strategies practiced in Matsheng and Kasane, the majority of the households (63%) indicated that without Government assistance they would not cope. Although most of the households rely on government assistance, 51% raised the problems of unequal distribution of food aid. They claimed that food does not get to all the households that need it. Some (30%) households who received employment for cash and in-kind noted that the money was too little given the number of people they have to support within the households (**Figures 4.12 and 4.13**). Even though the Botswana

Government has been successful in preventing starvation among its rural population, results suggest that there are problems with getting food to everyone who needs it. This is a problem that has been experienced by other southern African countries (e.g. see Christian Aid, 2002; UNICEF, 2002; Kajumulo, 1993; Sejanamane, 1993). This problem usually arises from failure to identify vulnerable households. Targeting the vulnerable remains a challenge for African countries (Sejanamane, 1993). Governments need to establish and strengthen information systems for monitoring vulnerable households so as to be able to reach them in times of need. Other current coping strategies are discussed in more detail below.

6.3.1 Formal employment

Households in Kasane and Matsheng made it clear that formal employment is one of the most important buffers against drought. Formal employment is a sure way to guarantee an income, which will help with the purchasing of food. However due to limited economic activities in Kasane and Matsheng, formal employment is not readily available for everyone. Apart from limited economic activities, the majority of the population lacks the skills and education to compete for employment. As was shown in chapter 4, the majority of the respondents in Kasane (40%) and Matsheng (45%) only have a primary education (**Figures 4.14** and **4.15**) while very few have tertiary education (Kasane 14% and Matsheng 9%).

In Matsheng, government institutions such as the district council dominate the formal employment sector. Apart from government institutions, limited employment is also provided by formal business activities such as construction business, small general dealerships and vending shops. Among the households (18 %) with at least one member engaged in formal employment, 11% are employed by government institutions, 3% by construction businesses, 2% by general dealerships and the other 2% by vending shops (**Figure 6.1**).

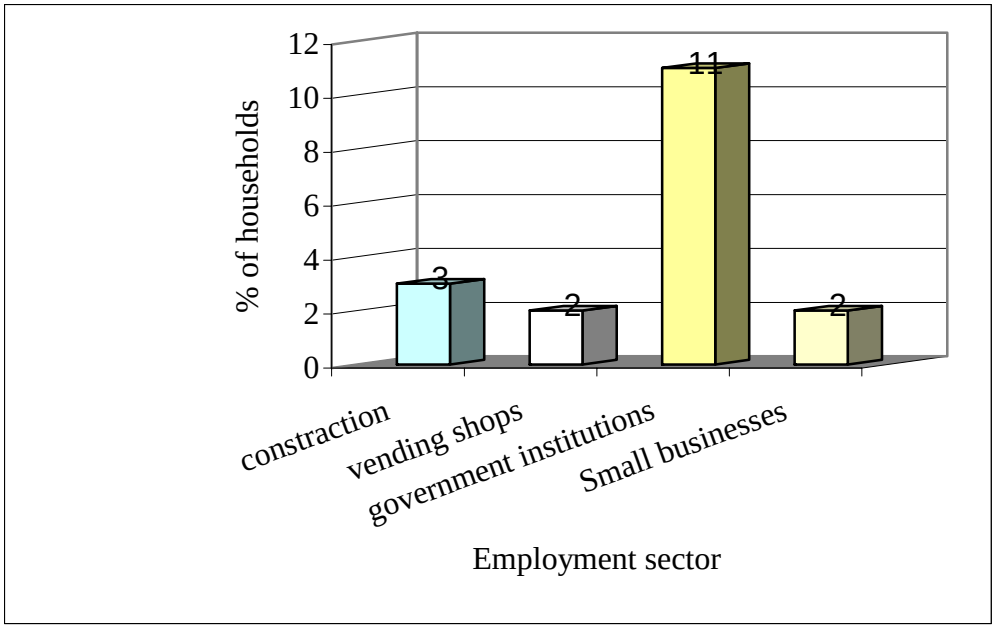

Figure 6.1: Percentage of households in different employment sectors in Matsheng

Source: Author's field survey (2002/2003).

Kasane, being a tourist and agricultural area, the population is more advantaged compared to the Matsheng population. In addition to government institutions and formal business activities, the tourism and the agricultural sector also provide formal employment. For this reason, there were more households with at least one member engaged in formal employment in Kasane (25%) as compared to Matsheng (18%). Of the 25% households with at least one member engaged in formal employment in Kasane, 6% are employed on the Chobe farm, 5% are employed in hotels and lodges, 10% in government institutions and 4% in small businesses (**Figure 6.2**).

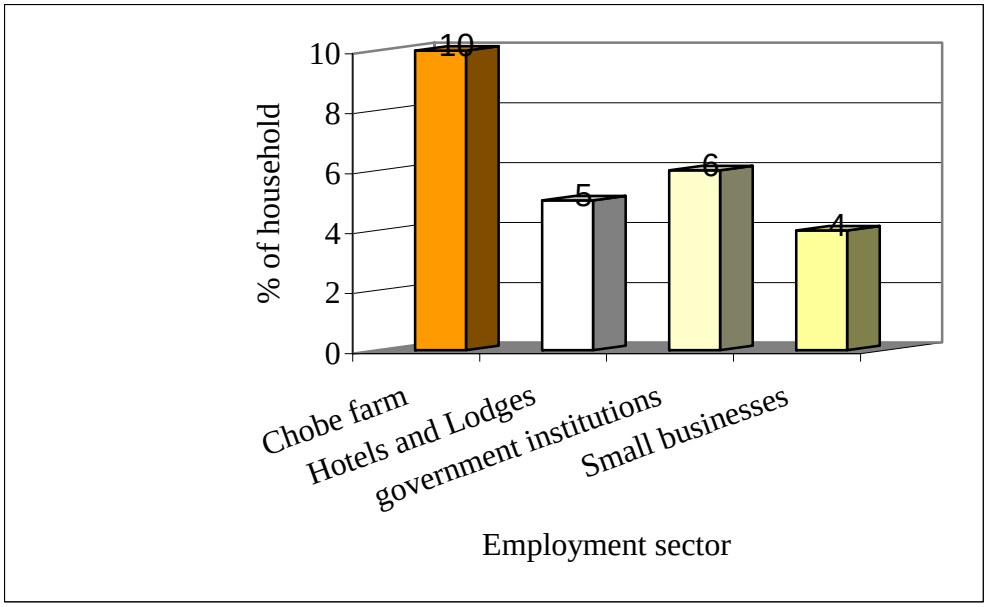

Figure 6.2: Percentage of households in different employment sectors in Kasane

Source: Author's field survey (2002/2003).

6.3.2 Labour for cash or in-kind

Labour for cash or in-kind payment is a traditional source of livelihood that has been practiced in Matsheng and Kasane for many years. Although the practice has declined over the last 30 years, it is still very popular among the poor households. Poor households in Matsheng and Kasane indicated that labour for cash or in-kind is an important coping mechanism during drought years. Even though they cannot rely entirely on this mechanism, on good days it contributes to the very much needed extra income or food.

The labour activities poor households engage in for cash or in-kind include herding of cattle, collecting of building stones, domestic work, contraction of traditional houses and making of bricks. In Kasane majority of the poor households go to look for work on the Chobe farm. This is one of the largest and most productive commercial farms in Kasane. Those who get employed on the farm undertake specific range of tasks in return for a share of the harvest and a small amount of cash for the duration of employment. The tasks include ploughing, weeding, harvesting, sorting of foods and fruits for packaging, packing of foods and fruits for sale, cattle herding, milking of cows, packaging of milk,

and production and packaging of dairy products. The number of employees on the farm varies from season to season and also depends on the amount of work.

The Chobe farm (privately owned farm) is hardly ever affected by drought. An irrigation system has been put in place to cater for years of no or reduced rainfall. As a result employment on the farm is not affected by drought and the employees are sure of getting food for as long as they are employed on the farm. The water used for irrigation is obtained from the Chobe River. The river always has water even during the drought years. The Chobe River (**Figure 6.3**) is part of the Kasai system which channels water from Namibia and Angola.



Figure 6.3: Chobe River

Source: Author's field survey (2002/2003).

Engagement in labour for cash or in-kind also involves migration to urban areas in search for work. Temporary migration in times of drought was reported in both areas as an important coping strategy. Household members in Kasane and Matsheng engage in activities such as domestic work, gardening, construction and cleaning. This is mainly because they do not qualify for any other job. Theses jobs are low income jobs and do not help much. The migrants earn between 150 and 300 Botswana Pula per month. Rural communities in Matsheng and Kasane have become desperate in searching for ways to

improve their standard of living. Therefore income earned from these types of jobs falls far short of their aspiration.

In total, 30% of the households interviewed in Matsheng and Kasane reported to have practice temporary labour migration in times of drought. The migrants are mainly male household heads or sons. Households preferred sending sons, as they were believed to stand a better chance of getting employment. Age and gender of migrates were also found to play an important role in determining the success of getting employment. Younger men for example, gained more opportunity to earn an income compared to the young ladies and the older men. Households feared sending young ladies in search of employment as most of them may end up prostituting themselves.

Of the 30% households whose members migrated in search of employment, 25% indicated that they did not receive remittances from the migrants. This is because either the migrants failed to get jobs and resorted to begging for their own daily survival or the migrants simply did not earn enough income to support themselves and the other members of the family. Households that received remittances from the migrants, it was an added income earning opportunity. Those that failed to get remittances from the migrants simply relied on the government and did not seem to put much effort in exploring for further sources of income. They believed that, as long as the government continued to support them, they would not die from hunger.

Migration as a coping strategy is not only practiced in Kasane and Matsheng. Different types of migration are practiced in many African countries. During the 2000 drought for example, poor households in northern Burundi resorted to temporary migration to Rwanda. People were finding it difficult to cope with the drought of 2000. As more people went to markets for food, prices for staple food doubled and the price of labour dropped. Temporary migration to Rwanda where labour rates were higher was seen as an alternative (Levine and Chastre, 2004). In Mali, Burkina Faso and Niger circular migration is practiced. This type of migration involves women and children. During periods of drought, women and children are sent to stay with wealthy relatives elsewhere to reduce pressure on rural households (DFID, 2004). In southern Africa (e.g.

Mozambique, Zambia, Zimbabwe and Malawi) temporary and permanent migration is used to cope in drought times (see for example, Save the Children, UK, 2002; Topouzis, 1999; Mambeshora *et al.*, 1995; Norton *et al*., 1994). Migration is therefore a common coping strategy.

6.3.3 Reduced number of meals eaten per day

Reducing meals eaten per day is a common drought coping mechanism in the SADC region (De Waal and Whiteside, 2003; SADC, 2002; Norton *et al*., 1994). This kind of practice was also practiced in Kasane and Matsheng. Households in Kasane and Matsheng admitted to reducing the number of meals eaten daily during times of drought. Rationing of food becomes an important means of controlling food consumption. Although the number of meals is reduced, the average number of meals varies by age and gender in each household. For example children under the age 16 and breastfeeding mothers may eat 3 meals a day, while breastfeeding children eat on demand. The rest of the household members were more than willing to sacrifice and eat once a day for the sake of children and breastfeeding mothers.

6.3.4 Sale and ownership of livestock

Sale of livestock as a buffer against drought was found to be unpopular in Kasane and Matsheng. Livestock comprised mainly of cattle and goats. Few households (30% in Kasane and 21 % in Matsheng) kept donkeys for transportation purposes. Data revealed that livestock ownership is highly skewed and gender biased in Kasane and Matsheng (**Figures 6.4** and **6.5**). More than half of the households in Kasane (64%) and Matsheng (68%) do not own any cattle. Of these households, 60% in Kasane and 65% in Matsheng were female-headed households. Households with more than 20 cattle were all male-headed households. Ownership of small stock such as goats, known as the poor man's stock among the communities, was also skewed (**Figures 6.6 and 6.7**) and mainly owned by female-headed households. Of the 35% households in Matsheng who owned goats 25% were female headed. In Kasane, of the 39% households who owned goats, 34% were female headed. Majority of the households in Kasane (61%) and Matsheng (65%)

had neither goats nor cattle. These are the poor households and are most vulnerable to drought.

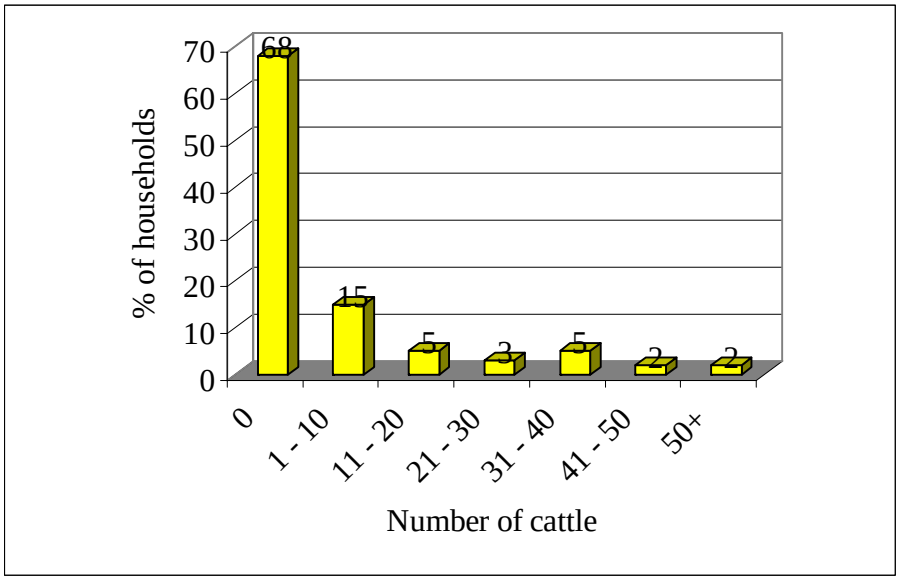

Figure 6.4: Ownership of cattle in Matsheng

Source: Author's field survey (2002/2003).

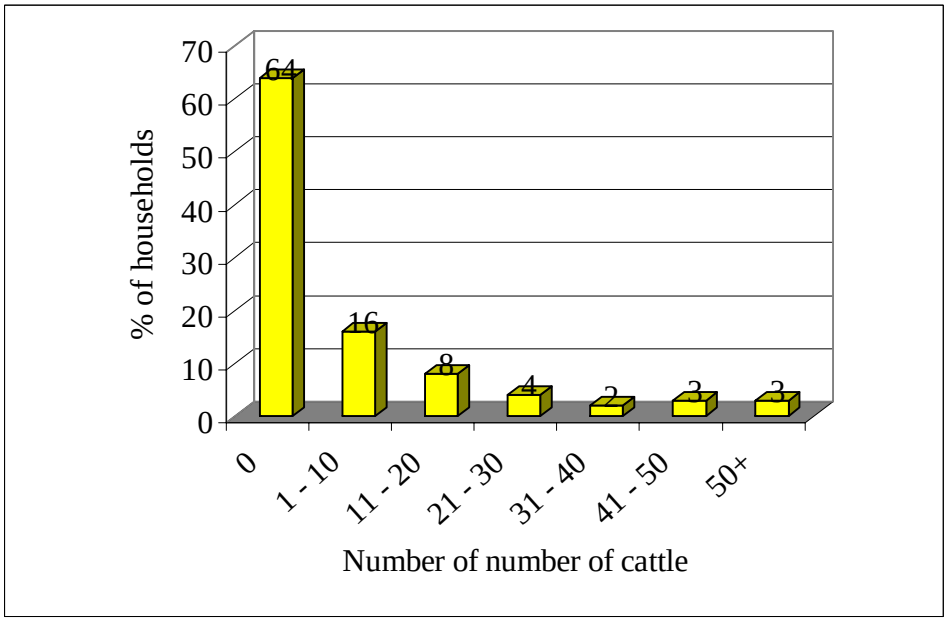

Figure 6.5: Ownership of cattle in Kasane

Source: Author's field survey (2002/2003).

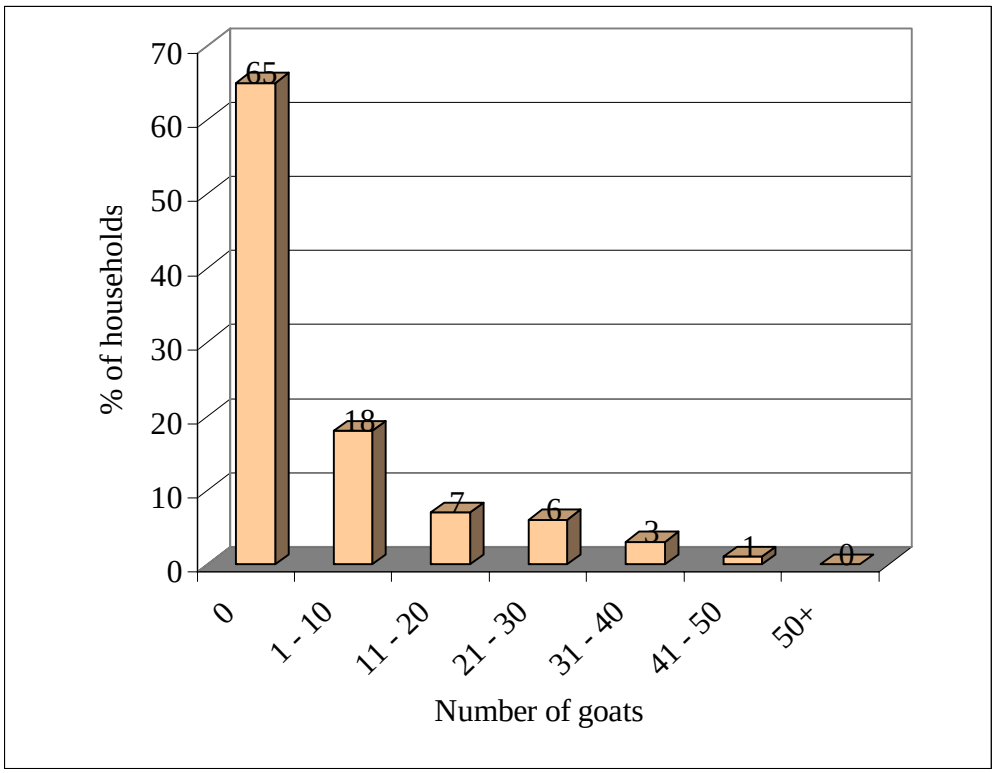

Figure 6.6: Ownership of goats in Matsheng

Source: Author's field survey (2002/2003).

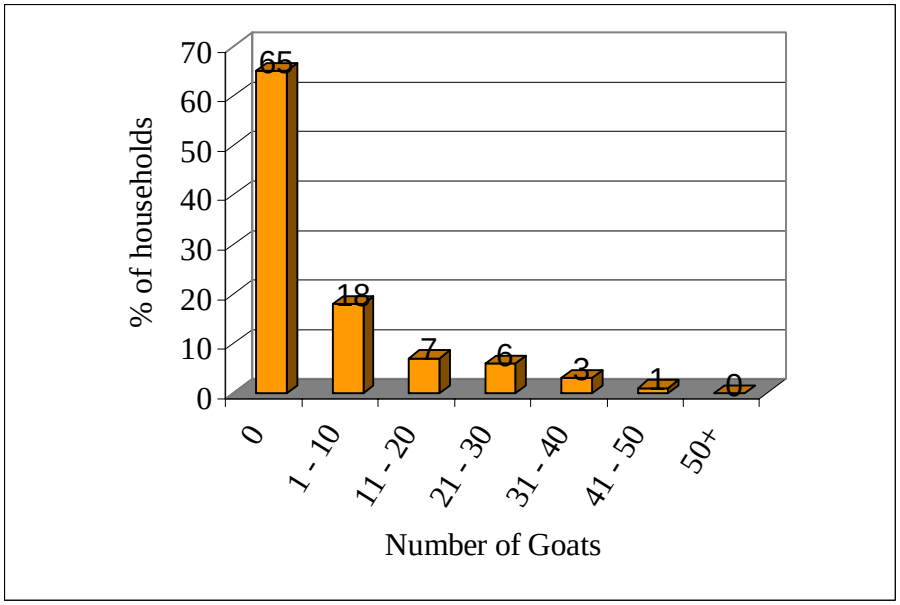

Figure 6.7: Ownership of goats in Kasane

Source: Author's field survey (2002/2003).

Wealthy livestock owners in Matsheng and Kasane revealed their reluctance to sell livestock at any time of the year. Drought years were no exception. Traditionally, cattle ownership is considered to be the preeminent measures of status and wealth. In Tswana society the number of cattle gives one social power and livestock owners cannot risk reducing their cattle by selling them even in times of drought. There were claims that even if they wanted to sell some of their livestock, it would not be worth it, as the market prices are low due to excess supply by those who cannot afford to maintain their livestock during drought years. The goats were mainly used for home consumption and traditional social functions. To livestock owners, reducing theirs herds meant loss of wealth, social prestige and reputation.

It has always been suggested that households keep livestock as a buffer against drought (e.g. Rosenzweig and Wolpin, 1993; Bromely and Chavas, 1989; Binswanger and McIntire, 1987; Watts, 1983). Although this has been true for some societies (e.g. U.S Agency for International Development, 2002; Swinton, 1988; Watts, 1983), it was not the case in Matsheng and Kasane. Documents as early as Herskovits (1926) have shown that in African societies the role of cattle and other livestock has been to generate prestige. This has continued to be the case in some African societies (Fassil *et al*., 2001; Khumalo, 1993; Eicher and Baker, 1982; McCown *et al*., 1979) as well as in Matsheng and Kasane. Livestock are therefore not always kept as a buffer against drought.

In Matsheng and Kasane livestock was found to play a less important role in coping with drought than is commonly believed. Given that most livestock owners in Matsheng and Kasane are wealthy and are employed in urban areas, they can afford other coping alternatives. They have access to financial resources to purchase food for their families. Government assistance has also provided alternatives to some livestock owners through the provision of food during drought. Even poor livestock owners are not forced to sell their livestock if they do not want.

Apart from some African societies refusing to sell livestock in times of drought, this strategy is not sustainable (FAO, 2003; Barton *et al.*, 2001; Topouzis, 1999). Selling of assets such as livestock erodes the core assets necessary for long-term recovery. Any

chance of accumulating enough stock to return to pastoralism is lost (Barton *et al*., 2001). Using livestock as a buffer against drought may protect livelihoods in the short-term but may have long-term effects.

6.3.5 Informal activities

Current coping strategies in, Kasane and Matsheng also include informal activities. These activities include traditional tanning, making of fat cakes for sale, collecting of firewood for sale, brewing of traditional beer, making of crafts and selling of dried fish. Households engaged in these activities were mainly the poor ones. They indicated that these activities generated a very low income but it was better than not having anything. Most women in Kasane spend a lot of time selling dry fish **(Figures 6.8 and 6.9**). They stated that they earn very little from selling dried fish, as most buyers are interested in fresh fish. Fresh fish can be obtained from the Chobe River but according to the Botswana law, fishing in the Chobe River is forbidden. As a result of this law, women from Botswana buy dried fish from the Namibians. Namibian women are aware of the demand for fresh fish in Kasane, therefore they cross the Chobe River to the Botswana side to sell their fresh fish. These women share the same market as the Batswana women. This has caused resentment for the Namibian women, as buyers buy all their fresh fish and not the dry fish. The Namibian women are able to sell all their fish on a daily basis making enough money to feed their families.



Figure 6.8: Women selling fish in Kasane

Source: Author's field survey (2002/2003).



Figure 6.9: Dry fish sold by Botswana women

Source: Author's field survey (2002/2003).

In Matsheng and Kasane, young males between the age of 14 and 25 engage in herding and watering cattle. Interviews with the young males revealed that they earn an income of P100 to P250 per month for the duration of employment. Employment is usually for the duration of the drought period. The income earned by the young males is barely enough to feed and cater for other basic needs of their families but circumstances force them to take even the little that is available. At least they are able to buy maize meal to last 2 to 3 weeks before the next payment.

6.3.6 Government intervention

Government intervention throughout southern Africa is common. Through drought relief programmes, governments try to help vulnerable societies deal with drought (Fuman, 1993; Rukamba, 1993; Sejanamane, 1993; Seshamane, 1993; Tobaiwa, 1993; SADCC, 1992). The drought relief programmes are similar and involve provision of free food to the poor, food for work programmes, and labour based programmes.

Interviews with government officials and households in Kasane and Matsheng revealed that the Botswana Government plays an important role is assisting those who are vulnerable to drought. Due to the frequent occurrences of drought, the Botswana government developed a drought relief programme aimed at preserving human life and protection of assets (Ministry of Finance and Development Planning, 1997). After the Botswana Government has declared a drought, several measures are taken to assist those who are vulnerable. The measures taken are as follows:

Provision of temporary employment by the labour-intensive relief programme

The government provides temporary employment for those in need. In return the employees get a payment of about P8 per day for unskilled labour and about P10 for the supervisors. The programme has no specific targets as all rural households who live below the poverty line may participate. Rural households in Matsheng (56%) and Kasane (45%) revealed that they have been involved in the labour-intensive relief programme. In theory the government believes that the income earned from the programme is enough for households to purchase food supplies from the market. The theory is based on the

governments promise to ensure that markets remain operational even during drought times (Ministry of Finance and Development Planning, 1991).

Although the markets were reported to remain operational during the 1991/92 droughts, households that engaged in employment provided by the labour-intensive relief programme complained of the low income they earned. They were aware of the Governments effort to assist them, but felt they should be given a higher income as most of them come from big families. Poor rural households have become so dependent on government support and are now reluctant to accept labour-intensive relief programmes as temporary. This is mainly due to the need for employment opportunities, which are scarce in rural areas. Poor household members were therefore of the view that the government should provide them with permanent employment. The poor households further expressed that they struggle to survive without these job opportunities. Despite complaints of low wages, the poor appreciated the employment because they are at least able to buy basic food requirements such as maize meal and bread.

In response to the suggestion of creating more permanent rural employment, Government officials stated that this was a challenge for them. They indicated that on several occasions they have had to explain to the employees that the purpose of the temporary employment is to assist them for the duration of the drought. Until the government can come up with better long-term alternatives, they will continue to provide only temporary employment through the labour-intensive relief programme.

Theoretically one of the aims of the labour-intensive relief programme is also to reduce rural urban migration (Ministry of Finance and Development Planning, 1991). Given that the criteria by which participants are selected are not defined, it has been evident in Matsheng and Kasane that, some households who qualify to participate in the programme are left out. As a result these households participate in migration practices. The aim of reducing rural-urban migration is therefore not achieved. The younger people opt to go and look for waged employment in the urban markets.

Feeding programmes at schools and clinics

The government supplies food to schools and clinics. During an interview with a government official from the ministry of health, it was made clear that the feeding programmes have contributed to low rates of malnutrition among children of poor households. Households in Matsheng (43%) and Kasane (39%) benefit from the feeding programme. Their children are provided with a daily meal at school. The households pointed out that the meals contribute a great deal during times of drought. These meals were reported to complement the daily household demand for food and they are also saved from extra expenditure on food purchase. The survey results revealed that households, whose children benefit from the feeding programme, do not give their children additional meals as they consider the meals at school to be adequate. These children are given snacks at home and they must wait for the next meal when they go to school. Although the feeding programme has been reported to be successful by rural households in Matsheng and Kasane, parents are taking advantage of it. The rural households view the programme as a finical relief making them more dependent on the state.

Despite the importance of school feeding schemes, much more detailed research that falls outside the scope of this research is required before one can fully assess the success or failure of such a scheme.

Based on the above results however, it can be concluded that although Botswana is known for successfully dealing with drought, it also encounters implementation problems. Review of drought relief programmes in southern Africa suggests that these problems are common in the region (Fumane, 1993; Kajumulo, 1993; Nyanda, 1993; Sejanamane, 1993; Seshamani, 1993; Tobaiwa, 1993). Drought relief programmes in southern Africa lack appropriate and comprehensive guidelines on how to conduct the programmes. This was also evident in Matsheng and Kasane during the implementation of the labour-intensive relief programme. As already indicated, this programme has no specific targets and criteria by which participants are selected. As a result people who are most in need, do not benefit. In a case like this, it can be argued that since the programme is not benefiting the people it was designed for, then, it is ineffective.

Another problem that seems to be common in the region is the challenge to preserve and retain the technical skills required for implementing relief programmes effectively. This problem arises from drought relief programmes being short-term mechanisms. It will be a great challenge for countries to integrate the skills provided on a temporary basis by expatriates in the local governments in the long-term (SADC 1993). This problem results in insufficient human and management resources, which leads to delays in the delivery process during times of drought. In Kasane and Matsheng, some households indicated that, there were cases whereby some people did not get food on time, some did not getting food at all, while some received surplus. A similar problem was experienced in Tanzania, Mozabique, Malawi, Zambia, Zimbabwe and Lesotho during the 1991/92 drought (Fumane, 1993; Kajumulo, 1993; Nyanda, 1993; Sejanamane, 1993; Seshamani, 1993; Tobaiwa, 1993). For such reasons effectiveness of the drought relief is affected.

Of particular significance is the lack of drought policies to understand and strengthen community level coping strategies. Local communities have not been involved in drought management as interventions are highly centralized and usually out of community control (SADC, 1993). This tends to promote a dependency syndrome as was found in Matsheng and Kasane. Communities in Kasane and Matsheng have been led to believe that drought mitigation is the government's responsibility. In such cases the government resources are likely to be overwhelmed by the demands of a drought. In 1992 for example, Botswana was faced with large commitments to employ a large number of people under the labour-based Rural Public Works Programme. This resulted in the stretching of government resources (Mananela, 1993).

Although Botswana shares similar problems to neighbouring countries, it is more advantaged. It has a better economy and therefore can afford to take care of its people while other countries (Mozabique, Malawi, Zambia and Lesotho) have to appeal to international donors (Fumane, 1993, Nyanda, 1993; Sejanamane, 1993; Seshamani, 1993). Donors have been found to be disorganized therefore affecting food delivery at a time when it is needed (Fumane, 1993). During the 1992 drought emergency appeals for food in Mozambique were made in May 1992, however, significant amounts of food were still arriving in August 1993. At this time the food was no longer needed, as harvest

time in April 1993 was good through out the country. Donors and government were now faced with the problem of delivering food aid to food surplus areas. Food had to be stored which resulted in costs for warehouse fumigation. Eventually food had to be used up in less than a month as more fumigation would have made the food unfit for human consumption (Fumane, 1993).

6.3.7 Prostitution

Prostitution is one coping mechanism that is rarely acknowledged. In cases where rural women are concerned about the survival of their families, they will engage in sexual services. The practice of prostitution could be temporary or long-term. Intimacy may be rewarded in cash or in-kind (e.g. food and clothing) (Topouzis, 1999). In countries such as Zimbabwe (Save the Children UK, 2003), Kenya (Topouzis, 1999) and Zambia (Norton *et al*., 1999) girls were found to practice prostitution as a coping strategy. In the case of Matsheng and Kasane some households (5%) indicated that desperation for income causes female household members to engage in prostitution. This can be in times of drought or normal years. The girls and women involved in prostitution usually demand for cash and not food. They prefer money because they can buy food of their choice and also buy other household requirements (e.g. soap, toilet paper, cooking utensils and medication). Prostitution is a very risky strategy as it could affect the health of those taking part. It puts those involved at the risk of contracting HIV/AIDS.

* *

In this chapter, various mechanisms used to cope with drought were examined. It was evident that rural households in Kasane and Matsheng use a combination of various coping strategies in order to deal with drought. Some of the coping mechanisms used in Kasane and Matsheng include, reliance on government assistance, temporary migration, reduced number of meals eaten per day, engagement in labour for cash or in-kind, formal employment and prostitution. The most common strategy was reliance on government support. Households in Matsheng and Kasane rely heavily on the government for drought mitigation measures. This has created a dependency syndrome. The government is partly to blame, as it does not involve communities when formulating drought policies. Having

examined coping strategies used in Matsheng and Kasane, in the next chapter, factors that affect their ability to cope and adapt to drought are discussed.

CHAPTER SEVEN

CONSTRAINTS AFFECTING COPING AND ADAPTATION TO CLIMATE VARIABILITY IN KASANE AND MATSHENG

7.1 Introduction

So far it has been evident that drought, a consequence of climate variability, is a significant feature in southern Africa. Most African countries live within a recognized drought cycle. African countries for example are usually preparing for drought, descending into drought, suffering from drought, recovering from drought or preparing for the next drought (Gainey and Devereux, 2000). The issue of drought, however, spreads beyond the immediate reduction in rainfall, its impacts and how people cope and adapt to it. Of more concern are issues affecting coping and adaptation strategies. Vulnerability to drought is a result of additional complex factors other than just drought. Africa has a long history of social, economic, and political conditions that place its people at risk in the first place (e.g. Lebillon, 2000; Keen, 1998; Anderson, 1994; Hitchcock, 1992; Mose, 1987). This chapter therefore pays particular attention to factors that heighten vulnerability to climatic conditions such as drought.

Conflict has been a major factor affecting ability to cope and adapt to drought in a number of African countries. In Sudan two decades of civil war have left some 2.9 million people dependent on food aid. Conflict in Eritrea has left Eritreans displaced and with no means to cope with drought (http://www.africarecovery.org). Displacement of farmers, damage to crops and fields by military operations and landmines reduced the ability of Angolans to cope with drought in 2001/02. In 2002, Zimbabwe was experiencing one of its worst droughts. Coping was made difficult by violent political conflict and human rights abuses (Christian Aid, 2002). Other African countries faced with conflict or political strife includes Cote d'Ivoire, Democratic Republic of Congo, Angola, Ethiopia and Sierra Leone (http://www.africarecovery.org). Botswana is an exception as it is politically stable. This is not to say that Botswana has no other problems that affect people's ability to cope with drought. Rural populations in Matsheng and Kasane are faced with a number of social, economic and health problems, which increases their vulnerability to drought. These are discussed below.

7.2 Dependency On Government

Based on government drought policies, a great effort has been put into improving the livelihoods of rural communities, especially the most vulnerable. The Botswana government has developed and demonstrated a good response to the vulnerable population through effective drought relief systems. Through the drought relief programme the government has managed to reduce under-nutrition, destitution and deaths among young and old people from vulnerable households. This has, however, created a problem of dependency. Dependency on the government was found to be widespread among the Kasane and Matsheng rural communities. During interviews with government officials from the Ministry of Finance and Development Planning, it was clear that, they were aware of the dependency problem. They indicated that the government is now faced with challenge of transforming this dependency into self-reliance.

Survey results revealed that dependency on government contributes to inability to cope and adapt to drought, as the willingness of dependent communities to invest effort in self-reliance is reduced. The key questions are, how long will the government be able to sustain the relief programme? Is this strategy sustainable? These are questions that the government should be asking itself. Dependent communities are likely to surfer even more, should the government fail to sustain them in the long run. Botswana is not the only country faced with a dependency problem. The dependency syndrome is a problem experienced by other African countries such as Ethiopia, Lesotho, Zambia, Mozambique and Malawi (Fissil *et al*., 2001; Sandford and Habtu, 2000; Gainey and Devereux, 2000; Fumane, 1993; Nyanda, 1993; Sejanamane, 1993; Seshamani, 1993). Dependency in other African countries has been a result of continuous relief food assistance following drought. One cannot deny that the relief assistance has saved many lives. This is, however, a short-term solution and does nothing to build resilience against future droughts. The search for long-term solutions that build resilience against drought will be challenging for many countries.

One-way forward would be to understand and strengthen past undermined traditional coping strategies. In Kenya, research into traditional coping strategies is already underway. The aim is to incorporate traditional knowledge into commercial food production systems (ACTS, 2001). Governments also need to provide stable conditions and support for making livelihood assets of the poor more resilient to climate variability. This can be done for example, through resource accessibility and reforming policies. So instead of undermining people's capabilities, governments should rather reinforce the opportunities of the poor to access resources, build assets and diversify their economic activities.

Further analysis of the survey results unveiled that, the drought relief programme has replaced traditional methods of self-sufficiency. In the past people were able to generate and develop coping and adaptive strategies appropriate to their culture. Traditionally communities, for example, practiced hunting and gathering for sustenance. Through government intervention hunting and gathering has been replaced with small-scale mixed farming. What the government did not take into consideration was that this strategy is prone to fail due to recurring drought and the availability of funds to sustain the practice. These circumstances, force the government to continue providing food aid to affected rural communities during the drought years. This is a short-term solution and it can be argued that, as a long-term solution, the strategy of providing food aid is unreliable.

Temporary employment during drought years is another strategy practiced by the government. Although the strategy teaches and encourages communities to work for food, it was found to affect the ability to cope even in normal years. After the drought period is over, employment ceases and it becomes difficult for poor households to cope, as they are no longer earning that extra cash to sustain their daily food requirements. The majority of the respondents only have primary education and therefore do not even qualify for formal employment. Some household members in Kasane and Matsheng look forward to drought years because they know the government will provide for them. For this reason a number of households in Kasane (20%) and Matsheng (30%) indicated that they were much better off during drought times compared to normal years. During the normal years they return to being unemployed and can barley afford to have two meals a

day. During drought years, however, they can take part in the labour-intensive relief programme. Although the pay is small, if they have more than one household member taking part, they can afford some bread and maize meal.

7.3 Poverty

Before assessing how poverty heightens vulnerability to drought in Kasane and Matsheng, a brief review of how it affects other African countries and Botswana in general is provided. Poverty affects all African countries. It is among the major factors that weaken ability to cope and adapt to drought. In southern Africa an estimated one in two people live in poverty. Many of the poorest have been trying to cope with chronic food shortages and have almost exhausted their coping mechanisms. The poor hardly get opportunities to find employment in the formal sector to earn enough income to buy food where it is available (Christian Aid, 2002). Although Botswana is a relatively well-off country with an exceptional economic growth, poverty renders a significant number of the country's population. Over 40% of Botswana's population as already indicated in chapter 2, lives below the poverty datum line (Ministry of Finance and Development Planning, 1997).

Major causes of poverty in Botswana include lack of unemployment, poor wages, inadequate levels of social safety nets, inequitable distribution of power and assets in households, over-reliance on government to provide economic resources and social services, cultural beliefs and practices which relegate women to a subordinate position and unequal distribution of national assets and income (BIDPA, 1997). In the agricultural sector, the distribution of cattle at the national and local level is highly skewed. This was evident in Kasane and Matsheng as shown in the previous chapter. The poorest 71% of Botswana's traditional farmers own only 8% of the total traditional herds, while the richest 2.5 own about 40% of the total herds (Kerapeletswe and Moremi, 2001). Based on the Botswana national poverty study in 1997, 10% of farming households owned 60% of the 2.3 million cattle in the country (BIDPA, 1997). The above factors that cause poverty in Botswana need to be seriously addressed in order to reduce poverty.

In neighboring countries such as Zambia 63% of its population live on less than one dollar a day. People's ability to purchase food during drought is eroded further by high inflation and currency devaluation. In Zimbabwe coping strategies have been exhausted as more people fall into deeper poverty. More than 70% of Mozambique's population lives in poverty. The deep and widespread poverty in Mozambique has left households and communities with little reserves to fall back on in times of drought (Christian Aid, 2002). Based on the above knowledge, it can be concluded that poverty certainly affects coping and adaptation strategies. As a result vulnerability to drought is heightened.

In the case of Matsheng and Kasane, poverty affects mainly female-headed households. Factors found to influence poverty of female-headed households in both villages included restriction of women's access to productive resources, gender inequalities, unequal distribution of resources and increase in the burden of caring for children who are a result of teenage pregnancies. Teenage pregnancy has contributed to large household sizes whereby the dependants outnumber the productive adults. This puts strain on resources provided to households at national level. Poor female-headed households are therefore faced with challenge of supporting the teenage dependents and their children.

Women were also found to be subjected to low productive economic sectors such as petty trade and service provision where incomes are barely secure. Due to insufficient education, training, information and knowledge, women are less able to make full use of available livelihood opportunities. Women complained that government programmes are not sufficiently gender-sensitive in planning and implementation. As a result specific needs of poor women are not met. Similar results were found in Zambia, Namibia, Zimbabwe, Malawi, Mozambique and Lesotho (SADC, 1993). Women have unequal entitlements to men with respect to job opportunities, incomes, decision-making positions in government and ownership of land.

As indicated in chapter 5, 60% of households in Matsheng and 65% of the households in Kasane do not own land. The majority of these households are female headed. The problems of land ownership are attributed to customary laws, which affect women.

Botswana has three categories of land that were inherited from the British rule. These are, customary (72%), state land (23%) and freehold (5%). Under the British rule these categories were known as, native land, crown land and freehold land respectively (Mathuba, 2003). Most of the people in Botswana are still resident on customary land. In the past, the Chiefs of a respective areas administered customary land under customary law.

Under the customary law, every male was entitled to land to build a shelter for his family, sufficient land for arable farming to feed his family, and access to tribal grazing land (Nkambwe, 2001). The customary law favoured male ownership of property and disadvantaged women's rights to own land. The customary land tenure system is not only practiced in Botswana but in other southern African countries**.** These countries include Zimbabwe, Malawi, Mozambique, and Zambia (UNECA, 2003; Adams *et al*., 1999). Women in other southern Africa countries therefore also face discrimination in accessing and owning land. Most women in southern Africa have access to farmland only through their husbands or fathers (Mutangadura, 2004).

The traditional exclusion of women from property and land ownership compromises economic and physical security of many women in Botswana. Access and ownership of land is essential for basic livelihood sustenance. By denying women the access to land condemns them to poverty and dependency. This was very evident among the communities of Kasane and Matsheng.

Although the land may not be productive for agriculture, like in the case of Matsheng, access to land could provide women with credit necessary for carrying out other productive activities. The problem of lack of access to land is particularly critical for the increasing number of female heads of rural households, which was evident in Kasane and Matsheng. These results confirm that women are among the most vulnerable (Anderson, 1994). It can therefore be concluded that female-headed households are more vulnerable to drought as they do not have the capacity to cope and adapt to such shocks.

7.4 Unemployment

Unemployment is a concern for developing countries as it affects income generation (Kunfaa *et al*., 2002). In southern Africa unemployment has left people unable to purchase food during drought periods. It is partly the reason poverty continues to deepen (Christian Aid, 2002). The majority (62% in Kasane and 68% in Matsheng) of households in Kasane and Matsheng comprise mainly of young unproductive people. The youth in Botswana are the main beneficiaries of the educational development that has occurred since independence and therefore one would be expect them to be more educated with the opportunity to successfully get employment. This was not the case in Kasane and Matsheng. It has been unfortunate for the youth as employment opportunities are not adequate to accommodate them.

Due to unemployment, the youth is discouraged to continue schooling, resulting in failure to complete their education. This has also contributed to Botswana's failure to foster a population with skills necessary for a workforce despite the considerable expenditure on education. Households in Kasane and Matsheng have a difficult time sustaining the unemployed youth and it becomes worse during drought years. These are household members that the elderly look up to for support. Instead it is the elderly are taking care of the youth. This is putting strain on the little resources they have. During times of drought the situation becomes worse as the resources are depleted further. In cases like these, the households must now rely entirely on government support.

Unemployment in Botswana is mainly blamed on the great decline in traditional agriculture. Employment in traditional agriculture, for example, declined from 121 000 (33%) of the labour force in 1984 to about 75 000 (15%) in 1991 (BIDPA, 1997). Agriculture in Botswana therefore has limited potential to generate income. Periodic droughts and poor soils have been attributed to the decline in agriculture. Compared to other southern African countries (e.g. Zimbabwe, Malawi and Zambia), Botswana's agricultural sector lacks the potential to create employment. Where traditional agriculture may gainfully occupy 50% to 80% of the labour force, Botswana's level of formal employment as well as employment growth, would be more than adequate to provide full

employment. Given that traditional agriculture occupies an estimated 15% of the labour force, solving the unemployment problem will be challenging, as there are always new entrants to the labour force (Osei-Hwedie, 2004; Kerepeletswe and Moremi, 2001; Good, 1999; BIDPA, 1997; Jefferis, 1997).

7.5 Health

Due to the sensitivity of the issues surroundings HIV/AIDS among households, questions concerning details related to HIV/AIDS were excluded. However issues concerning HIV/AIDS, particularly related to its impact arose. Some of the respondents volunteered the information during the discussion addressing major constraints affecting coping and adaptation to drought. Concerns that were raised will be discussed in more detail in this section.

While Botswana has managed to successfully develop mitigation measures to deal with societies vulnerable to drought, it now faces a great challenge of dealing with the HIV/AIDS epidemic. HIV/AIDS threatens to reverse most of the gains that the Botswana government has made to social development (Ministry of Finance and Development Planning, 2003). Households in Kasane and Matsheng revealed that HIV/AIDS is among the many factors seriously affecting their livelihoods and their ability to cope and adapt to drought. They were concerned about the rate at which HIV/AIDS is claiming lives of breadwinners and the youth they look up to for support now and in future.

Families affected by HIV/AIDS explained that their families have been weakened physically, emotionally and economically. The families become very stressed, as they have to care for the sick as well as other family members. The burdened of caring for the sick robs the families of the little they have to sustain themselves. It is very difficult for these families to cope during the drought years. Although they get relief from the government, they are only provided with food to prevent them from hunger. The government has not made provisions for HIV/AIDS affected families or the victims of HIV/AIDS. The government does not support them financially therefore they still need finances to meet other costs such medication and hospitalization for the AIDS victims.

Looking after sick household members is very costly. This has contributed to their inability to cope and adapt to drought.

There were cases whereby households lost the male-head to HIV/AIDS, who is also a breadwinner. The women left to head the households were greatly disadvantaged partly for cultural reasons. Family members of the deceased husband come and claim deceased's property leaving the window and her children nothing. The female-headed households find themselves in economic hardships and it is difficult for them to cope in times of drought. The situation is made worse by the women's lower educational level, leaving them in no position to obtain a well paying job. In cases like these, households reported to sale physical assets such as household goods (furniture and equipment). This is only a temporary solution, which in the long run erodes the few assets they have. In the long-term, households will find themselves in unstable positions particularly during times of stress.

Households in Kasane and Matsheng were also concerned about the orphans left behind by parents who are victims of Aids. The number of orphans is on the increase in both villages. The households are faced with the burden of taking care of these orphans therefore stretching their daily budgets. Orphans left to be raised by grandparents were found to be the most vulnerable. These orphans are disadvantaged, as the grandparents cannot afford to educate them. The orphans therefore remain illiterate and have no skills to compete for employment in future. Another group of orphans found to be vulnerable in Kasane and Matsheng are those heading households. They have no source of income and are left to fend for themselves. They have no basic education because they had to stay home and look after their sick parents or other family members. This affects their ability to earn a reasonable income in future. Unless these orphans find alternative effective ways to build their resilience against drought, they remain vulnerable.

HIV/AIDS has significantly increased the vulnerability of households in Kasane and Matsheng to drought. Family networks, which have been a crucial source of support for some households in Kasane and Matsheng, are under a great deal of strain due to HIV/AIDS. Some households (30% in Matsheng and 35% in Kasane) reported to have

lost family members who they depended on for remittances. This has had an impact on the families receiving remittances. They have had to find alternative means, some of which were not socially accepted. When asked what these alternative means were, they claimed to be ashamed to talk about it. However one woman in Matsheng was able to discuss what has happened in her household in the absence of her husband. This is what she had to say.

"My husband does not know about this and I am so ashamed of what I have become. I cannot take it anymore. I am suffering all alone and I could go mad if I don't talk to anyone. My husband works as a cattle keeper. He does not earn much to support us all. He refused to go to school when his father could afford to take him. His two brothers had good jobs and they supported us by giving us an allowance and some food as payment for looking after their cattle. We were very dependent on his family for a long time. We never went hungry even in times of drought.

My parents died from AIDS and I had to leave school to take of care of my three siblings. I married my husband in 1990 and we took the responsibility to look after my siblings together. I worked as a domestic worker. Since 1998 we buried one member of his family after the other. They have all died of AIDS. His mother, father and two brothers. He inherited the brothers cattle but most of them died during the 1991 drought. The rest were sold since we could not afford to look after them. After we lost the support from his family things have changed. I had to find a way to earn enough money to support the children and my siblings. I have since got involved in prostitution. I have no qualifications since I did not finish school, this is the best I felt I could do. My family has no idea what I am doing. As far as they are concerned I work for a wealthy family that pays me well. I go to the city during the week and I come home to be with my family every weekend. I get paid very well but I am so ashamed of what I do. What consoles me is that my family is eating well and I can afford to buy uniform and books for my children. I don't want them to ever go through what I am going through. I desperately want to provide for them. My siblings are now at university and supported by the government. I know they will soon finish and hopefully they will get good jobs and they can support me. Then I can stop what I am doing".

This story is one example of what HIV/AIDS can do to a family. In desperate situations people may engage in high-risk behavior. This particular family has had its safety net destroyed. The woman has had to change her life for the sake of the children. What she sees to be the only alternative is not safe for her as she might also contract HIV/AIDS. This would make the family even more vulnerable and less resilient to drought, since she would no longer be there to support her family when she dies. She feels she is doing what she needs to do in order to support her family. One would wonder how many more families are like this one.

HIV/AIDS has also proved to be a challenge in Botswana's neighboring countries. The disease claims thousands of lives. The high prevalence of HIV/AIDS is increasing destitution, lowering labour productivity and eroding coping strategies (www.africaarecovery.org). In Lesotho for example, households affected by HIV/AIDS were reported to be most at risk during drought conditions. One in three adults live with HIV/AIDS. Care for the sick takes up time and money for medication (Christian Aid, 2002). Similar to the findings in Kasane and Matsheng, it is the wage earners or providers who fall ill. Often single mothers and grandparents are left to support children after deaths in the family. In Mozambique food production falls in households where members are living with HIV/AIDS (World Food Programme, 2002). These households have difficulty coping with stresses of food shortages therefore making them more vulnerable during drought years.

Based on the findings of this study, HIV/AIDS has negative impacts on coping strategies. The impacts faced by Botswana's neighboring countries are not different form what was found in Kasane and Matsheng. Results suggest that there has been an increase in widows, widowers and orphans. Greater time is spent on caring for the sick. Households face increased medical costs, as well as reducing spending on household requirements. Households have a deteriorating dependency ratio, characterized by low number of healthy adults relative to people living with HIV/AIDS. Households affected by HIV/AIDS are therefore faced with the challenge of building resilience against drought.

7.6 Physical Environment

Given that soils are relatively poor throughout the country, only 5% of Botswana's land is cultivatable (Ministry of finance and Development planning, 2003; Arntzen and Vennendaal, 1986). This suggests that the physical environment limits their agricultural activities. Agriculture is an important livelihood activity in Africa and is the main economic activity in most African countries. It provides employment for about 75% of Africa's labour force and generates about 50% of the raw materials for domestic industry. Agricultural exports represent about 60% of foreign exchange. Apart from economic gain, agriculture also plays an important role in food security (COMESA, 2004; Taylor *et al*., 1999; Bollinge, 1999). In Zimbabwe agriculture provides over 75% of household income (Save the Children UK, 2002). The physical environment of Botswana does not allow its people to realize the potentials of agriculture. This would especially benefit the rural poor providing them income and food security, which would reduce their vulnerability in times of stress.

With income earned from agriculture, households could set up saving accounts, which would only be used in times of stress. With a better physical environment people could reserve some food in good years to be utilized in drought years, hence providing food security in times of drought.

Households in Matsheng are faced with poor sandy soils and poor climate conditions, which do no allow them to practice successful crop production. Some (10%) households attempt to grow crops such as maize, watermelons, beans and sorghum. Even in good years the harvest is barely enough to feed their families. For example maize harvests are usually less than 15kgs. This is enough to last about three weeks for households with more than 5 people. Compared to Matsheng, Kasane has more suitable land for cultivation. During good years, households in Kasane that have access to agricultural land are able to harvest enough to feed their families and are able to sell some of the crops to earn an income. A good physical environment is therefore also important in reducing vulnerability.

* *

The above findings have shown that there are several constraints that affect coping and adaptation strategies in Kasane and Matsheng. These factors include government dependency, poverty, health, unemployment, gender issues and environmental factors. These constraints make it very difficult for rural communities in Kasane and Matsheng to cope and adapt to drought. The HIV/AIDS pandemic for example, has had serious implications for households in Kasane and Matsheng. Households affected by HIV/AIDS suffered the loss of productive labour, income, decreased productivity and an increasing number of dependents. Savings were diverted and assets were depleted to meet healthcare and funeral costs. HIV/AIDS was found to contributing to the rise in poverty levels. As a result a combination of HIV/AIDS and poverty increased the vulnerability of rural households in Kasane and Matsheng.

The survey moreover also demonstrated that female-headed households are the most vulnerable to drought. Vulnerability of female-headed households can mainly be attributed to poverty. Poverty resulted mainly from the roles women are assigned and the limits placed by societies on their access to control of resources. Gender inequality has proved to intensify the unequal distribution of resources amongst men and women, making female-headed households more vulnerable to the impacts of climate variability. The female-headed households in Kasane and Matsheng were found to lack security, opportunity and empowerment, resulting in lower quality of life. These findings are particularly alarming, given that more than 50% of the rural households in Kasane and Matsheng are female-headed. The government will need to increase women's participation in national and regional policy-making so as to address issues of most concern to women. Conclusions that were drawn from the findings of this study are presented in the next chapter (eight).

CHAPTER EIGHT

CONCLUSIONS AND RECOMMENDATIONS

8.1 Introduction

This chapter presents the conclusions and recommendations based on the study findings. The chapter begins by briefly outlining the aim and the objectives of the study as way to link what the study set out to achieve. Conclusions are then presented according to the research questions. Finally the recommendations are provided.

This study set out to examine vulnerability of rural societies and the configuration of forces that shape their ability to cope and adapt to climate variability. The study compared vulnerability of two rural societies in Botswana, living in two different climatic zones. The two rural societies are situated in Matsheng (driest part of the country), which is located in the Kgalagadi district (southwestern Botswana) and in Kasane (wettest part of the country), which is located in the Chobe district (northern Botswana).

In order to keep the study focused, the main objective was broken down into specific questions. These were as follows:

1. What is the history of climate variability in the southwestern and northern parts of Botswana (30 years)?
2. How has such climate variability affected rural societies living in the southwestern and northern parts of Botswana?
3. What factors (biophysical, socio-economic or political) have heightened or weakened people's ability to cope with and adapt to climate variability?
4. How have the rural societies coped and adapted to climate variability in the past and how are they currently coping and adapting?
5. What coping and adapting strategies have been successful and how can they be strengthened or made more effective?

Based on these questions, results were obtained, analysed and presented. The following conclusions were drawn.

8.2 History of Climate Variability in the Southwestern and Northern Parts of Botswana (30 Years)

Whatever the underlying cause, climate variability has existed for as long as man has inhabited the earth. Climate variability is therefore not new to man. Over the last 30 years rural communities in Matsheng (Southwestern Botswana) and Kasane (Northern Botswana) have continued to experience climate variability. Both communities have experienced variation in annual and monthly rainfall as well as temperatures. The most recurrent consequence of climate variability in the two areas has been drought.

- While drought is common in Kasane and Matsheng there is a difference in the frequency of drought experiences. Matsheng suffers more drought conditions compared to Kasane.

- Climate variability has certainly had an influence on the physical appearance of Matsheng and Kasane. This was evident in the appearance of the vegetation.

Given that Kasane experiences wetter climatic conditions, it has a wider variation of vegetation compared to Matsheng. Kasane has belts of indigenous forest, dense bush, open woodlands with dense closed canopy and grasslands. Matsheng with dry climatic conditions is predominantly covered by shrub savanna with tufted grasses and spatially varying abundance of woody vegetation.

Climate variability does not only shape our environment but also societal development. Climate variability will continue to have great influence on society and the environment. The critical issue that is of main concern today is the process by which society copes and adapts to climate variability. There is need to obtain as much knowledge possible regarding adaptation and coping mechanisms in order to improve and better the ability to cope and adapt to climate variability and future climate change.

8.3 The Impact Climate Variability Has Had on Rural Societies Living in the Southwestern and Northern Parts of Botswana

Climate variability in one-way or another has no doubt affected rural societies in Matsheng and Kasane. Despite one area being 'wetter' than the other, under conditions of drought, both societies experienced similar impacts. The impacts included change in vegetation; loss of livestock, reduced food production, lack of water, loss of employment and increased poverty.

- Though communities in Matsheng proved to be more vulnerable to the impacts of drought, both rural societies demonstrated that climate variability could have serious consequences on any society regardless of the different climatic zones they live in.

Under the same type of climatic stress, in this case drought, both communities are vulnerable due to inability to cope with drought.

8.4 Coping and Adapting Strategies

The study has demonstrated that rural households in Matsheng and Kasane both cope in similar ways with drought. In the past, the communities of Matsheng and Kasane practiced several traditional mechanisms in order to cope and adapt to drought.

- Informal social networks, for example, in Kasane and Matsheng played an important role in coping with drought. The communities used support systems known, as *Mafisa, Masotla, Letsholo* and *Majoko,* which are outlined in chapter 2. These social networks involved drawing on extended families, friends, neighbours, and wealthy patrons for help in times of need.

- Rain-making ceremonies, were also practiced in Matsheng and Kasane. The rain-making ceremonies were important to the communities of Matsheng and Kasane as they provided an opportunity to discuss what measures would be taken in case of a drought.

- Other coping strategies practiced in the past include theft, food sharing, hunting and gathering and mobility.

Based on the survey results, these traditional coping and adaptive strategies appear to have been eroded in modern times. Traditional coping strategies have come under severe pressure, that once suitable strategies are no longer effective. The erosion of traditional coping strategies has been attributed to colonialism and external (governments and international aid) interventions, which undermine indigenous knowledge. The communities of Matsheng and Kasane highlighted other causes of the erosion of traditional coping strategies. These were,

- Conflicts among households and communities that affected social networks and change in the rural household structure.

- Change in the rural household structure resulted in the change of kinship relations that once provided a safety net for many families during times of drought.

Traditional coping strategies in Kasane and Matsheng have been replaced by various modern strategies. These included,

- Government interventions, reduced number of meals eaten per day, formal and informal employment, engagement in labour for cash or in-kind, remittances from family members with formal sector employment, temporary migration, and prostitution.

During the survey, it was evident that;

- Households could not rely on one strategy for sustenance regardless of whether household members were engaged in formal employment, self-employment, unemployed or receiving remittances from family members. Households were therefore involved in more than one of the above-mentioned activities.

- Despite the various coping strategies practiced in Kasane and Matsheng, the majority of the households (63%) indicated that without Government assistance they would not cope with drought.

Government assistance is therefore seen as an important buffer against drought. This is because the other activities they were involved in did not effectively reduce their vulnerability to drought. Activities such as domestic work, for example, did not provide enough income to sustain a family.

- Non-farm income activities such as formal employment and ownership of small businesses were found to have the potential to reduce vulnerability to drought, but not all rural dwellers could have access to these non-farm opportunities.

- The unemployed in Kasane and Matsheng have failed to benefit from non-farm employment and they do not have access to capital needed to start small businesses.

Communities in Kasane, however, stood a better chance of getting employment given that, in addition to employment provided by government institutions and formal business activities, the tourism and the agricultural sector also provide formal employment. For this reason, there were more households with at least one member engaged in formal employment in Kasane (25%) as compared to Matsheng (18%).

Although it has always been suggested that households keep livestock as a buffer against drought (e.g. Rosenzweig and Wolpin, 1993; Bromely and Chavas, 1989; Binswanger and McIntire, 1987; Watts, 1983) this was not the case in Matsheng and Kasane.

- The sale of livestock as a buffer against drought was found to be unpopular in Kasane and Matsheng. Wealthy livestock owners in Matsheng and Kasane revealed their reluctance to sell livestock at any time of the year. Traditionally, cattle ownership is considered the pre-eminent measures of status and wealth. Reducing their herds therefore meant loss of wealth, social prestige and reputation.

- Informal activities practiced in Matsheng and Kasane to cope with drought include traditional tanning, making of fat cakes for sale, collecting of firewood for

sale, brewing of traditional beer, making of crafts and selling of dried fish, which is only done in Kasane.

- Prostitution is one coping mechanism that is rarely acknowledged. In cases where rural women are concerned about the survival of their families, they engage in sexual services. Some households in Matsheng and Kasane admitted to practicing prostitution as a coping strategy to deal with drought.

- Temporary migration was mentioned as one of the most common strategies practiced in Kasane and Matsheng.

Migration has been seen to have the potential to enhance social resilience by providing new opportunities and experiences, as well as having the ability to diminish resilience by weakening social structures (Locke *et al*., 2000). In the case of Kasane and Matsheng, migration proved to diminish resilience against drought by weakening household structures. In addition most migrants failed to send back remittances. Most labour migrants were not able to find jobs that could provide an income level that can generate remittances.

Strategies used to cope with drought in Kasane and Matsheng are often short-term responses. It would be expected that when societies have experienced the same climatic event repeatedly, they would opt for adaptive strategies, which involve long-term change in behavior patterns. Long-term adaptive strategies have not only proved to be a challenge for the communities of Kasane and Matsheng but also for the whole southern Africa region (SADC, 1993). However in order to build resilience against drought, societies will have to look beyond coping strategies and develop adaptive strategies.

8.5 Factors Heightening or Weakening Ability to Cope and Adapt to Climate Variability

The findings of this study revealed that, there are several constraints that affect coping and adaptation strategies in Kasane and Matsheng.

- Major constraints heightening vulnerability to drought emerging from the study are, dependency on government, poverty, HIV/AIDS, unemployment, gender issues and environmental factors. These constraints make it very difficult for rural communities in Kasane and Matsheng to cope and adapt to drought.

- The HIV/AIDS pandemic has had serious implications for households in Kasane and Matsheng. Households affected by HIV/AIDS suffered the loss of productive labour, income, decreased productivity and an increasing number of dependents. Savings were diverted and assets were depleted to meet healthcare and funeral costs. HIV/AIDS was therefore found to be a contributing factor to the rise in poverty levels. As a result, a combination of HIV/AIDS and poverty increased the vulnerability of rural households in Kasane and Matsheng.

- The survey results further indicate that, female-headed households are the most vulnerable to drought. Vulnerability of female-headed households is mainly attributed to poverty.

- Poverty among women resulted mainly from the roles they are assigned and the limits placed by societies on their access to control of resources. Gender inequality has proved to intensify the unequal distribution of resources amongst men and women, making female-headed households more vulnerable to the impacts of drought.

- The female-headed households in Kasane and Matsheng were found to lack security, opportunity and empowerment, resulting in lower quality of life.

- Concerning dependency on government, it has had crushing effects on rural societies in Kasane and Matsheng. This is not to say that government AID has not been crucial in alleviating suffering, but it has also had negative consequences. This is mainly due to the manner and the type of interventions made. The government interventions have created a culture of dependency and contributed to the suppression of local coping strategies and the opportunity to strengthen indigenous knowledge.

The dependency that has been created by the government should be viewed as a concern as it increases cost of the national economy. In future the rural population is likely to be even more vulnerable to droughts because traditional strategies, which allowed people to survive previous droughts, have been undermined to the point they no longer provide basic social security.

Fighting the dependency syndrome will be difficult for the government of Botswana, as government relief assistance has become a comfortable mode for its population. Botswana needs to make a transition from food aid to more sustainable adaptive strategies. The government needs to find ways to intervene without undermining traditional strategies. The government for example could aim at increasing people's choices and opportunity through access to appropriate technologies, practices, information and experience. Policy objectives should center on empowerment thereby allowing people the opportunity to explore technological and economic options for themselves.

It has been evident in this study that vulnerability of rural communities in Matsheng and Kasane cannot be entirely blamed on climate variability. There has been a tendency for using climatic events such as drought as a scapegoat. All social and economic disruption and human suffering are usually attributed to drought while other underlying factors are ignored (inequality, health, economic organization, gender relations, unemployment etc). As a result these factors that contribute to the vulnerability of rural communities are not dealt with.

Given that Botswana has one of the fastest growing economies, the study further demonstrated that economic development on its own does not necessarily eradicate vulnerability to climate variability if its gains are unevenly distributed. Botswana has a lot to learn regarding vulnerability to climate variability and how to build resilience in order to cope and adapt to extreme climatic shocks. The following recommendations could contribute to the way forward in addressing vulnerability to climate variability.

8.6 Recommendations

- Government officials and decision-makers need to interact with the local people and involve them in their decision making, so as to formulate more successful programmes, which enable rural communities to build resistance against climatic conditions. In other words its important for government officials and decision makers to know what the people need, whether the systems they have put in place for them are beneficial and appropriate, whether their policies are able to support their livelihoods effectively and equitably, or whether the policies inhibit their ability to cope with extreme climatic events.

- Traditional coping and adaptive strategies should not be undermined, instead they should be studied and understood and then improved on.

- The government needs to come up with longer-term sustainable policies to deal with drought. For example it could have more effective and long-term labour-intensive projects. The projects need to target the poorest communities, which in turn will increase livelihood opportunities.

- The government needs to address gender issues such as inequality. Given that majority of households in rural areas are female-headed, it is these women that are most vulnerable to drought. The government should have in place projects that are socially equitable and gender fair.

- There is a need to educate and enhance people’s knowledge on how they can help themselves during times of drought rather than spoon-feed them.

- Rural communities could be encouraged to acquire resources and facilities that will enable an effective response to drought. For example since female-headed households seem to be among the most vulnerable, groups of women could work together on small businesses that would in turn feed their families. To be able to do this, the government could provide them with capital, and then teach them how to manage and maintain the business.

- When making decisions concerning vulnerable people it is important that HIV/AIDS victims and their families are included.

- Poverty and unemployment are issues that have been brought up again and again in government policies yet the number of poor and unemployed people seems to be increasing. These issues need to be taken seriously as they have a serious impact on people's ability to cope and adapt to climate variability.

Climate variability has certainly contributed to great human suffering. Climate variability however, is not the only factor causing suffering to human societies as was seen in Matsheng and Kasane. Exposure to the consequences of climate variability is unavoidable but does not have to trigger a crisis. Vulnerability to drought has proved to be a function of human action and behavior in Kasane and Matsheng. Issues of poverty, HIV/AIDS, government policies, unemployment, inequality, discrimination, cultural practices and environmental factors need to be addressed not only in Botswana but also throughout Africa. By addressing these issues the goal of reducing vulnerability to climate variability as well as future climate change can be achieved.

REFERENCES

Acosta, R., Allen, M., Cherian, A., Granich, S., Mintzer, I., Suarez, A., and Von Hippel, D.,1999, Climate Change Information Kit, http://www.undp.org

Adato, M., and Meinzen-Dick, R., 2002, Studying the Impact of Agricultural Research on Poverty using the Sustainable approach, Prepared for International Conference on Impact Agricultural Research and Development, San Jose, Costa Rica.

Adams, M., Sibanda, S., and Turner, S., 1999, Land Tenure Reforms and Rural Livelihoods in Southern Africa, Overseas Development Institute.

Adger, W. N., Khan, S. R., and Brooks, N., 2003, Measuring and Enhancing Adaptation, Adaptation Policy Framework: A guide for policies to Facilitate Adaptation to Climate Change, UNDP, http://www.undp.org

Adger, W. N., Huq, S., Brown, K., Conway, D., and Hulme, M., 2003, Adaptation to Climate Change in the Developing World, *Progress in Development Studies* 3(3), 179 – 195.

Adger, N. and Kelly, M., 1999, Social Vulnerability to Climate Change and the Architecture of Entitlements, *Mitigations and Adaptations Strategies for Global Change*, 4: 253 – 266.

Adger, N., 1999, Social Vulnerability to Climate Change and Extremes in Coastal Vietnam, *World Development*, Elsevier Science Ltd, Great Britain, 27 (2), 249 – 269.

Adikisson, S., and Devereux, S., 1995, Options for Drought Relief in Namibia, Social Science Development Report, 20 July 1995.

Agarwal, B., 1993, Social Security and The Family: Coping with Seasonality in Rural India, *Agriculture and Human Values*, Winter-Spring, 156 – 165.

Alabala-Bertrand, J. M., (1993), Political Economy of Large Natural Disasters: With Special Reference to Developing Countries, Clarendo Press, Oxford.

Alverson, H., 1999, Agricultural Development in Botwana: Targets and Constraints, Gaborone Institute of Development Management.

Anderson, M. B., 1994, Understanding the Disaster-development Continuum, Focus on Gender: *Perspective on Women and Development*, 2(1): 7 – 10.

Arntzen, J. W., 1989, *Environmental Pressure and Adaptation in Rural Botswana*, Brussels: Central Huisdrukkerij van de Universiteit.

Arntzen, J. W., and Veenendaal, E. M., 1986, *A Profile of the Environment and Development of Botswana*, National Institute of Development Research and Documentation, University of Botswana, Gaborone.

Ashely, C. and Carney, D., 1999, *Sustainable Livelihoods: Lessons from Early Experience*, Overseas Development Institute, London.

Babbie, E., 1992, *The Practice of Social Research*, Wadsworth, London.

Ballard, C., 1986, Drought and Economic Disasters: South Africa in the 1980s, *Journal of Interdisciplinary History*, 17: 359 – 378.

Barnett, 2002, *Aids in the Twenty First Century: Disease and Globalization*, Macmillan Palgrare, London.

Barnett. T., and Blaikie. P. M., 1992, *AIDS in Africa: Its Present and Future Impacts* Belhaven press, London.

Barton, D., Morton, J., and Hendy, C., 2001, Drought Contingency Planning for Pastoral Livelihoods, Policy Series 15, Natural Resources Institute University of Greenwich, Chatham, UK.

Baylies, C., 2002, The Impact of Aids on Rural Households in Africa: A shock like Any Other? *Development and Change*, 33 (611 – 32).

Bebbington, A., 1999, Capitals and Capabilities: A framework for Analyzing Peasant Vulnerability, Rural Livelihoods and Poverty, *World Development*, 27(12): 2021 – 2044.

Beg, N., Morlot, J. C., Davidson, O., Afrane-Okesse, Y., Tyani, L., Denton, F., Sokona, Y., Thomas, J. P., La Rovere, E. L., Parikh, J. K., Parrikh, K., and Rahman, A. A., 2002, Linkages Between Climate Change and Sustainable Development, Elsevier Science Ltd, http://www.climatepolicy.com

Botswana Institute of Development and Policy Analysis (BIDPA), 1997, *Study of Poverty and Poverty Alleviation in Botswana*, Botswana Institute of Development, Policy Analysis and Ministry of Finance and Development planning, Gaborone, Vol 2.

Binswanger, H., McIntire, H., and Udry, C., 1989, Production Relations in Semi-Arid African Agriculture in Bardhan, P., (ed), *The Economic Theory of Agrarian Institutions,* Oxford, Calrendon.

Blaikie, P., Cannon T., Davis, I. and Wisner, B., 1994, *At Risk: Natural Hazards, People's Vulnerability and Disasters*, Routledge, London.

Blair, T., 2004, A Year of Huge Challenges, www.economist.com

Bohle, H. G. and Watts, M. J., 1993, The Space of Vulnerability: The causal Structure of hunger and Famine, *Progress in Human Geography*, 13(1): 43 – 67.

Bohle, H. G., 2001, Vulnerability and Criticality: Perspectives from Social Geography, *IHDP Update*, Number 2: 1 – 5.

Bohle, H. G., Downing, T. E., and Watts, M. J., 1994, Climate Change and Social Vulnerability: Towards a Sociology and Geography of Food Insecurity, *Global Environmental Change*, 4(1): 37 – 48.

Botswana Society, 1986, The Management of the Botswana Environment, proceedings of a workshop on environmental and development in Botswana, held in Gaborone, 8 – 12 May.

Botswana Meteorological Centre, 2000, unpublished climate data.

Brace, S., 1995, Participatory Rural Appraisal a Significant Step Forward in Understanding Relationships Between Poor People and their Environments, in Binns, T., (ed), *People and Environment in Africa*, John Wiley and Sons, Chichester, 39 – 45.

Bratton, M., 1987, Drought, Food and the Social Organizations of Small Farmers in Zimbabwe, in Glantz, M. H., (ed) *Drought and Hunger in Africa: Denying Famine a Future*, Cambidge University Press, Cambridge.

Bromley, D. W., and Chavas, J., 1989, On Risk, Transactions and Economic Development in Sem-arid Tropics, *Economic Development, Cultural Change*, 37(4) 719 – 736.

Brook, N., 2003, Vulnerability, Risk and Adaptation: A conceptual Framework, Tyndall Centre for Climate Change Research and Centre for Social and Economic Research on the Global Environment (CSERGE), http://www.tyndall.ac.uk

Bruwer, J. J., 1993, Drought Policy in the Republic of South Africa, in Wilhite, D. A. (ed), Drought Assessment, Management and Planning: Theory and Case Studies, Kluwer Academic Publishers, London,

Bryceson, D., 1996, Deagrarianzation and Rural Employment in Sub-Saharan Africa: A Sectoral Perspective *World Development*, 24(1): 97 – 111.

Burgess, R. G., 1993, *In the Field: An Introduction to Field Research*, Routledge, London.

Burton, I., 1997, Vulnerability and Adaptive Response in the Context of Climate and Climate Change, *Climatic Change*, 36: 185 – 196).

Burton, I., Kates, R.W. and White, G. F., 1993, *The Environment as Hazard*, The Guildford Press, New York.

Burton, I., Smith, B. J., and Lenhart, S., 1998, Adaptation to Climate Change: Theory and Assessment, in: Feenstra, J. F., Burton, I., Smith, J. B. and Tol, R. S. J. (eds), Handbook on Methods for Climate Change Impact Assessment and Adaptation Strategies, United Nations Environmental Programme and Institute for Environmental Studies, Vrije Universiteit, Amsterdam

Campbell, A., 1986, The Use of Wild Food Plants and Drought in Botswana, *Journal of Arid Environments*, 11: 81 – 91.

Campbell, D. J., 1984, Response to Drought Among Farmers and Herders in Southern Kajiado District, Kenya, *Human Ecology*, 12(1): 35 – 64.

Campbell, D. J., Zinyama, L. M., and Matiza, T., 1989, Strategies for Coping with Food Deficient in Rural Zimbabwe, *Geographical Journal of Zimbabwe*, 20: 15 – 41.

Campbell, D., 1977, Strategies for Coping with Drought in the Sahel: A Study of Recent Population Movement in Maradi, Niger, Phd thesis, Clarke University, Worcester, Massachusetts

Carney, D., Drinkwater, M., Rusinow, T., Neefjes, K., and Singh, N., 1999, Livelihoods approaches compared: A brief comparison of the livelihoods approaches of the UK Department for International Development (DFID), CARE, Oxfam and United Nations Development Programme (UNDP), November 1999. London: Department for International Development.

Central Statistics Office, 2001, National Housing and Population Census, Gaborone, Government Printers.

Central Statistics Office, 2000, *Environmental Statistics*, Gaborone: Government Printers.

Central Statistics Office, 1991, National Housing and Population Census, Gaborone, Government Printers.

Central Statistics Office, 1981, National Housing and Population Census, Gaborone, Government Printers.

Chacdwick, B. A., 1984, *Social Science Research Methods*, Prentice Hall Inc.

Chambers, R. and Conway, G., 1992, Sustainable Rural Livelihoods: Practical concepts for the 21st Century, IDS Discussion paper 240, Brighton IDS.

Chambers, R., 1992, Rural: Rapid, Relaxed and Participatory Discussion paper 331. University of Sussex, Brighton, Institute of Development Studies.

Chambers, R., 1992, Shortcut and Participatory Methods for Gaining Social Information for Projects, in: Cernea, M. (ed), *Putting People First: Sociological Variables in Rural Development 515*-537.

Chambers, R., 1994, Participatory Rural Appraisal (PRA), Analysis of Experience, *World Development*, 22(9): 1253 – 1268.

Chanda, R. and Magole, L., 2001, Rangelands in the Context of Subsistence Livelihoods: The Case of the Matsheng Area, Kgalagadi North Botswana, Workin Paper number 3, Global Change and Community Ranglnds Project, University of Botswana Gaborone.

Checkland, P., (1992), From Framework Through Experience to Learning: The Essential Nature of Action Research, in: Nissen, H., Klein, H., and Hirschheim, R., (eds) *Information systems research: contemporary and emergent traditions* Amsterdam: Elsevie

Chenje,M., and Johnson, P., (eds), 1994, *State of the Environment in Southern Africa.* SADC/IUCN/SARDC, Maseru and Harare

Christian Aid, 2002, Southern Africa Food Emergency, http://www.un.org

Clay, E., 1994, Drought in Southern Africa: Shocks and Research, Development Research Insights for Policy Makers.

Cobb, C., 2003, Front Load Africa's Development, Say UN Humanitarian Aid Coordinators, http://www.relieweb.lnt

Cobbett, M., 1988, The Land Question in a Post-apartheid South Africa: A Preliminary Assessment, in Cross, C. R., and Haines, R. J., (eds), *Towards Freehold: Options for Land Development in South Africa's Black Rural Areas*, Juta, Cape Town.

Cochrane, H. C., 1975, *Natural Hazards: Their link Distributive Impacts*, Institute of Behavioral Science, University of Colorado.

Cook, H. J., 1978, The Problem of Drought in Botswana, Working Paper Number 17, Gaborone National Institute for Research in Development and African Studies.

Cutter, L., 2001, A Research Agenda for Vulnerability and Environmental Hazards, *IHDP Update*, Number 2: 8 – 9.

Cutter, S. L., 1993, *Living with Risk*, Edward Arnold, London.

Czukas, K., Fafchamps, M., and Udry, C., 1998, Drought and Savings in Western Africa: Are Livestock a stock, *Journal of Development Economics*, 55(2), 273 – 305.

Davies, S., 1993, Versatile Livelihoods: Strategic Adaptation to Food Insecurity in the Malian Sahel, *Institute for Sustainable Development*, Falmer, Sussex.

Davies, S., 1996, Adaptable Livelihoods: Coping with Food Insecurity in the Malian Sahel, Macmillian, London.

De Satge, R., Hollowy, A., Mullins, D., Nchabaleng, L. and Ward, P., 2002, Learning About Livelihoods: Insights from Southern Africa, Periperi Publication, South Africa and Oxfam GB, UK.

De Waal, A and Whiteside, A., 2003, New Variant Famine: AIDS and Food Crisis In Southern Africa, http://www.earthinstitute.columbia.edu

Dercon, S., 2001, Economic Reform Growth and the Poor: Evidence from Panel Data in Rural Ethiopia Centre for the Study of African Economies, Working Paper 8, Oxford University.

Dershem, L., and Gzirishvili, D., 1998, Information Social Support Networks and Households Vulnerability: Empirical Findings from Georgia, *World Development* 26: 1827 – 1838.

Devereux, S., 1999, Making Less Last Longer: Informal Safety Nets in Malawi, IDS Discussion paper 373, Institute of Development Studies.

Devereux, S., 2001, Transfers and Safety Nets, in Devereux, S. and Maxwell, S., (eds), ITDG Publishing, London.

Devereux, S., and Naerra, T., 1996, Drought and Survival in Rural Namibia, *Journal of Southern Africa*, 22: 421 – 440.

Department for International Development (DFID), 2004, Climate Change in Africa, http://www.dfid.gov.uk

De Queiroz, J. S., (1993) Range degradation in Botswana: myth or reality? Overseas Development Institute, London.

Dube, O. P., and Pickup, G., 2001, Effects of Rainfall Variability and Communal and Semi-Commercial Grazing on Land Cover in Southern African Rangelands, C*limate Research*, 17: 195–208.

Dilley, G., 2000, Reducing Vulnerability to Climate Variability in Southern Africa: the Growing Role of Climate Information, *Climate Change*, 45: 63 – 73.

Dinar, A., and Keck, A., 2000, Water Supply Variablity and Drought Impact and Mitigation in Sub – Saharan Africa, in Wilhite, D. A., (ed), *Drought: A Global Assessment*, Routledge, London and New York, Vol 2, 129 – 148.

Dow, K. and Downing, T. E., 1995, Vulnerability Research: Where Things Stand, *Human Dimensions Quarterly*, 1: 3 – 5.

Dow, K., 1992, Exploring Differences in Our Common Future (s): The meaning of Vulnerability to Global Environmental Change, *Geoforum*, 23: 417 – 436.

Dow, K., 1992, Exploring Differences in Our Common Future(s): The meaning of Vulnerability to Global Environmental Change, *Geoforum*, 23: 417 – 36.

Downing, T. E., 1987, Climate Impact Assessment in Central Kenya, in Wilhite, D. A., Easterling, W. E., and Woods, D. A., (eds), *Planning for Drought: Towards a Reduction of Societal Vulnerability*, West Press, Boulder, Colorado.

Downing, T. E., 1991, Vulnerability to Hunger in Africa: A Climate Change Perspective, *Global Environmental Change*, 1(5): 365 – 380.

Downing, T. E., 1992, *Climate Change and Vulnerable Places: Global Food Security and Country Studies in Zimbabwe, Kenya, Senegal and Chile*, Environmental Change Unite, Oxford.

Downing, T. E., 1992, Vulnerability and Global Environmental Change in Semi-arid Tropics: Modelling Regional and Household Agricultural Impacts and Responses, Presented at ICID, Fortaleza-Ceara, Brazil, 27 January to 1 February 1992.

Downing, T., Ringius. L., and Waughray. D., 1997, Adapting to Climate Change in Africa, *Mitigations and Adaptations Strategies for Global Change*, 2 (1): 19 – 44.

Downing, T., and Patwardhan, 2003, Vulnerability Assessment for Climate Adaptation, Technical paper 3, http://start.org

Drèze, Jean and Amartya Sen. 1989. *Hunger and Public Action*. Oxford: Clarendon Press.

Drinkwater, M., 2003, HIV/AIDS and Agrarian Change in South Africa: Presentation for the United Nations Regional Inter-Agency Coordination and Support Office Technical Consultation on Vulnerability in the Light of an HIV/AIDS Pandemic, Johannesburg, South Africa, 9 – 11 September.

ECA, 2001, Transforming Africa's Economies, Economic Commision for Africa, Addisa Ababa, Ethiopia.

Eicher, C., and Baker, D., 1982, Research on Agricultural Development in Sub-Saharan Africa: A Critical Survey, MSU International Development Paper Number 1, Michigan State University.

Ellis, F., 1998, Household Strategies and Rural Livelihoods Diversification, *Journal of Development Studies*, 35: 1 – 38.

El Raey, M., 2004, Adaptation to Climate Change for Sustainable Development in the Coastal Zone of Egypt, paper presented at the Global Forum on Sustainable Development, Paris, 11-12 November 2004, http://www.oecd.org

Escott, V. J., 1985, Symposium on Drought in Africa, Proceedings and Summary Report of a Symposium held in Ottawa, Canada, 12 – 14 August 1985.

FAO, 2003, Response to the Southern African Crisis, Regional Newsletter issue 3, Regional Inter – Agency Coordination and Support Office, Johannesburg, http//www.sahims.net

Finan, T. J. and Baro. M., 1998, Rapid Appraisal Approaches for Vulnerability Assessments: Applications to the FEWS Methodology, unpublished paper, University of Arizona.

Fissil, K., Tsegaye, D., and Synnevag, G., 2001, Traditional Coping Strategies of the Afar and Borana Pastoralists in Response to Drought, Drylands Coordination Group Report, Number 17.

Fleshman. M., 2001, AIDS Orphans: Facing Africa's Silent Crisis, *Africa Recovery*, 15 (3) October 1

Fleurt, 1986, Indigenous Responses to Drought in Sub-Saharan Africa, *Disaster* 10(3): 224 – 229.

Forest, C. E., Stone, P. H., and Sokolov, A. P., 1999, Constraining Uncertainties in Climate Models using Climate Change Detections Techniques, http://web.mit.edu

Frampton, S., Chaffey, J., MacNaught, A. and Hardwick, J., 1996, *Natural Hazards*, Hodder and Stoughton, Great Britain.

Frankenberger. T., Luther. K., Fox. K., and Mazzeo. J., 2003, Livelihoods Erosion Through Time: Macro and Micro Factors That Influenced Livelihood Trends in Malawi Over the Last 30 Years, Tango International, Inc, Care Southern and Western Africa Reginal Management Unit.

Fumane, P., 1993, Mozambique: The Response to the 1992 Drought in the Context of Long-term Development Objectives, in SADC, Drought Management Workshops in Southern Africa, Report of the regional drought management workshop held at holiday inn, Harare, Zimbabwe, 13 to 16 September 1993, vol 2: 116 – 154.

Glantz, M. H. and Katz, R. W., 1977, When is a Drought a Drought? *Nature* 267: 192 – 3.

Glantz, M., 1996, Climate Variability, Climate Change and Vulnerability: Moving toward by Looking Back, in: J., Ribot, A., Magalhaes and S., Panagides (ed), *Climate Variability, Climate Change and Social Vulnerability in Semi-arid Tropics*, Cambridge University Press, Great Britain.

Glantz, M., and Katz, R. W., 1987, Drought as a Constraint to Development in Sub-Saharan Africa, Ambio, 14(16) 334 – 339.

Glantz. M., 1990, " Climate Variability, Climate Change and the Development Process in Sub-Saharan Africa, In: H. J., Karpe, D., Otten, S. C., Trinidade, (eds.) *Climate and Development*, Springer-Verlag, Germany.

Glewwe, P. and Hall, P., 1998, Are Some Groups More Vulnerable to Macroeconomic Shocks than Others? Hypothesis Test Based on Panel Data from Peru, *Journal of Development Economics*, 56: 181 – 206.

Good, K, 1999, The State and Extreme Poverty in Botswana: The San and Destitutes, The Journal of Modern African Studies, 37 (2), 185 – 205.

Hall, M. J., 2000, Preface, in: Kane. S. M and Yohe. G. W. (eds), *Societal Adaptation to Climate Variability and Change*, Kluwer Academic Publishers.

Handmer, J., Dovers, S., and Downing, T., 1999, Societal Vulnerability to Climate Change and Variability, *Mitigations and Adaptations Strategies for Global Change* 4: 267 – 281.

Hay, R. W., 1988, Famine, Incomes and Employment: Has Botswana Anything to Teach Africa? *World Development*, 16: 1113 – 1125.

Hay, R. W., 1989, Food Aid and Relief Development Strategies, *Journal of Social Development in Africa*, 4: 7 – 25.

Hay, R.W., Burk, S. and Dako, D. Y., 1985, A Socio-economic Assessment of Drought Relief in Botswana, UNDP/UNICEF/WHO, Gaborone.

Herskovits, M., 1926, The Cattle Complex in East Africa, *American Anthropologist*, 28

Hewitt, K., (ed), 1983, Interpretations of Calamity, MA: Allen and Unwin, Winchester.

Hewitt, K., 1995, Excluded Perspectives in the Social Construction of Disaster, *International Journal of Mass Emergencies and Disaster*, 13: 317 – 39.

Hewitson, B., 2003, Climate Projections: Scale and Uncertainty, http://www.sasta.co.za

Hewitson, Bruce, 1997, Regional Climates in the GISS General Circulation Model: Surface Air Temperature, *Journal of Climate*, 7(2): 283-303.

Hitchock, R. K., 1979, The Traditional Response to Drought in Botswana, in: Hinchey, M. T. (ed), Botswana Drought Symposium, Gaborone, Botswana: Botswana Society, 91 - 97.

Hitchock, R. K., Ebert, J. I., Morgan, R. G., 1989, Drought, Drought Relief and Dependency Among the Basarwa of Botswana in: Huss-Ashmore, R. and Katz, S. H., *African Food Systems in Crisis*, Gordon and Breach Science Publishers, New York.

Hitchock, R., 1992, The Rural Population Living Outside of Recognised Villages, in: Sustainable Rural Development Proceedings of Workshop held by the Botswana Society in Gaborone, 13 – 15 April, 1992, Gaborone, Botswana.

http://www.avert.org, HIV/AIDS in Botswana, Last updated February 12 2004.

http://www.avert.org, HIV/AIDS in South Africa, Last updated February 12 2004.

http://www.afrizim.com, Chobe, Botswana.

http://www.ghanaweb.com Stopping the Aid Dependency Syndrome, A rejoinder feature article of Monday 22 March 2004.

http://www.overlandafrica.com, Overland, Africa.

http://www.botswana.tourism.gov.bw, Botswana maps 2001.

http://www.neweconomics.org, Climate catalyst.

http://www.oxfam.org Adapting to Climate Change in Southern Africa.

http://www.developments.org.uk, Climate change and livelihoods.

Hulme, M., (ed) 1996, *Climate Change and Southern Africa: An Exploration of Some Potential Impacts and Implications in the SADC Region*, WWF International and Climate Research Unit, UEA, Norwich, UK.

Intergovernmental Panel on Climate Change (IPCC), 2001, *Climate Change 2001: Impacts, Adaptations, Vulnerability*, Contribution of working Group II to the Third Assessment Report of the IPCC, Geneva: UNEP/WMO.

International Geosphere-Biosphere Programme (IGBP), 2002, *Global Change and the Earth System: A Planet Under Pressure*, The Global Environmental Change Programes, IGBP Science Number 4.

International Institute for Sustainable Development, 2005, Vulnerability and Adaptation in the South, http://www.iisd.org

Ison, R. and Ampt. P., 1992, Rapid Rural Appraisal: A Participatory Problem Formulation Method Relevant to Australian agriculture *Agricultural Systems* 38.

Jackson, R. H., 1979, Drought in The Western United States: Perceptions and Ajusment 1976 – 1977, Paper Presented at the Annual Meeting, Association of American Geographers, Phildelphia, PA April 22 – 25.

Jackson, W., 1995, *Methods*, Prentice-Hall Canada Inc; Scarborough, Ontario

Jacques, G., 1995, Drought in Botswana: Intervention as Fact and Paradgm, *Pula:Botswana Journal of African Studies*, National Institute of Development Research Documentation 9(1).

Jayne, T. S., Tschirley, D. C., Staatz, M. J., Shaffer, J. D., Weber, M. T., Chisvo, M., Mukubu, M., 1995, Market – Oriented Strategies to improve Household Access to Food, http://www.afr-sd.org

Jefferis, K., 1997, Poverty in Botswana, in Salkin, J. S., Mpabanga, D., Cowan, D., Selwe, J., and Wright (eds), Aspects of the Botswana Economy Selected Papers, Lentswe la Lesedi (pty) Ltd, Gaborone, Botswana.

Jeffrey, P., 2000, Why Another Drought in Ethiopia, http://gbgm-umc.org

Jodha, N. S., and Mascarenhas, A. C., 1985, Adjustment in Self-provisioning Societies, in R. W., Kates, J. H., Ausube and M., Berberian (eds), *Climate Impact Assessment*, John Wilely and Sons Ltd, Great Britain, 437 – 459.

Joliffe, F. R., 1986, *Survey Design and Analysis*, Ellis Horwood, London.

Kajumulo, D., 1993, Tanzania: The Response to the 1992 Drought in the Context of Long-term Development Objectives, in SADC, Drought Management Workshops in Southern Africa, Report of the regional drought management workshop held at holiday inn, Harare, Zimbabwe, 13 to 16 september 1993, vol 2: 279 – 324.

Kansteinner, W. H., and Natsios, A. S., 2002, Briefing on the Crisis in Southern Africa, Remarks at Special Briefing Washington DC, 20 August 2002.

Karim, Z., 1996, Agricultural Vulnerability and Poverty Alleviation in Bangladesh, in T. E., Downing (ed), *Climate Change and World Food Security*, Heilelberg Springer-Verlag, 307 – 346).

Kasperson, R., 2001,Vulnerability and Global Environmental Change, *IHDP Update*, Number 2: 2 – 3.

Kates, R., 2000, Caustionary Tales: Adaptations and the Global Poor, *Climate Change*, 45:5 – 17.

Kelly, M., and Adger, N., 2000, Theory and Practice in Assessing Vulnerability to Climate Change and Facilitating Adaptations. *Climate Change*, 47: 325 – 352.

Kent, G., 1984, *The Political Economy of Hunger: The Silent Holocaust*, Praeger, New York.

Kerapeletswe, C. K., and Moremi, T., 2001, Poverty and Democratization: The Case of Botswana, in Wilson, F., (ed), *Poverty Reduction: What Role for the State in Todays's Globalized Economy?* Cape Town: New Africa Education Publishing, 219 – 245.

Khogali, H., 2002, HIV/AIDS Home Based Care in Zimbabwe, Federation of the Red Cross and Red Crescent.

Khumalo, D., 1993, Swaziland: The Response to the 1992 Drought in the Context of Long-term Development Objectives, in SADC, Drought Management Workshops in Southern Africa, Report of the regional drought management workshop held at holiday inn, Harare, Zimbabwe, 13 to 16 September 1993, vol 2: 218 – 264.

Kinsey, B., Burger. K., Gunning. W., 1998, Coping with Drought in Zimbabwe: Survey Evidence on Responses of Rural Households to Risk, *World Development*, Vol 26 No 1 pp 89 – 110.

Kinuthia, J. H., 1997, Global Warming and Climate Impacts in Southern Africa: How Might Things Change? *Internet Journal for African Studies*, http://www.brad.ac.uk

Kjekshus, H., 1977, *Ecology Control and Economic Development in East African History*, Heineman, London.

Klein, R. J. T., and Nicholls, R. J., 1999, Assessment of Coastal Vulnerability to Climate Change, *Ambio* 28(2): 182 – 187.

Koshy. C. K., 2004, Environment and Sustainable Development: Pacific SIDS context, paper presented at the Global Forum on Sustainable Development, Paris, 11-12 November 2004 http://www.oecd.org

Kruger. F., 1999, Drought Hazards and Threatened Livelihoods: Environmental Perceptions in Botswana, in Lohnert. B., and Geist. H., (eds), *Coping with Changing Environments*, Ashagate Publishing Ltd, England.

Kunfaa, E. Y., Dogbe. T., Mackay. H. J., and Marshall. C., 2002, Empty Pockets, in: Narayan. D. and Petesch. P., (eds), *Voices of the Poor From Many Lands*, The World Bank, Washington Dc.

Lado, C., 2001, Environmental and Socio-Economic Factors Behind Food Security Policy Strtegies in Botswana, *Development Southern Africa*, 18(2): 141 – 168.

Legesse, A. L., 1989, Adaptation, Drought and Development: Boran and Gabra Pastoralists of Northern Kenya, in: Huss-Ashmore, A. and Katz, S. H., *African Food Systems in Crisis*, Gordon and Breach, New York, 261 – 279.

Leon, A., 2001, Vulnerability and Food Systems, *IHDP Update*, Number 2: 15 – 16.

Levine, S., and Chastre, C., 2004, Missing the point: An Analysis of Food Security Interventions in the Great Lakes, Humanitarian Practice Network at Overseas Development Institute, London

Liverman, D. M., 2000, Adaptation to Drought in Mexico, in Wilhite, D. A., (ed), *Drought: A Global Assessment*, Routledge, London, vol II 35 – 45.

Liverman, D., 1994, Vulnerability to Global Environmental Change, In S., Cutter (ed), *Environmental Risks and Hazards*, Englewood Cliffs: Prentice Hall.

Locke, C., Adger, W. N., and Kelly, P. M., 2000, Migration's Social and Environmental Consequences, http://www.findarticles.com

Mainguet, M., 1999, *Aridity: Droughts and Human Development*, Trans by TDE Reimer, Springer, Berlin.

Manamela, N., 1993, Botswana: The Response to the 1992 Drought in the Context of Long-term Development Objectives, in SADC, Drought Management Workshops in Southern Africa, Report of the regional drought management workshop held at holiday inn, Harare, Zimbabwe, 13 to 16 September 1993, vol 2: 2 – 35.

Marsh, c., 1982, *The Survey Method: The Contribution of Social Explanation*, George Allen and Unwin, London.

Marsland, N., 2004, Development of Food Security and Vulnerability Information Systems in Southern Africa, the Experience of Save the Children UK, Save the Children, London.

Mathew, R. A., 2000, The Relationship Between Environment and Security. Keynote address to IUCN world congress, Environment and Security: A Strategic Role for IUCN Interactive, 5 October 2000.

Mathuba, B. M., 2003, Botswana Land Policy, Ministry of Lands and Housing, paper presented at an international workshop on land policies in southern Africa, Berlin Germany, May 26 – 27, 2003.

Maveneka, L., 2002, Double Jeopardy for Rural Zimbabwe, Oxfam America.

Maxwell, S., and Frankenberger, T., 1992, *Household Food Security: Concepts, Indicators, Measurements: A Technical Review*, UNICEF, New York.

McCow, R., Haalands, G., and de Haan, C., 1979, The Interaction Between Cultivation and Livestock Production in Semi-Arid Africa, in Hall, A., (ed) *Agriculture in Semi-Arid Environments*, Sprnger-Verlag, New York.

Milich, L., 1997, Food Security in Pre-colonial Hausaland, http://ag.arizona.edu

Ministry of Agriculture, 1988, Impact Assessment of the accelerated Rainfed Arable production and drought Relief Programmes, Government Printer Gaborone, Botswana

Ministry of Agriculture, 1989, ALDEP – Report on Progress and Assessment of Impact, Government Printer Gaborone, Botswana

Ministry of Finance and Development Planning, 1985, National Development Plan 1985 – 1991, Government Printer Gaborone, Botswana.

Ministry of Finance and Development Planning, 1991, National Development Plan 1991 – 1997, Government Printer Gaborone, Botswana.

Ministry of Finance and Development Planning, 1993, Planning for People: A Strategy for accelerated Human Development in Botswana, Sygma Publishing, Botswana.

Ministry of Finance and Development Planning, 1997, National Development Plan 1997/98 – 2002/2003, Government Printer Gaborone, Botswana.

Mitchell, J. K., 1989, Hazards Research, in: Gaile, G. L. and Willmott, C. J., (eds), *Geography in America*, Columbus, OH: Merrill.

Mogotsi, B., 2002, Energy and Sustainable Development in Botswana http://www.helio-international.org

Molutsi, P., 1988, The State, Environment and Peasant Consciousness in Botswana, in *Review of African Political Economy*, 2: 40 – 47.

Molutsi, P., 1992, The Changing Socio-Economic Framework of Rural Settlements in Botswana, in: *Sustainable Rural Development*, Proceedings of Workshop held by the Botswana Society in Gaborone, 13 – 15 April, 1992, Gaborone, Botswana.

Molvoer, R. K., 1991, Environmentally Induced Conflicts? *Bulletin of Peace Proposal*, 22: 175 – 188.

Mooka, M. G. K., and Mokone. F. S., 1993, Drought Management in Botswana: Past Experience, in: Report on The National Conference on Drought Management, November 24 to 25 1993, Rural Development co ordination Division, Ministry of Finance and Development Planning, Botswana printers

Morgan, R. G. and Holm, J. D., 1985, Coping with Drought in Botswana: An African Success, The Journal of Modern African Studies, 23(3): 463 – 482.

Moneo, M., and Iglesias, A., 2004, Food and Climate Basics, http://www.atmosphere.mpg.de

Morse, B., 1987, African Beyond the Famine: New Hope Foreword in Drought and Hunger in: Glantz, M. H., (ed), Africa: *Denying Famine a Future*, Cambridge University Press, England.

Moser, C., 1998, The Asset Vulnerability Framework: Reassessing Urban Poverty Reduction Strategies, *World Development*, 26(1): 1 – 9.

Moser, C.A., and Kalton, G., 1993, *Survey Methods in Social Investigation*, Dartmouth, Aldershot.

Mozambique National News Agency, 2000, *AIM Reports*, Issue No. 194, 6 November 2000

Mukras, M. S., 2003, Poverty Reduction through Strengthening small and Medium Enterprise, Pula *Botswana Journal of African Studies*, 17 (2), 58 – 69.

Mupawose, R. M., 1985, Pattern and Impact of Drought in the SADCC Countries, *Proceedings of the Symposium on Drought in Africa*, International Development Research Centre, the Canadian International Development Agency and the International Council of Scientific Unions, 12 – 14 August, Ottawa, 27 – 36.

Mutangadura, G., 2004, Women and Land Tenure Rights in Southern Africa: A Human Rights-based Approach, http://www.iied.org

National Drought Mitigation Center, 2000, Understanding ENSO and Forecasting Drought, http://drought.unl.edu/ndmc/enigma/elnino.htm

National Research Council, 1999, Making Climate Forecasts Matter, in: Stern. P.C. and Easterling. W. E., (eds), *Report of the Panel on the Human Dimensions of Seasonal International Climate Variability*, National Academy Press, Washington, D.C.

National Academy of Science Committee on the Science of Climate Change, 2001, *Climate Change Science: An Analysis of Some Key Questions*, National Academy Press, Washington, Dc.

Nobre, C. A., Massambani, O. and Liu, W. T. H., 1992, Climatic Variability in the Semi-arid Region of Brazil and Drought Monitoring from Satellite, Presented at ICID, Fortaleza-Ceora, Brazil, 27 January to 1 february 1992.

Norton, A., Owen, D., Milimo, J. T., 1994, Zambia Poverty Assessment, Report N° 12985 – ZA, Vol 3, World Bank.

Ntwaagae, C., 1993, Coping with the Current (1992/93) Drought: Problems and Strtegies, Report on the National Conference on Drought Management, November 24 to 25 1993, Government of Botswana.

Nkambwe, M., 2001, More Data Less Management: Problems in Coordinating Information Systems for Land Management in Botswana, paper presented at the International Conference on special information for sustainable development in Nairobi, Kenya, 2 – 5 0ctober 2004.

Nyanda, 1993, Malawi: The Response to the 1992 Drought in the Context of Long-term Development Objectives, in SADC, Drought Management Workshops in Southern Africa, Report of the regional drought management workshop held at holiday inn, Harare, Zimbabwe, 13 to 16 september 1993, vol 2:79 – 104.

O' Brien, K., The Dynamics of Vulnerability to Global Change, *IHDP Update*, Number 2: 10 – 11.

O'Brien, K., and Leichenko, R., 2000, Double Exposure: Assessing the Impacts of Climate Change Within the Context of Globalization, *Global Environmental Change*, 10: 221 – 232.

Ogallo, L. A., 2000, Predictig Drought in Kenya, in Wilhite, D. A., (ed), *Drought: A Global Assessment*, Routledge, London and New York, Vol 1, 52 – 67.

Parry, M. L. and Carter. T. R., 1985, The effects of Climatic Variations on Agricultural Risk, in Parry M. L., (ed), *The Sensitivity of Natural Ecosystems and Agriculture to Climate Change*, Dordrecht: Kluwer.

Peters, P., 1984, Strggles Over Water, Struggles Over Meaning: Cattle, Water and the State in Botswana, *Africa*, 54(3): 29 – 49.

Prah, A. K., 1979, Some Sociological Aspects of Drought, in: Hinchey, M. T. (ed), *Botswana Drought Symposium, Gaborone, Botswana: Botswana Society*.

Quinlan, A., 2003, Resiliency and Adaptive Capacity, in IHDP Update, News Letter of the International Human Dimensions Programme on Global Environmental Change

Chanda, R., and Otlogetswe, T., (ed) 2001, Rangelands State, Products. Productivity, Livelihoods and Government Policies in the Matsheng Area, Kghalagadi North, Botswana – An Intergrated Summary Report and Assessment, Workshop Paper number 5 Unpublished.

Rasmusson, E. M., 1987, Global Climate and Variability: Effects on Drought and Desertification in Africa, in M. H., Glantz (ed), *Drought and Hunger in Africa: Denying Famine a Future*, Cambridge University Press, Cambridge.

Raynaut, 1977, Circulation Monetaire et Evolution des Structures Socio-economique Chez les Haoussas du Niger, *Africa*, 47(2): 160 – 171.

Reardon, T. C. D., and Matton, D., 1988, Coping with Household Level Food Insecurity: Drought Affected Areas of Burkina Faso, *World Development*, 16 (9), 148 – 70.

Regional Vulnerability Assessment Committee (RVAC), 2004, Discussion Paper: Strengthening Vulnerability Analysis in the SADC Region, A 5 year Programme, Gaborone, July 2004.

Reibsame, W. E., Changnon, S. A. and Karl, T. R., 1991, *Drought and Natural Resources Management in the United States: Impacts and Implications of the 1987 – 89 Droughts*, Westview Press, Boulder.

Reily, F., 2000, FIVMS Synthesis Document: A Comparison of Vulnerability Analysis Methods and Rationale for their Use in Different Contexts, Preliminary Draft: August 8, 2000.

Reyna, S., 1979, Equity in Niger: Cycles, Evidence and Options, Draft Report REDSO/WA Mimeograph, Abidjan: USAID.

Ribot, C. J., 1996, Climate Variability, Climate Change and Vulnerability: Moving toward by Looking Back, in J., Ribot, A., Magalhaes and S., Panagides (ed), *Climate Variability, Climate Change and Social Vulnerability in Semi-arid Tropics*, Cambridge University Press, Great Britain.

Ribot, C. J., Magalhaes, A.R., and Panagides, S. S. (eds), 1996, *Climate Variability, Climate Change and Social Vulnerability* in *Semi-arid Tropics*, Cambridge, Cambridge University Press.

Ribot, C., Najam. A., and Watson. G., 1996, Climate variation, Vulnerability and Sustainable Development in Semi-arid Tropics, in Ribot. J., Magalhaes. A., and Panagides. S., (eds), *Climate Variability, Climate Change and Social Vulnerability in Semi-arid Tropics*, Cambridge University Press, Great Britain.

Richard, P., and Harris, N., 1975, *African Environment: Problems and Perspectives Special Report 1*, International African Institute.

Riordan, T., 1990, Hazards and Risk in the Modern World: Political Models for Programme Design.

Rolando, G. V., 1981, *Nature Pleads Not Guilty*, Pergamon Press Ltd, England.

Rukamba, B. R., 1993, Namibia: The Response to the 1992 Drought in the Context of Long-term Development Objectives, in SADC, Drought Management Workshops in Southern Africa, Report of the regional drought management workshop held at holiday inn, Harare, Zimbabwe, 13 to 16 september 1993, vol 2:170 – 209.

Sandford, S., 1979, Towards a Definition of Drought, in: Hinchey, M. T. (ed), Botswana Drought Symposium, Gaborone, Botswana: Botswana Society.

Sandford, S., 1983, *Management of Pastoral Development in the Third World*, John Wiley and Sons, New York

Sandford, S., and Habtu, Y., 2000, Emergency Response Interventions in Pastoral Appraisal Team, DFID.

Save the Children (UK) Zimbabwe Programme, 2002, Vulnerability in Zimbabwe, 2002 – 2003, http://www.db.idpproject.org

Save the Children (UK), 2000, The Household Economy Approach: A Resource Manual for Practitioners, Save the Children, London.

Schneider, S. H.(ed), 1996, Encyclopedia of Climate and Weather, Oxford University Press, New York

Scoones, I. et al, 1996, *Hazards and Opportunities*, Zed Books Ltd, London.

Scoones, I., 1998, Sustainable Rural Livelihoods A Frame Work For Analysis; IDS working paper 72, Livelihood Adaptation, Vulnerability and Resilience.

Sear, C., Hulme, M., Adger, N., and Brown, K., 2001, Global Climate Change, http://www.tyndall.ac.uk

Sejanamane, M. P., 1993, Lesotho: The Response to the 1992 Drought in the Context of Long-term Development Objectives, in SADC, Drought Management Workshops in Southern Africa, Report of the regional drought management workshop held at holiday inn, Harare, Zimbabwe, 13 to 16 September 1993, vol 2: 36 – 68.

Sen, A., 1981, *Poverty and Famines: An Essay on Entitlement and Deprivation*, Oxford: Clarendon Press.

Sentsho, J., 2003, Development and Poverty Reduction in Botswana, *Pula*, *Botswana Journal of African Studies*, 17 (2), 70 – 77.

Seshamani, V., 1993, Zambia: The Response to the 1992 Drought in the Context of Long-term Development Objectives, in SADC, Drought Management Workshops in Southern Africa, Report of the regional drought management workshop held at holiday inn, Harare, Zimbabwe, 13 to 16 September 1993, vol 2: 337 – 280.

Setshwaelo, L., 2000, Grassland/Livestock Vulnerability and Adaptation to Climate Change, Botswana Government.

Shah, M. K., Osborne, N., Mbilizi, T. and Vilili, G., 2002, Impact of HIV/AIDS on Agricultural Productivity and Rural Livelihoods in the Central Region of Malawi; CARE international in Malawi

Sheppard, C. and Vierich, H., 1980, Drought in Rural Botswana: Socio Economic Impacts and Government Policy, Ministry of Agriculture, Botswana.

Shilington, K., 1981, Land Loss Labour and Dependency: The Impact of Colonialism on the Southern Tswana 1870 – 1900, PhD thesis S.O.A.S, London.

Singh, M., 2000, Environmental, in Security: Loss of Indgenous Knowledge and Environmental Degradation (in) Africa in Tevera, D., and Moyo, S., (eds), *Environmental Security in Southern Africa*, SARIPS, Harare.

Singh, M., 2001, Human Vulnerability to Environmental Change, Draft Chapter for Global Environmental Outlook 3, In Press.

Singh, N., and Vangile, T., 1994, *Adaptation Strategies of the Poor in Arid and Semi-Arid Lands: Searching of Sustainable Livelihoods*, IISD Working Paper, Winnipeg, International Institute for Sustainable Development.

Smit, B., Burton, B., Klein, R. J. T. and Wandel, J., 2000, An Anatomy of Adaptation to Climate Change and Variability, *Climate Change*, 45: 223 – 251.

Smit, B., Burton, B., Klein. R. J. T. and Wandel, J., 1999, The Science of Adaptation: a Framework for Assessment, *Mitigation and Adaptation Strategies for Global Change*, 4: 199 – 213.

Smith, K., 1992, *Environmental Hazards: Assessing Risk Reducing Disaster*, Routledge, London.

Sokona, Y., and Denton, F., 2001, Climate Change Impact: Can Africa Cope with the Challenges?, Elsevier Science Ltd, http://www.climatepolicy.com

Solway, J. S., 1994, Drought as a Revelatory Crisis: An Exploration of Shifting Entitlements and Hierarchies in Kalahari, Botswana, *Development and Change*, 25: 471 – 495.

Solway, J., 1979, People, Cattle and Drought, Rural Sociology Unit Report, Government Printers, Gaborone, Botswana.

Southern African Development Community (SADC), 1993, Drought Management Workshops in Southern Africa, Report of the regional drought management workshop held at holiday inn, Harare, Zimbabwe, 13 to 16 september 1993, vol 2.

Southern African Development Community (SADC), 2002, Understanding and Responding to Fragile Livelihoods in Southern Africa, SADC Food Security Network Ministerial Brief, http://www.Savethechildren.org.uk

Southern African Development Community/Food Security Technical and Administrative Unit (SADC/FSTAU), 1993, Assessment of the Response to the 1991/92 Drought in the SADC Region, SADC/FSTAU, Harare.

Southern African Development Coordination Conference (SADCC), 1992, Drought Emergency in Southern Africa Consolidation, UN-SADCC Appeal, 1992.

Stephen, L. and Downing, T. E., 2001, Getting the Social Right: A comparison of analytical Methods for Vulnerability Assessment and Household-Level Targeting, *Disasters*, 25: 113 – 13

Sukkary-Stolba, S., 1989, Indigenous Institution and Adaptation to Famine: The Case of Western Sudan, in: Huss-Ashmore, A. and Katz, S. H., *African Food Systems in Crisis*, Gordon and Breach, New York, 281 – 293.

Susman, P., O'Keefe, P, and Wisner, B., 1984, Global Disaster: A Radical Interpretation, in: Hewitt, K., (ed), *Interpretations of Calamity*, MA;Allen and Unwin, Boston, 264 – 83.

Sutter, S. W., 1979, Social Analysis of the Nigerian Rural Producer, in: Warren, J. and Smale, M. (ed), Niger Agricultural Sector Assessment, Niameg: USAID.

Swift, J. 1989, Why are Rural People Vulnerable to Famine? *IDS Bulletin*, Vol. 20, No. 2, pp. 8-15.

Tabor, S., 1983, Drought Relief and Information Management: Coping intelligently with Disaster, Gaborone, Botswana.

Tannehill, I. R., 1947, *Drought: Its Causes and Effects*, Princeton University Press, Princeton, NJ.

Teklu, T., 1992, Household Response to Declining Food Entitlement: The Experience in Western Sudan, *Quarterly Journal of International Agriculture*, 31 (3), 247 – 261.

Tiffen, M., 1995, The Impact of the 1991 – 92 Drought on Environment and People Zambia, in T., Binns (ed), *People and Environment in Africa*, John Wiley and Sons Ltd, Englang, 115 – 127.

Timberg, C., 2004, A Bounty of Food Relief Sits Unused in Zimbabwe: Claim of Bumper Crop Ties Aid Groups Hands, Washington Post.

Timmerman, P., 1981, *Vulnerability, Resilience and the Collapse of Society, Environmental Monograph*, Institute for Environmental Studies, Toronto.

Tobaiwa, C., 1993, Zimbabwe: The Response to the 1992 Drought in the Context of Long-term Development Objectives, in SADC, Drought Management Workshops

in Southern Africa, Report of the regional drought management workshop held at holiday inn, Harare, Zimbabwe, 13 to 16 September 1993, vol 2: 385 – 436.

Tony, D., 1994, Rapid Rural Appraisal: A Description of the Methodology and Its Application in Teaching at Charles Sturt University, *Rural Society* 4(3/4).

Topouzis, D., 1999, The Impact of HIV/AIDS for Household Food Security in Africa, United Nations Economic Commission for Africa Food Security and Sustainable Development Division, http://www.uneca.org

Topouzis, O., 1998, The Implications of HIV/AIDS for Rural Development Policy and Programming: Focus on Sub-Saharan Africa, FAO and UNDP.

Townsley, P., 1992, Rapid Rural Appraisal, ALCOM News January: 10-15.

Tsheko, R., 2003, Rainfall Reliability, Drought and Flood Vulnerability in Botswana, http://www.wrc.org.za

Turn, B. L., Matson, P. A., Kasperson, R. E., and Kasperson, J. E. X., 2000, *Vulnerability in Human-Environment Relationships*, AAAS Symposium: Science and Technology for a Transition Towards Sustainability, Feb. 17, 2002, MA, Boston.

Tyson, P. D. and Preston-Whyte, R. A., *The Atmosphere and weather of Southern Africa*, Oxford University Press, Cape Town.

Umoh, T. U., 2003, Effects of Drought Spells on Water Resources Management in Botswana, http://www.waternetonline.ihe.nl

UNAIDS (United Nations programme on HIV/AIDS), 2001, Addressing the Impact of HIV/AIDS on Ministries of Agriculture: Focus on Eastern and Southern Africa, Discussion Paper, UNAIDS/FAO 2001.

UNAIDS (United Nations programme on HIV/AIDS), 2002 AIDS epidemic update, December.

UNAIDS (United Nations programme on HIV/AIDS), 2002, Report on the global HIV/AIDS epidemic 2002 July.

UNAIDS (United Nations programme on HIV/AIDS), 2003, AIDS epidemic update, December.

UNICEF (United Nations Children's Fund), 1993, Drought in Malawi: The UNICEF Response.

UNICEF (United Nations Children's Fund), 2002, Southern Africa Crisis, UNICEF Emergency Updates.

United Nations and SADCC, 1992, Drought Emergency in Southern Africa, UN and SADCC.

United Nations Environment Programme (UNEP), 2000, *Climate Change Vulnerability: Linking Impacts and Adaptation*, Oxford, UNEP/University of Oxford.

United Nations Framework Convention on Climate Change (UNFCCC), 2000, *Methods and Tools to Evaluate Impacts and Adaptation: Information on Impacts and Adaptation Assessment Methods* (Progress Report, Note by the Secretariat), Subsidiary Body for Scientific and Tecnological Advice, Twelfth Session, Bonn, 12 – 16 June 2000.

United Nations, 1992, Agenda 21, http://www.un.org

United Nations, 1992, Drought Impact in Zimbabwe: An assessment and Additional Requirements, UNDP Harare.

United Nations, 1999, Report of the Secretary General on the UN Observer Mission to Angola (MONUA), UN, New York, http://www.un.org.

United Nations, 2000, Report of the Secretary General on the UN Mission in the Democratic Republic of Congo, UN, New York, http://www.un.org.

UNECA (United Nations Economic Commission for Africa), 2003, Land Tenure Systems and Sustainable Development in Southern Africa, http://www.uneca.org

Union of Concerned Scientists, 2003, Global Environment, http://www.ucsusa.org

UNRIACSO (United Nations Regional Inter-Agency Coordination Support Office), 2003, Southern African Humanitarian Crisis Update, http://www.who.int

US Committee for Refugees, 2001, More than Half-million Newly Uprooted People in Central and Horn of Africa in 2001, http://www.refugees.org

U.S Agency for International Development, 2002, Southern African – Complex Drought, Fact Sheet #2, Fiscal Year 2002, http://www.dec.org

U.S Agency for International Development, 2002, Southern African – Complex Food Security Crisis Situation, Report #2, Fiscal Year 2002, http://www.dec.org

Van Apeldoorm, G. J., 1981, The 1972 – 74 Disaster: Responses and Consequences, in *Perspective on Drought and Famine in Nigeria*, George Allen and Unwin, London, 57 – 72.

Veenedaal, E. M., 1991, Adaptive Strategies of Grasses in a Semi-arid Savanna in Botswana, Doctorial Thesis, Vrije Universiteit, Amsterdam

Vogel, C. H., 1994, Consequences of Drought in Southern Africa 1960 – 1992, PhD thesis, University of Witwatersrand, Johannesburg, South Africa.

Vogel, C. H., 1994, South Africa, in Glantz, M. H., (ed), *Drought Follows the Plough: Cultivating Marginal Areas*, Cambridge University Press, Cambridge.

Vogel, C., 1998, Vulnerability and Global Environmental Change, Lucc News Letter, No.3: 15 – 18.

Vogel, C., Laing, M., and Karl, M., 2000, Drought in South Africa, with Special Reference to the 1980 – 94 Period in Wilhite (ed), Drought: A Global Assessment, Routledge.

Walker, B., 2003, The Resilience Alliance, in IHDP Update, News Letter of the International Human Dimensions Programme on Global Environmental Change.

Warren, D.M., Slikkerveer, L. J. and Brokensha, D., 1995, *The cultural dimension of development: indigenous knowledge systems.* London: IIED.

Watson, R. T., Zinyoera, M. C. and Moss, R. H., 1996, *Climate Change 1995: Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analysis*, Contribution of Working Group II to the Second Assessment Report of the Intergovernmental Panel on Climate Change, Cambrdge: Cambridge University Press.

Watson, R. T., Zinyoera, M. C., and Moss, R. H., 1998, *The regional Impacts of Climate Change: An Assessment of Vulnerability*, A special Report of IPCC working Group II, Cambridge: Cambridge University Press.

Watts, M. J., 1983, *Silent Violence: Food Famine and Peasantry in Northern Nigeria*, University of California Press, Berkeley.

Westley, K. (ed), 1999, Household Livelihood Assessment in Midlands and Masvingo Provinces; CARE International in Zimbabwe.

Wilhite, D.A., 1992, Drought, *Encyclopedia of Earth Systems Science*, CA: Academic Press, San Deigo, 2: 81 – 92.

White, R., 1993, Livestock development and pastoral production on communal rangelands in Botswana, The Botswana Society, Gaborone.

WMO (World Metrological Organization), 2000, WMO Statement on the Status of the Global Climate in 2000.WMO, Geneva, 19 December 2000.

World Bank, 1993, AIDS and African Development Washington DC: World Bank

World Food Programme, 1993, Food Aid Management During the 1992 – 93 Drought Relief Operation, WFP Lilongwe.

WMO (World Metrological Organization), 1975, Drought and Agriculture; WMO Technical Note, Number 138, Report of the CAGM Working Group on the Assessment of Drought, Geneva, Switzerland: WMO.

Worster, D., 1979, *Dust Bowl: The Southern Great Plans in the 1930s*, Oxford University Press, New York.

WWF, 2004, Changing a Delicate Balance, http://www.panda.org

WWF, 2002, Climate Change Threatens Africa's People and Wildlife, http://www.wwf.org.uk

Yone, G., 2000, Assessing the Role of Adaptation in Evaluating Vulnerability to Climate Change, *Change Climate*, 46: 371 – 390.

APPENDIX 1

QUESTIONNAIRE FOR HOUSEHOLDS IN KASANE AND MATSHENG

UNIVERSITY OF THE WITSWATERSRAND
SCHOOL OF GEOGRAPHY, ARCHAEOLOGY AND ENVIRONMENTAL STUDIES

VULNERABILITY TO CLIMATE VARIABILITY IN BOTSWANA
1972 – 2002

Date of interview _____

Village name _____

Household number _____

Socio-economic characteristics of households

1. Sex of respondent? Male _____ Female _____
2. Household head? Male _____ Female _____
3. Age of respondent? _____
4. Are you
   a) Employed_____
   b) Unemployed_____
   c) Self-employed_____

   Please provide more details regarding the nature of your work

_____
_____
_____
_____

5. How many members in your household are
   a) Employed _____
   b) Unemployed _____
   c) Self-employed _____

6. What is the main source of income in your household?

   _____

   _____

   _____

   _____

   _____

7. What is the highest level of education attained?
   a) None_____
   b) Primary_____
   c) Secondary_____
   d) Tertiary_____
   e) Other_____

8. How many children are in school? _____

9. Household size?

Number of adults (18 +)	
Number of young people aged (13 – 17)	
Number of children under 13 years	
Total	

10. How long have you stayed here? _____

11. Where did you stay before coming here? _____

12. Is there agricultural land here? Yes_____ No_____

13. Who owns the land?

_____

_____

_____

14. How is land allocated?

_____

_____

_____

15. Can everyone have access to land? Yes ____ No_____

16. If no, who can have access to it and why?

_____

_____

_____

Food Consumption and livelihoods

17. Does your household produce agricultural goods? Yes ____ No_____

18. If yes, what agricultural goods does your household produce?

_____

_____

_____

19. Is this food sufficient for home consumption? Yes___ No____

20. Do you sell any of your agricultural produce? Yes___ No____

21. If yes how much money do make on average? _____

22. What stock does your household have?

	Goats	Pigs	Poultry	Sheep	Donkeys	Cattle	None
Number							

Drought Issues

23. What do you understand by the word Drought?

_____

_____

_____

24. Would you say your village is experiencing drought at present? Yes___ No__

25. Has this place always experienced drought? Yes____ No____ Don't know___

26. How often does this place experience drought? _____

27. How many times has this area experienced drought since you started living here? Please list the years if possible.

_____

_____

_____

28. In which year did you experience the worst drought?

29. When do you expect the next drought? _____

30. How severely has your household been affected by drought? Please explain.

_____

_____

_____

_____

_____

31. How does drought influenced employment and Jobs?

32. How does drought affect family and social life?

33. What measure has your household taken to reduce the damage caused by drought?

34. What long-term measures has your household taken to adapt to drought?

35. What measures are the most important in your households? Please rank them in the order of importance.

_____

_____

_____

_____

36. Are there any changes in the way you deal with drought today compared to the past? Yes___ No____

37. If yes please explain

_____

_____

_____

_____

_____

_____

_____

_____

38. Who has been most affected by drought?

_____

_____

_____

_____

39. Does the community take any actions to deal with drought? Yes___ No___

40. If yes what actions?

_____

_____

_____

41. Do you receive any help from the government during drought years? Yes___ No____

42. If yes what kind of help?

_____

_____

_____

_____

_____

_____

_____

_____

43. For how long does the government provide help?

_____

_____

_____

_____

44. Do you find the government help adequate? Yes____ No____

45. Please provide more details.

_____

_____

_____

_____

46. Are you able to tell when a drought will come? Yes___ No____

47. If yes how can you tell?

_____

_____

_____

48. How to do you prepare for the drought?

_____

_____

_____

49. What problems do you experience that prevent you from coping with drought?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

50. How do see the future of this village?

APPENDIX 2

QUESTIONS USED TO GUIDE FOCUS GROUP DISCUSSIONS

UNIVERSITY OF THE WITSWATERSRAND
SCHOOL OF GEOGRAPHY, ARCHAEOLOGY AND ENVIRONMENTAL STUDIES

VULNERABILITY TO CLIMATE VARIABILITY IN BOTSWANA 1972 – 2002

1. What was this area like in the past?
2. Has there been any change in the climate since you started living here?
3. Has there been any change in the physical environment since you started living here?
4. How would you describe your environment?
5. Who owns the land?
6. How is land allocated?
7. What can have access to it and why?
8. What agricultural goods are produced here?
9. Is enough food produced here?
10. Is any of the food produced here sold?
11. What stock is most common here?
12. What do you understand by the word Drought?
13. Would you say your village is experiencing drought at present?
14. Has this place always experienced drought?
15. How often does this place experience drought?
16. How many times has this area experienced drought since you started living here? Please list the years if possible.
17. In which year did you experience the worst drought?
18. When do you expect the next drought?
19. How severely has the community been affected by drought?
20. How does drought affect family and social life in your community?
21. What measure has your community taken to deal with the impacts of drought?
22. What long-term measures has your community taken to adapt to drought?

23. What measures are the most important in you your community? Please rank them in the order of importance.
24. Are there any changes in the way you deal with drought today compared to the past?
25. Who has been most affected by drought?
26. Does your community receive any help from the government during drought years?
27. Do you find the government help adequate?
28. Are you able to tell when a drought will come?
29. What problems do you experience that prevent you from coping with drought?
30. How do see the future of this village?

APPENDIX 3

RESEARCH PERMIT

TELEGRAMS: PULA
TELEPHONE: 350800
TELEX: 2655 BD

REPUBLIC OF BOTSWANA

OFFICE OF THE PRESIDENT
PRIVATE BAG 001
GABORONE

OP 46/1 C (76)

30 October 2002

Ms. Agnes A. Babugura
c/o Dr. A. K. Babugura
Maths/Science Department
University of Botswana
P/Bag 0022
Gaborone

Dear Madam,

RE: GRANT OF A RESEARCH PERMIT: MS. A. A. BABUGURA

Your application for a permit refers.

We are pleased to inform you that you have been granted permission to conduct a study entitled "Vulnerability to Climate Variability in Botswana". The research will be carried out at Chobe and Kgalagadi Districts.

The permit is valid for a period not exceeding one (1) year effective October 30, 2002.

The permit is granted subject to the following conditions:

1. Copies of any report/papers written as a result of the study are directly deposited with the Office of the President, National Assembly, Ministry of Agriculture, Ministry of Works, Transport & Communications, Ministry of Local Government, National Archives, National Library Service, Research and Development Office, National Conservation Strategy Agency and University of Botswana Library.

2. You reconsider the budget to ensure that adequate funds are available for this study.

3. You conduct the study according to the particulars furnished in the application.

4. The permit does not give authority to enter any premises, private establishment or protected area. Permission for such entry should be negotiated with those concerned.

5. Failure to comply with any of the above-stipulated conditions will result in the immediate cancellation of the permit.

Yours faithfully

J. Mosweu
for/PERMANENT SECRETARY TO THE PRESIDENT

cc: Permanent Secretary
- Ministry of Agriculture
- Ministry of Local Government
- Ministry of Works, Transport & Communications

Clerk of the National Assembly
Executive Secretary, National Conservation Strategy Agency
Director, National Archives
Director, National Library Service
Director, Research and Development Office
Librarian, University of Botswana Library
District Commissioner/Council Secretary
- Chobe District
- Kgalagadi District

Land Board Secretary
- Chobe Land Board
- Kgalagadi Land Board