A STUDY OF PERCEPTIONS, KNOWLEDGE AND UNDERSTANDING OF DESERTIFICATION AND ITS CAUSES AMONG DECISION MAKERS IN NORTHERN NAMIBIA

BY

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ABSTRACT

This study was aimed at investigating the perceptions, knowledge and understanding of desertification and its causes among decision makers in northern Namibia. The focus of investigation was on desertification and its major causes as identified in the general literature, *viz.* deforestation, overgrazing and overcultivation. Particular attention was given to the socio-economic and cultural factors which are behind these perceived 'ecological' causes of desertification. Furthermore, the respondents were also engaged in the generation of solutions to the problem of desertification and its causes.

Data collection was based on semi-structured interviews with the regional governors, councillors and chief headmen from the four northern regions. A qualitative approach was adopted for the research and findings are essentially descriptive and qualitative.

It is anticipated that the study will make an important contribution to the current debate on desertification in Namibia, specifically with regard to the perceptions, knowledge and understanding of desertification and its causes among the decision makers in northern Namibia.

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LIST OF ACRONYMS USED IN THE TEXT AND REFERENCES

DAPP	Development Aid from People to People
DC-PAC	Desertification Control Programme Activity Centre.
DEA	Directorate of Environmental Affairs.
DEES	Directorate of Extension & Engineering Services.
DoF	Directorate of Forestry.
DRFN	Desert Research Foundation of Namibia.
EE	Environmental Education
EEASA	Environmental Education Association of Southern Africa
FAO	UN Food and Agriculture Organization.
FFWP	Food For Work Programme.
IUCN	International Union for Conservation of Nature and Natural Resources
IISD	International Institute for Sustainable Development.
MAWRD	Ministry of Agriculture, Water and Rural Development.
ME&T	Ministry of Environment & Tourism.
NEPRU	Namibia Economic Policy Research Unit.
NGO	Non-Governmental Organization.
NISER	Namibian Institute of Social and Economic Research
OALS	Office of Arid Land Studies.
OPO	Ovamboland People's Organization.
RDC	Rural Development Centre.
SADC	Southern African Development Community.
SWANU	South West African National Union.
SWAPO	South West African People's Organization.
UN	United Nations.
UNCED	United Nation Conference on Environment and Development.
UNCOD	United Nations Conference on Desertification.
UNEP	United Nation Environment Programme.
UNESCO	United Nations Educational, Scientific and Cultural Organisation.

UNICEF	United Nations International Children's Emergency Fund.
USSR	Union of Soviet Socialist Republic.
WRI	World Resources Institute.

CHAPTER 1

INTRODUCTION TO THE STUDY

1.1 INTRODUCTION

This chapter provides a background to the research, describes its aims and describes the physical and socio-economic environment of Namibia. Factors such as population, soils and water resources which have a direct bearing on the processes of desertification are highlighted. A brief history of Namibia is also given, with special emphasis on those events that have shaped the environmental situation of the communal areas.

The background against which this study was initiated has two important dimensions. These are firstly, the growing awareness of environmental issues and concern about environmental problems, both globally and in Namibia, and secondly, the growing awareness of desertification and its causes in Namibia.

During his work as an extension office coordinator, the researcher has become aware that the process of desertification is increasingly taking place in Namibia and especially in the northern part of the country, where there exist many of the conditions necessary for this process to take place namely, population density (both human and animal), deforestation, overgrazing and overcultivation. Deforestation in particular (the first step to desertification following Grainger, 1990) is widely noticeable in northern Namibia. These observations were supplemented and shaped by the researcher's study for a Master degree in Environmental Education which led him to better understanding of the complexity of the causes, symptoms and effects of desertification, hence the choice of the topic.

1.2 AIMS OF THE STUDY

The concept of desertification is fairly new in Namibia and does not seem to be widely understood amongst Namibians. This research was designed to investigate the perceptions, knowledge and understanding of desertification and its causes among decision makers in northern Namibia. The focus of investigation was on desertification and its major causes as identified in the general literature *viz.* deforestation, overgrazing and overcultivation (Seely & Jacobson, 1994; SADC, 1994). Particular attention is paid to the socio-economic, cultural and historical factors which are behind these perceived 'ecological' causes of desertification.

The study aims to:

- ascertain how agricultural decision makers in northern Namibia (hereafter referred to as the respondents) currently perceive desertification and its causes.
- establish the respondents' knowledge and understanding of the concept and causes of desertification with particular reference to the three main causes identified in the general literature on the subject *viz.* deforestation, overgrazing and overcultivation (Seely & Jacobson, 1994; SADC, 1994).
- explore the respondents' perceptions of the extent to which the process of desertification is starting to take place in their own regions and what they think might be the causes.
- engage the respondents in the generation of solutions to the problem of desertification and its causes.
- provide a basis for the development of an educational programme on land-use planning for farmers in northern Namibia.

When this study was planned, it was generally assumed that the decision makers concerned were not intimately conversant with the concept of desertification and its major identified causes, but as land users would have an interest in the processes affecting them.

1.3 NAMIBIA

1.3.1 Position and physiography.

Namibia is located in the southwestern corner of Africa and covers an area of approximately 823 144 million hectares. The country is characterised by two distinct parts, the Namib Desert and the Central Plateau. The Namib desert stretches along the entire coastline and constitutes about 15 per cent of the total area of Namibia (Erkillä & Siiskonen, 1992). The Central Plateau is itself comprised of two regions, the Central Highland which covers about half of the country (Republic of Namibia, 1994) and the Mega Kalahari occupying the eastern and northeastern part of the country. There are only a few rivers in Namibia. Most of them are ephemeral (periodic), flowing sporadically after intensive rains. Namibia's only perennial rivers lie on the southern and northern borders. The Kunene, Kavango, Kwando-Linyanti-Chobe and Zambezi rivers lie on the northern border while the Orange river lies in the south. (See Figure 1.1 and Figure 1.2).

Figure 1.1 Map of Africa showing the position of Namibia

1.3.2 Climate

Namibia has been described as the driest country in sub-Saharan Africa (Quan *et al.*, 1994., Seely & Jacobson, 1994), 22 per cent of the land is arid (<100 mm rain per annum), 70 per cent is semi-arid (100 - 500 mm), and 8 per cent is dry sub-humid (>500 mm). The rainfall is furthermore extremely variable and unpredictable. The highest annual rainfall totals are found in the north eastern corner of the country. The potential average annual evapotranspiration varies between 3 700 mm in the central-southern area to 2 600 mm in the north thus far exceeding potential rainfall. In central region the warmest month is December, and in the south January. Temperatures often exceed 40°C. The coldest month is July in most parts of the country, except on the coast where the lowest temperatures can be expected in August. Temperatures often fall below freezing at night.

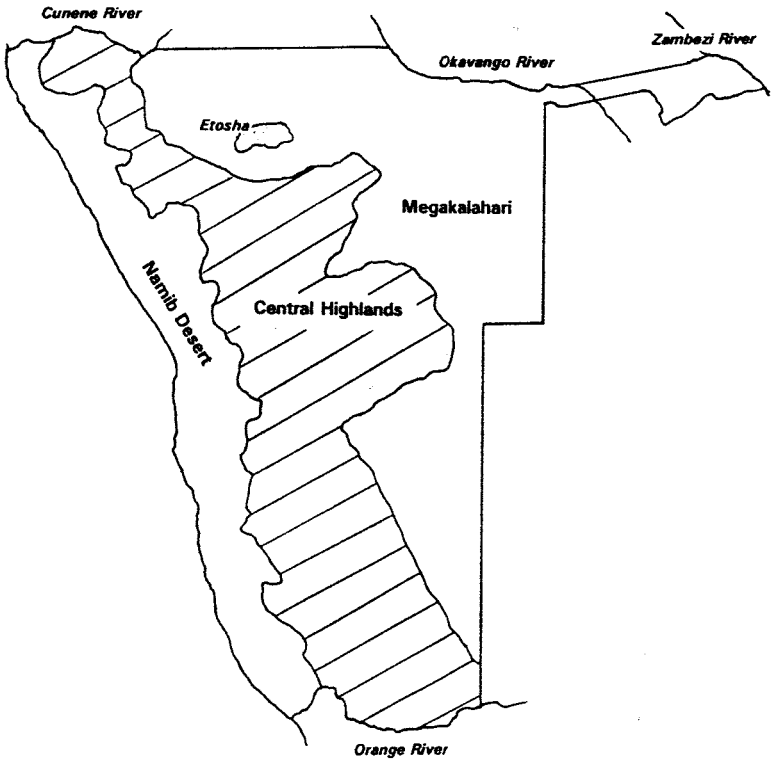

Figure 1.2 Physiographical features of Namibia

1.3.3 Population

Following the latest census figures, Namibia has a population of about 1,4 million. The inter-censual annual growth between 1981 and 1991 was 3.1 per cent per annum. The average population density in Namibia is only 1.7 inhabitants per km^2 whilst that of Sub-Sahara African is about 22 inhabitants per km^2. There are many languages spoken in Namibia but English is the official language of the country (Republic of Namibia, 1994).

1.3.4 Economy

Namibia has inherited a dualistic economy based on race-space segregation. Seventy per cent of the Namibian people live in a Third World economy, 5 per cent in First World conditions while the remaining 25 per cent live in a transitional economy (Moyo *et al.*, 1993). Namibia's economy depends mainly on its renewable and non-renewable natural resources, mainly agriculture and mining. This is of particular significance because it means that any process of desertification is likely to have a critical effect on the country's economy. The minerals and mining sector provide about 75 per cent of total export earnings while commercial agriculture is dominated by the needs of the export-oriented commercial ranching sector. The bulk of the population, in excess of 70 per cent are however dependent on subsistence agriculture. Fisheries, wildlife and tourism are increasingly contributing to the mainstream economy. The communally farmed areas of the country, mainly in the north are characterised by a marginalised subsistence economy which has been shaped by the dictates of colonial apartheid. The quality of life of many Namibians in rural areas is poor and depends mainly on wage labour, subsistence farming and old age pensions. The average per capita income in the subsistence farming sector was estimated to be US$ 100 in 1988, while Namibia as a whole has a per capita income in excess of US$1,000 (UNICEF/NISER, 1991).

1.3.5 History

According to Lau (1984), very little literature exists today on the pre-colonial history of Namibia, except the point of its termination. It is widely accepted that recorded Namibian history only really

started in 1884 when the German Government declared a Protectorate over the whole of Namibia from the Orange to the Kunene rivers. The territory henceforth became known as German South West Africa (Parker and Pfukani, 1982; Shillington, 1987; Republic of Namibia, 1994). The German annexation was made without the consent of the Namibian people and from that date on, the history of Namibia was one of persistent African resistance against colonialism (Shillington, 1987).

German colonial rule in Namibia came to an end on 19 July 1915 and in 1920, South Africa was given the mandate to rule the territory by the League of Nations. Afrikaners from South Africa and a few from Angola poured into the territory in the 1920's and by 1930, there were 30 000 whites in South West Africa owning or controlling about 60 per cent of the land. More and more land continued to go into the hands of white settlers and by 1960 there were already 6 000 white commercial farms in the central, eastern and southern parts of the country, some the size of two English counties. Africans were barred from owning land in the southern and central parts of Namibia, and were put into reserves or 'bantustans'. Generally these bantustan-subsistence farmers came to subsidise commercial farming through the provision of cheap labour, and were also forced to eke out a miserable living on the most unproductive patches of land which soon succumbed to overgrazing and soil erosion (Shillington, 1987). This situation has tended to make the communal areas to be more susceptible to the processes of desertification.

This state of affairs were not welcomed by the Africans, and during the late 1950's a new generation of leaders who opposed a continued South African presence began to emerge. In April 1959, the Owamboland People's Organisation (O.P.O.), and in May 1959, the South West African National Union (SWANU) were formed. In June 1960, the O.P.O. broadened into a national party and took on the name of the South West Africa People's Organisation (SWAPO). These organisations began to campaign for independence from South African rule.

In 1966 the General Assembly of the United Nations (UN), the League's successor, dissolved the mandate, but the South African Government remained. With little signs of success by peaceful agitation SWAPO decided to opt for querilla war (Parker and Pfukani, 1982) and in 1960 SWAPO querillas had their first clashes with South African armed forces at Ongulubashe in

northern Namibia. Since then the war between the people of Namibia and South Africa continued until the signing of the Geneva Protocol and the Protocol of Brazaville in 1988 which resulted in the implementation of UN Resolution 435 and 632 which culminated in the independence of Namibia on 21 March, 1990.

1.3.6 Desertification in Namibia

Following Seely and Jacobson (1994), in Namibia today, the naturally low and variable rainfall is thought to be a greater problem and affects more people today than in the past. Furthermore, the increasing population of people and domestic livestock as well as the activities of people are exacerbating the negative effects of dry environments for humans and for all living organism. Indeed these issues have been of such concern that they have been the subject of discussion at UN conferences (Skoupy, 1993). Desertification in Namibia, is thus regarded as one of the most urgent environmental issues in Namibia today (Seely, 1991., Republic of Namibia, 1992; Seely & Jacobson, 1994). It is widely considered to be caused by the processes of deforestation, overgrazing and over-cultivation (SADC, 1994., Seely & Jacobson, 1994). *Deforestation* is furthermore considered the major cause of desertification in Namibia and especially in the northern (O-4) regions. A major factor is thought to be the unsustainable use of trees for building poles, firewood, carving or the clearing land for agriculture (Erkkilä & Siiskonen, 1992; Seely & Jacobson, 1994).

Desertification due to *overgrazing* is considered to be minimal and has mainly occurred where provision of artificial water holes has caused animals to concentrate, and to remain for some time in normally dry places (Seely, 1991). Desertification due to *overcultivation* is however evident. Following Seely & Jacobson (1994) as populations increase, more people need land for fields, the fallow period shortens and the soil nutrients, fertility and productivity decreases. The situation is exacerbated by mechanical ploughing which is increasingly being used in rural communal areas in Namibia.

1.4 THE STUDY AREA (O-4 REGIONS: OSHANA, OMUSATI, OHANGWENA, OSHIKOTO)

1.4.1 Physical position

Following independence, the area of former Owambo in northern Namibia was divided into four administrative regions, being **Oshana, Omusati, Ohangwena and Oshikoto**. The study was carried out in these four regions and for the purpose of this study these four regions will be referred to as the **O-4 regions.** (See Figure 1.3).

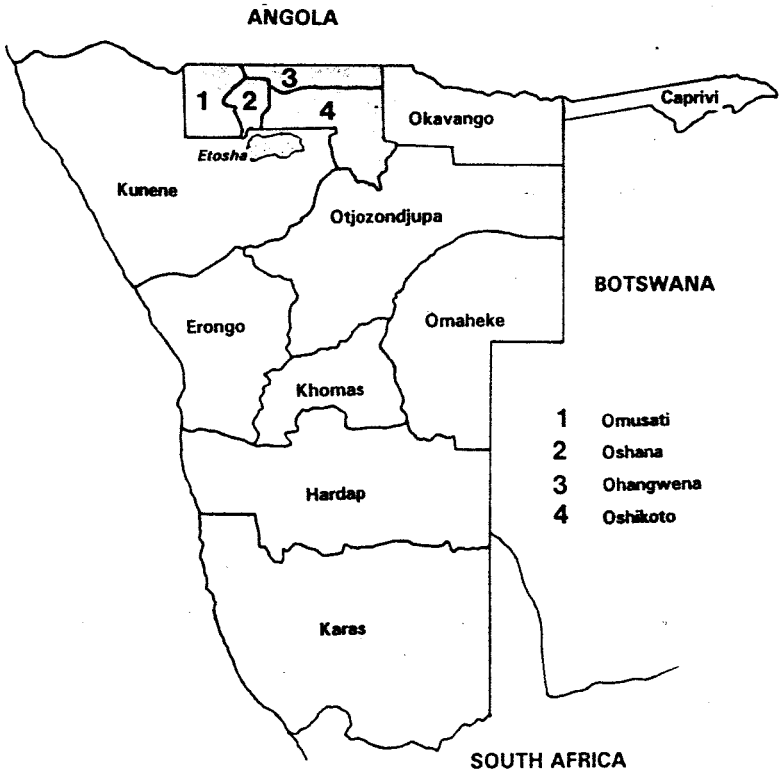

Figure 1.3 Map of Namibia showing the study area and other administrative regions.

The O-4 Regions, are bordered by Angola in the north, Okavango in the east, part of Kunene in the west and part of Kunene and Otjozondjupa in the south. The regions comprise a broad plain, about 1 100 m above sea level with a gradient of less than 2 per cent. The central area is slightly concave, sloping very gently southwards.

During the high floods in summer, water drains from the delta (Cuvelai catchment, 3,7 million ha) south of the Evale in Angola into Lake Oponono and via Ekuma channel to the Etosha Pan. The floodwater courses or *iishana*, vary in width from a few metres to over a kilometre and in depth from less than half a metre to more than 5 metres. All the water courses together form a large inland delta which is a very important ecological unit. This water recharges groundwater, renews grazing for livestock, brings fish and provides water for people and animals.

Ombuga Grassland extends north of the Etosha Pan . It is a flat plain about 50 km wide with numerous pans (seasonally flooded depressions). Most of the time the pans are dry, receiving water only from local runoff or from floodwater during the rainy season (Erkillä & Siiskonen, 1992).

1.4.2 Climate

The O-4 Regions of the North are semi-arid. The rainfall increases from an average of less than 350 mm in the south west to an average of 550 mm in the north east. Most of the rain falls in summer, from October to April with the peak in February and beginning of March. There is high variability in both the amount and timing of the rainfall, the greatest variability being in the west. In some years, rains may be good and spread evenly across the summer months. In others, all the rain may fall early in the season, or late in the season or the total rainfall may be very low. Drought, a long period of low rainfall is common in the O-4 regions (Seely, 1991). (See also Figure 1.4). The temperatures are high in summer (October, November and December) with mean December temperatures of 26°C and cool in winter with mean July temperature of 17°C (Seely, 1991).

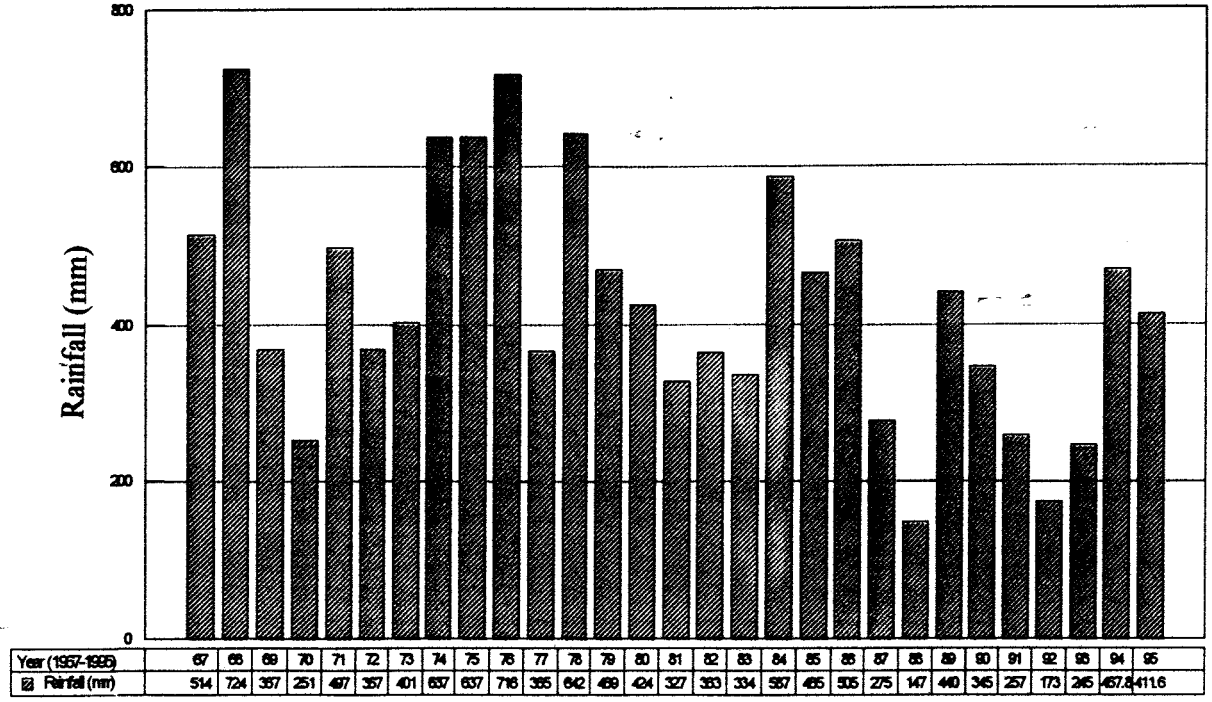

Figure 1.4 Rainfall data of the O-4 regions from 1967 to 1995. (Source: Extracted from data-Department of Water Affairs, Namibia).

1.4.3 Water resources

1.4.3.1 Surface water resources

There are only three natural surface water resources in the O-4 regions.

- *Iishana*, a system of shallow rivers that started several hundred kilometres north of the international border in Angola and flow southwards into Namibia is filled by the floods or *efundja* (see section 1.4.1).

- The Kunene River, the only perennial surface water resource in the O-4 regions forms the border between Namibia and Angola. Water is supplied from the Kunene River by pipelines and canals to the major centres of the O-4 regions. It is then made available to people and domestic animals through taps and watering points.

- Local precipitation accumulated in pans, excavations, dams and *iishana*. Many people living in rural areas of the O-4 regions still rely on the fresh surface water in these pans, dams, excavations and *iishana*. Due to high evaporation, these water resources seldom last throughout the dry season, and usually dry up rapidly from March onwards (Erkillä & Siiskonen, 1992).

1.4.3.2 Groundwater resources.

As in the rest of Namibia, most of the water used by residents of the O-4 regions comes from the groundwater resources. This underground water is found in certain rocky or sandy layers called aquifers. These groundwater resources are generally high in salinity and thus are often unusable for irrigation or human consumption. Saline groundwater comes closer to the surface almost everywhere in the O-4 regions, but especially in the south towards the Etosha Pan. The rural population in these regions tap their water from 2-3 m deep hand-dug wells called *omithima*, as well as from boreholes. Groundwater is recharged by water that flows in *iishana* and by direct local rainfall. A reduction in the amount of water flowing in *iishana* will therefore reduce recharge.

1.4.4 Soils

Following Erkillä & Siiskonen (1992), the O-4 regions are geologically dominated by the arenosols soils. The sand and underlying deposits vary in depth but can be as much as 300 metres. Rocks do not occur but precipitated calcareous 'white stones' are found in some sites. The soils are poor in humus and plant nutrients.

The soil pH varies from neutral to strongly alkaline, which together with high evaporation presents a danger of salinization. The salinity of the soil is generally high due to the high evaporation. These kind of soils are known to be sensitive to erosion.

1.4.5 Vegetation

According to Gies (1971), the vegetation of Namibia can primarily be divided , on the basis of rainfall, into three regions; desert, savannas and woodlands. The vegetation found in the O-4 regions comprises mainly the Savannas and Woodlands. The western part of the 0-4 regions belongs to the Mopane Savanna . The dominant tree species is '*omusati*' *Colophospermun mopane* (Erkillä & Siiskonen, 1992). In the most densely populated central part of the O-4 regions, the Mopane Savanna has been extensively converted to agricultural fields and in the western part to grazing land. The southern-central part of the 0-4 regions is dominated by Draft Shrub Savanna Fringe. In conformity with high salinity *Halophytic* vegetation dominates. The eastern part of the O-4 regions has been classified as Tree Savanna and Woodland (Gies, 1971). Especially in the north, fine stands of '*omipupa*' *Baikiaea plurijuga*, ' *omitundungu*' *Burkea africana*, '*omiguya*' *Pterocarpus angolensis* and '*ominkete*' *Ricinodendron rautanonii* occur.

1.4.6 Population

The study area comprises an area of 54 526 km² and a population of 633 182 inhabitants. Oshana has the highest population density of 26 persons per km², followed by Ohangwena with 17,7 persons per km² and Omusati with 15,1 persons per km². Oshikoto has the lowest population density of 4,8 persons per km². Thus, 50 per cent of the population of Namibia lives in the O-4 regions which comprises only 7 per cent of the total area of the country. This situation has a bearing on the process of desertification as will be seen in chapter five. The most prominent language spoken in the O-4 regions is '*Oshiwambo*' which includes the *Oshikwanyama, Oshindonga, Oshikwambi, Oshimbalantu, Oshingandjera, Oshikwaluudhi* and *Oshikolonkhadhi* dialects (Republic of Namibia, 1994).

1.5 OUTLINE OF THE THESIS

Chapter two contains a literature survey and provides a conceptual explanation of key terms used in the text. Chapter three describes the research methodologies employed, while chapters four, five and six present and discus the results of the research. This thesis is concluded in chapter seven which includes an evaluation of the research, its implication for Environmental Education and recommendations.

CHAPTER 2

LITERATURE SURVEY AND CONCEPTUAL CLARIFICATIONS

2.1 INTRODUCTION

This chapter initially presents an overview of extant literature on desertification and its causes from a global and a Namibian perspective. It then proceeds to a clarification of key concepts in the research through an examination of the current literature.

2.1.1 Global literature

Globally, there is a voluminous body of general literature on land degradation and especially desertification. The first *World Desertification Bibliography* was issued in 1976 by the University of Arizona's Office of Arid Land Studies (OALS) and presented at the 23rd International Geographical Congress held in Moscow in 1976 (Summers *et al.*, 1991). This volume contained 1,645 references dating from approximately 1967 to 1976. This edition was updated in 1980 and another 402 fully abstracted references were added. Due to the accumulation of fresh literature from 1980 onwards, the 1980 edition became outdated and UNEP in collaboration with OALS produced the first joint UNEP/OALS edition of the bibliography which contains 3,897 citations through 1988. Of the 3 897, 1 459 are on Africa and 23 are on Namibia while 64 are on South Africa and 216 are on Southern Africa (SADC).

Since 1988 numerous studies have been carried out by scholars from different regions (Poor *et al.*, 1989., Grainger, 1990., Odingo, 1990., Tivy, 1990., Seely, 1991., UNEP, 1991). In 1990, a comprehensive document entitled '*Desertification revisited*' was produced by Odingo (1990). This document examined UNEP's conceptually problematic definition of desertification. It also reviewed critically major reports of UNEP's assessment of the status of desertification and progress on combatting desertification. It further examined and compared reports and reviews of

the concept and definition of desertification from different scientists, organisations and institutions. The document also contains other useful reports on desertification or land degradation which have been useful to the present study, especially with regard to the clarification of the concepts of desertification and its causes.

From the researcher's point of view, the most important article contained in this document is that by Rozanov (1990) entitled '*Global Assessment of Desertification: Status and Methodology*'. This is a fairly comprehensive look at desertification globally but with the most interesting examples coming from the USSR in general and Middle Asia in particular. The study leaves no doubt in ones' mind that desertification or land degradation resulting largely from human activities is fast accelerating even in the so-called developed world. This is contrary to the popularly held view that desertification is a problem only of the Third World Countries. The article further gives the status of desertification globally as well as the states-of-the art of the methodological aspects of desertification assessment and monitoring. It also shows information available on desertification from 1977 up to 1990 on a global level.

The most useful paper in Odingo (1990) is that by Ottichilo *et al.* (1990), *A Methodology for Assessment and Mapping of Desertification - Report of the Kenya Pilot Study - using the modified FAO/UNEP Methodology for the Assessment of Mapping of Desertification*'. This is a report of the Kenya Pilot Study carried out in the two semi-arid districts of Baringo and Marsabit. The case study is particularly important because it attempts to adopt the FAO/UNEP Desertification Assessment Methodology to a particular situation. The lessons learnt from this study could be extremely useful in other similar situations around the world and especially in Namibia where most of the country is also semi-arid.

In 1987, a special issue of the international journal *Land Use Policy* devoted to the decade of combating desertification was published which opens with the review " 10 years after UNCOD" (Land Use Policy, 1987). This special issue is a valuable document for reference and has been useful to the present study particularly in terms of further references and ideas.

Another useful item of literature on desertification worth mentioning is the Report of the

Executive Director of UNEP (1991) entitled: *Status of Desertification and Implementation of the United Nations Plan of Action to Combat Desertification.* In this document, some recommendations are suggested that could prevent lands that are not affected or slightly affected by desertification from deteriorating, as well as applying measures and sustaining the productivity of lands that are moderately affected. These recommendations have been taken into account especially in chapter seven of the present study.

A six-monthly *Desertification Control Bulletin* of UNEP, is another important source of information on desertification or land degradation. The bulletins contain some valuable reports and papers from various scholars and scientists across the globe. Some of the most outstanding papers (from the point of view of the researcher and seen in the context to the present study) which have been useful as reference material to this study include; Cardy (1993) *Desertification: A fresh approach* . This article looks particularly at the concept of desertification, costs of desertification, drought, the economic factors and the need for global action. Darkoh (1993) *Land degradation and Soil conservation in Eastern and Southern Africa: A Research Agenda.* In this report, Darkoh looks at the problem of environmental degradation as well as the concept of sustainable development. He also gives a valuable literature review on land degradation and desertification. Oppong (1993) *Desertification in Northern Ghana*, is another paper which has been used substantially in the present study. Dregne, *et al.* (1991) in *A new Assessment of the World Status of Desertification* have provided valuable information to this study. Their article examines the concept of desertification with particular regard to the socio-economic side of desertification. It also looks at the definition of the World's drylands and the desertification costs, damage and rehabilitation. *Desertification and drought: An Ecological and Economic Analysis* by Kassas, *et al.* (1991) reviews the world wide manifestation of desertification as well as at the processes and results of desertification.

Another article worth mentioning is the report that was compiled from the Proceedings of a Workshop hosted by UNEP entitled, *Listening to the People: Social Aspects of Dryland Management* (IISD, 1993). In this report, the workshop participants substantially describe how the social dimension of desertification can be recognised and taken into account in the design and extension of all interventions to assist the people affected the most. (See section 6.4).

Grainger (1986., 1990), has produced two essential reference resources. *Desertification: how people make deserts, how people can stop and why they don't*, and *The Threatening Desert: Controlling desertification.* These two publications defined desertification and set out the question of desertification and drought. The causes especially the main causes studied in the present study, were looked at and the factors behind these causes were identified in these two publications. Grainger also proposes some measures to reduce or halt desertification in Dryland areas.

With regard to Africa, the only comprehensive bibliographic documentation on environmental degradation or desertification was compiled more than a decade ago by Leng (1982). Currently, no comprehensive bibliography on land degradation or desertification is known to exist in the Eastern and Southern Africa region (Dorkoh, 1993). While a few countries in southern Africa such as South Africa, Tanzania and Botswana have benefited from fairly comprehensive studies of certain aspects of desertification, the majority of the Countries in Southern Africa have not. The *Desertification Control Bulletin* mentioned above does however contain articles on land degradation or desertification that are particularly relevant to Africa.

2.1.2 Literature specific to Namibia

Apart from the 23 publications mentioned in the *World Desertification Bibliography* (Summers *et al.*, 1991), there exist few other literature sources on desertification specific to Namibia. Nearly all of these deal with either animal or plant adaptation to desert conditions. Probably the most important article on desertification in Namibia is that by Seely & Jacobson (1994), entitled: *Desertification and Namibia: a perspective.* This article gives a very interesting view of desertification in Namibia looking particularly at the factors that have given rise to desertification. Furthermore, it offers suggestions that could be employed to reduce these processes.

Another key document is the one edited by Wolters (1994), entitled: *Proceedings of Namibia's National Workshop to Combat Desertification.* The two most interesting papers from the researcher's point of view are; *The Namibian Environment and Desertification* (Seely, *et al.*, 1994) and *The Socio-Economic Situation of Farming in Namibia, and Sustainable Development*

by Tapscott (1994). Apart from these, the document also contains other interesting papers especially the one by Werner (1994) entitled: *Land Tenure issues in Namibia: Interaction with Sustainable Resource Management.*

Other important work done on desertification includes: *A preliminary Assessment of the Economic Impact of Desertification in Namibia* by Quan, *et al.* (1994). This document attempts to give the economic costs and factors involved in desertification. A comparison was made between the communal and the commercial areas of Namibia. The following two documents, one by Seely (1991) entitled; *Namibia: Drought and Desertification*, and the other one by Marsh (1992) *Namibia: Environmental degradation and the future* have also been useful to this study.

2.1.3 Literature specific to the study area

Very little literature on desertification specific to the study area exists. The *Proceedings of Namibia's National Workshop to Combat Desertification* (Wolters, 1994), contains some papers specific to the study area, the most interesting one, from the point of view of the researcher being, *Deforestation in Northern Namibia* by Shanyengana (1994). Other interesting documents are; *Oshanas: Sustaining People, Environment and Development in Central Owambo, Namibia* (Marsh & Seely, 1992) and *Understanding the Oshana Environment*, (Pallett, 1994).

As far as deforestation is concerned, a study by Erkillä and Siiskonen (1992) entitled *Forestry in Namibia 1850-1990,* has been an essential reference source with regard to deforestation in the O-4 regions. Likewise, Marsh (1994), *Trees: Threatened lifeline of Northern Namibia: The people's perspective,* has been a refreshing reference source in that it was based on field interviews. Renaud and Pelkonen (1994), gave some accounts on deforestation in Northern Namibia in their work entitled: *Deforestation and Soil fertility problems in the West of the Ohangwena Region.* In their study, they attributed much of the soil fertility problems facing farmers in Ohangwena region to the process of deforestation. Ollikainen (1991), gives an account on the consumption of wood in Namibia including Northern Namibia in his work entitled: *Study on wood consumption in Namibia.*

2.2 CONCEPTUAL CLARIFICATION

This section seeks to clarify the concepts of 'desertification', 'deforestation', 'overgrazing', and 'overcultivation' as well as that of 'perception', 'knowledge' and 'understanding'. Working definitions for the concepts will also be given and the results from the survey will be measured against these definitions to determine the degree of understanding of these concepts by the respondents.

2.2.1 Desertification

Desertification is one of the most serious global environmental problems today (UNEP, 1991). According to Goldsmith & Hildyard (1990), 30 per cent of the world's land surface is threatened with desertification and 75 per cent of this total (some, 3,3 million km^2) is already moderately degraded. This figure is significant since the world's present food producing land is only about 13 million km^2 (Mainguet, 1991). At present 40 million people are said to be suffering from malnutrition due to desertification in Africa alone and of these, some 2 million are believed to be suffering from starvation and on the verge of death (Cardy, 1993).

Desertification or land degradation is worldwide in its geographical spread, leaving no continent unaffected (Cardy, 1993). It is not new, it is not peculiar to any particular land use system, area of the world or culture (Spooner & Mann, 1982). However, until the Sahelian drought of 1968 - 73 the phenomenon elicited little more than academic interest (Tivy, 1990). It has only recently been perceived as a serious problem because the rate of global population growth has for the first time brought us to the point where it is not only conceivable that we shall run out of resources, but we have felt threatened by imminent failure to feed ourselves (Spooner & Mann, 1982). It has been estimated that since the beginning of the 19th century, the world's population has increased five-fold and continues to increase at a rate of 1.7 per cent per annum - and doubling every 35 years (Lean *et al.*, 1990).

Cardy (1993), has argued that even though desertification is a world wide phenomenon, the perception of it is not universal. Similarly, Spooner & Mann (1982) has stated that 'even where

the problem is perceived to be immediate, the perceptions are not uniform'. Differing views exist even among scientists with regard to the definition and causes of desertification (Grainger, 1990., Dregner *et al.*, 1991., Dorkoh, 1993., Oppong, 1993). Odingo (1990), has noted that at the Ad-hoc Consultative Meeting on Desertification held by UNEP/DC-PAC in Nairobi, as many as thirteen different definitions of the term could be identified. Glantz as quoted by Mainguet (1991), has estimated that the word desertification has more than 100 definitions.

The term desertification was coined by Aubreville for the first time in 1949 (Grainger, 1990) but it was only popularized during and after the 1968-73 drought disaster in the Sahelian region of Sub-Saharan Africa (Darkoh, 1993). Aubreville commented the process of land degradation that was taking place in semi-arid and even sub-humid zones as follows. "These are real deserts that are being born today, under our very eyes, in regions where the annual rainfall is from 700 mm to 1,000 mm " (Odingo, 1990:12). In the past there has been some confusion between two different processes *viz* desertification and expansion and contraction of the desert. For instance, the United Nations Conference on Desertification (UNCOD) in 1977 officially defined desertification as the spread of desert like conditions of low biological productivity into areas beyond previous desert boundaries (Tivy, 1990). Following this definition, the concept of desertification has been perceived as expanding deserts and advancing sand dunes (Grainger, 1990). Rugumamu (1993:69) for instance erroneously saw the environmental problem of Africa as the "spread of [existing] deserts and accelerated soil erosion". Unlike Rugumamu, however, Myers (1993), has termed the process of desert expansion 'desertization' and not desertification. Likewise, Grainger (1990), has argued that there is not enough evidence to support the notion of deserts actually expanding. Similarly, Dregne *et al.* (1991),has pointed out that desertification is a distinct process of *land degradation* throughout the drylands and must be distinguished from the quite separate phenomenon of observed cyclic oscillations of vegetation productivity that occur at desert fringes.

Also, it was originally assumed that desertification was a consequence of decreasing rainfall - of increasing climatic aridity (Tivy, 1990). For instance, Middleton (1991), stated that drought is the most obvious cause of desertification. Darkoh (1993) in sharp contrast has argued. that there is

little evidence to support the view that desertification results from a long term climatic change. On the contrary, he argues man's destructive activities - his bad management of land resources through overcultivation, deforestation, and overgrazing are the main causal elements in the process of desertification. Lambin (1993), on the other hand finds himself in-between these two extremes and has argued that it is difficult to single out man's destructive activities on land resources from other effects such as climatic change.

In 1992 the United Nation Conference on Environment and Development (UNCED) modified its earlier definition of desertification to read as follows. "Desertification is land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities" (Cardy, 1993:4). The new definition recognises that although the main cause of desertification is adverse human impact, the impact of natural climatic conditions, particularly recurrent droughts, may play a role under certain circumstances.

The anthropogenic role in desertification processes in arid, semi-arid and dry sub-humid developing regions is well known. These are deforestation in rural areas and around cities, overgrazing by ever-expanding herds, cultivation in ecologically marginal areas and agricultural over-exploitation, low levels of and inappropriate agricultural technologies, reduced fallow time, deep well construction, practice of annual bush fires during the dry season and unfavourable land tenure systems (Lambin, 1993). However, following Spooner & Mann (1982), there is also causation at another level, that of the economic and political conditions that generate land use decisions. Similarly the workshop *'Listening to the People: Social Aspects of Dryland Management'* (IISD, 1993) has noted that desertification and environmental degradation are complex processes brought about by a varied mix of interactions between political, social, economic as well as natural factors at global, regional, international, national and local levels.

Likewise Dregne *et al.* (1991) has pointed out that desertification is a socio-economic problem and that the overriding socio- economic issues in desertification are the imbalances of power and access to strategic resources between different groups. Similarly, Darkoh (1993), has noted that there has been a general tendency to attribute the causes 'simplistically or mechanistically' to either physical factors such as climate change, drought and soil erosion or to human factors such

as mismanagement of natural resources as manifested in overgrazing, overcultivation and deforestation. He asserted that while these factors are real and do indeed give rise to desertification, the tendency however, has been to simply accept them *per se* and not to question the historical, socio-economic and institutional factors that are behind them. Management, according to Baker (1981) is not the principal cause of desertification but the manifestation of more fundamental problems inherent in the structures of society eg. political, social and economic inequalities.

Lastly, the 1992 UNCED definition of desertification given above will be used as the working definition in this study. The following points that need to be noted:

- Unlike Spooner & Mann (1982), Oppong (1993), has asserted that following this definition, desertification is peculiar to certain areas since it is land degradation in arid, semi-arid and dry sub-humid areas of the earth. Land degradation elsewhere (for example in tropical rainforests) cannot be referred to as desertification.

- Both the role of human activities and the impact of natural climatic conditions in the process of desertification have been recognised.

- Land in this context includes soil and local water resources, land surface and natural vegetation or crops (Dregne *et al.* 1991).

- Degradation refers to the reduction of resource potential systematically over a long period of time by one or a combination of processes acting on the land (Oppong, 1993). These processes may include natural factors such as prolonged droughts, physical factors such as soil erosion, and human factors such as overcultivation, overgrazing and deforestation. These are in turn underlain by historical, socio-economic and institutional factors.

2.2.2 Deforestation

According to Crump (1991) in 1950 just over 100 million hectares (ha) of the world's forests were cleared but by 1975 well over 200 million ha had been destroyed to meet the needs and demands of the ever increasing human population. By the year 2000, between 600 and 700 million ha could have disappeared. Africa is the worst affected continent, losing 2,7 million ha every year (Grainger, 1986). These are just estimates and do not give us the exact situation of the problem of deforestation. Jones *et al.* (1990), have argued that the precise extent of deforestation cannot be accurately assessed due to the remoteness of many areas from which forest is removed, the lack of written records for deforestation and the counteracting effects of afforestation. It is not easy to measure the loss of open woodlands in the dry lands. As Grainger (1986), has noted when animals die of starvation, their carcasses can be counted, but nobody counts every tree that is chopped down to make way for agriculture.

Today deforestation has been claimed by the World Resources Institute (WRI) to be the world's most pressing land use problem (Jones *et al.*, 1990). It can be defined as the unsustainable harvesting of trees for building poles, fences, fuelwood, commercial purposes and carving, the permanent clearing of forest land, and its conversion to non-forest uses. The dying of trees due to diseases and the insidious effects of air pollution (most notably acid rain) or the felling or burning down of trees also contribute to deforestation (Goldsmith & Hildyard, 1990). In Africa for instance tree cover is decreasing rapidly, due mainly to clearing for settlements (building poles), crops, commercial purpose and domestic use and removal for fuelwood (Darkoh, 1994). Trees are being cut much faster than they are being replaced. According to Renaud and Pelkonen (1994) wood in rural areas is principally used for two main activities, the building of traditional dwellings and for firewood. Besides this, social and economic as well as cultural aspects have a causal effect. Gradwohl & Greenberg (1988), have for instance noted that deforestation has a complex connection with Third World poverty, and as a result it appears relentless and irreversible.

Deforestation has deprived many countries (including Namibia) of much of their tree cover, and there is now an urgent worldwide need to plant trees to restore ecological stability and combat

erosion, desertification, groundwater depletion, droughts and floods (Goldsmith & Hildyard, 1990). Ecologists and biologists (Gradwohl and Greenberg, 1988., Banks, 1989) have pointed out that removing the wood cover (forest) can have very serious side effects. Trees for example are responsible for local rainfall, since giant trees absorb a great deal of rainfall which they later release as additional moisture into the atmosphere. Cutting down these trees leads to rapid runoff eventually reducing the rainfall of the region to the extent that desert condition prevail. In addition, when the woodland have been cleared increased erosion often occurs. Without the tree cover, rain cannot be absorbed and so it drains off the ground, gradually wasting away the topsoil. Thus a working definition is taken to be; the unsustainable use of trees for construction poles, firewood, carving or the clearing of land for agriculture or settlements.

2.2.3 Overgrazing

Overgrazing occurs where too many animals are concentrated or clustered in small areas, such as around artificial water holes or kept on the same land for a long period (Goldsmith & Hildyard, 1990., Grainger, 1990). When livestock density becomes excessive and too many animals are grazed on the same area of rangelands, valuable perennial grasses are depleted and replaced by less nutritious annual plants, and the density of vegetation is reduced (Grainger, 1990). As a consequence, the land is laid bare, the soil becomes vulnerable to severe erosion, excessive compaction and sealing resulting from the trampling of livestock (especially near waterholes), and pioneer vegetation regrowth is retarded, all leading ultimately to desertification. Tivy (1990) has also pointed out that overgrazing in semi-arid areas (such as Namibia) has a deleterious impact on the hydrological cycle. Exposed surfaces become susceptible to sun-baking, soil sealing by torrential rain storms and to compaction by animals and human trampling. As a result, the infiltration capacity of the soil is reduced, and water loss by surface evaporation and surface run-off is increased with a decline in available precipitation.

In northern Namibia where the rainfall is low and variable, concentration of animals has occurred mainly where artificial water holes have been provided. At such places all available food has been consumed and seeds have disappeared from the soil. It is also argued that overstocking in northern Namibia in particular has lead to rapid deforestation (Marsh, 1992). Thus, overgrazing

has a chain reaction. Ultimately animal production is affected through decreasing calving rates, increasing death rates and reduced milk yields (Grainger, 1990).

Many factors have resulted in the rise of livestock density that has bring about overgrazing in especially the O-4 regions. These include, population pressure and the reduction of grazing areas by the encroachment of other land uses, such as rainfed cropping (Grainger, 1990., Seely & Jacobson, 1994). De Lange (1994) argues the major problem facing livestock owners using communal grazing is the lack of clearly defined rights and obligations for users. This leads to the over exploitation of the resource base (often by non-residents living in major urban centres) and inadequate maintenance of the agricultural infrastructures. Furthermore, the working definition of overgrazing is taken to be; it is when too many animals are grazed on the same area of rangelands, result in the depletion of valuable perennial grasses which are replaced by less nutritious annual plants and leading further to the reduction in vegetation density.

2.2.4 Overcultivation

Grainger (1990) has defined overcultivation as the cropping of land more intensively by reducing the fallow period and increasing plant population per unit area of land each year without replenishing fertility, through the application of fertilizers, manure or organic matter (crop residues) and the ploughing of marginal land as well as inappropriate cropping with tractors and heavy machinery which leads to soil compaction. Overcultivation therefore, reduces the fertility of the soil, damages its structures, and exposes it to erosion. This definition will be use as the working definition for this study.

In the O-4 regions most farmers still practice traditional agriculture which is characterised by low levels of mechanisation (Erkkilä & Siiskonen, 1992). Under the system of traditional agriculture, farmers do not aim to produce food for sale but to produce food for consumption by their own families (Goldsmith & Hildyard, 1990). According to Seely and Jacobson (1994), mechanical ploughing is, however, increasingly being used in rural communal areas in Namibia. Mechanical ploughing allows large areas to be ploughed with relatively little effort. In Namibia like much of Africa the mechanisation of agriculture together with human population increase has forced

farmers to increase food production either by continuous cultivation of the same land each year or by increasing the area cultivated onto marginal land.

Spooner & Mann (1982), has observed that in the case of rainfed cultivation, the main hazard arises from the extension of the system onto marginal soils that will not support it. Opportunistic ploughing of such soils, which may produce few good harvests in the short term, in the long term leads to erosion and the desertification processes.

2.2.5 Perception

It is important that we understand the community's perceptions *vis- a- vis* the multiple processes that lead to environmental degradation if effective plans are to be drawn up to counter any negative factors (IISD, 1993). According to Zapata (1971), 'perception is the interpretation of the meaning of a situation from the point of view of an individual and is based on his/her past experience'. This view has been echoed by Bryant (1974) who states that what a person perceives may be considerably affected by his past experiences. Similarly, according to Mkala-Pholo (1994), perception is the expression of the individual's, propositions, facts, opinions or beliefs, about a particular situation.

The Larousse Illustrated International Encyclopedia and Dictionary (1972), has further defined perception in its philosophical sense as the ability to perceive, especially understand, the action of the mind in referring sensations to the object which caused them, and in its psychological sense as the awareness through the senses of an external object. Similarly, Onions (1973) defined it as 'taking cognisance of objects in general or the intuitive recognition of a moral or aesthetic quality while Page *et al.* (1979), defined it as a process by which the individual organizes and make sense of his/her sensory experience.

Thus, people in general construct their environment through perceptual processes. From the different definitions given, perception is seen for the purpose of this research in a broader philosophical sense and not its narrow psychological sense, i.e. the way things are *seen and understood* by people based on their past experiences. It is a reflection of the personal reality of

an individual not necessarily the way things necessarily are (objective reality). A farmer for example may perceive a drought to be worst even when rainfall records clearly show this not to be the case or may perceive rainfall to be below average in a normal year due to desertification.

2.2.6 Knowledge and Understanding

The researcher needed to unpack the concept of 'understanding'. Following Sierpinska (1994) understanding is a very complex issue, both philosophically and practically . It can be thought of as an actual or potential mental experience, an expression of a situation, a problem or a phenomenon which reflects an act of understanding. Things can further be understood in various ways and the understanding may consist of a variety of things. For instance, if the object of understanding is a phenomenon then its understanding may consist in finding an explanation of why the phenomenon occurs. Quite a lot of understanding is related to this question `why` and consists in finding the premises 'reasons' or a `cause` for something. Similarly, according to Bryant (1974:2), "our perception and our understanding of our environment are very closely linked, and this relationship between what we perceive and what we understand is almost certainly a two way one. The better we understand the world around us, the more affectively can we set about gathering information about a particular part of it and similarly the better we perceive our surroundings, the more efficiently can we interpret what is going on."

Knowledge or knowing includes interaction with the environment in its own terms, exploring the territory, appreciating its scenery and understanding how its various components interact Sierpinska (1994).

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

The aims and assumptions of this study were presented and discussed in chapter 1. This chapter outlines the process of the research and describes and evaluates the methodology employed.

3.2 RESEARCH APPROACH

The nature of both the topic and the aims of the research led to the choice of a qualitative research approach (Miles & Huberman, 1984; Walker, 1985; Ely *et al.*, 1991). It has been stated that qualitative research is a systematic strategy for answering questions about people in a bounded social context (Locke *et al.*, 1993). It is a means for describing and attempting to understand the observed regularities in what people do, say and report as their experience. It raises the old question 'what's going on here?' Qualitative research is also exploratory and is used to find one's way into a relatively unstudied field and to lay the groundwork for further research (Dixon, 1989).

In qualitative research the focus of attention is on the perception and experience of the respondents. What individuals say they believe, the feelings they express, the explanations they give are treated as significant realities (Seidman, 1991). Qualitative research is seen as relativistic in the sense that it does not seek verifiable and absolute 'truth' (Locke *et al.*, 1993).

The working assumption is that people make sense out of their experiences (Seidman, 1991), and in doing so create their own reality. Therefore, in qualitative research, understanding both the content and construction of such multiple and contingent realities is regarded as central to answering the question 'what's going on here?' (Locke *et al.*, 1993).

Locke *et al.* (1993), have further noted that this kind of research is descriptive in the context that recorded words rather than numbers are the most common form of data. Theory is created to

explain the data as opposed to the collection of data to test a pre-established hypothesis. The main purpose of the researcher is to find out how the respondents perceive and understand their environment (Seidman, 1991). It should also be born in mind that qualitative research methods potentially yield rich data in relation to the limited number of research respondents. Cost in both money and time is a major consideration when working in an area as geographically extensive as northern Namibia (Walker, 1985).

3.3 THE RESEARCH INTERVIEW

Data were collected through semi-structured interviews (Burroughs, 1975), with 12 senior decision makers in the O-4 regions during April 1995. The major advantage of this interview technique is that it allows considerable flexibility in the following up of questions. It also lends itself to the creation of a relaxed person-to-person interaction where the interviewer initiates conversation for the specific purpose of obtaining relevant research information (Cohen & Manion, 1989). It further provides "the opportunity for the interviewer to probe deeply, to uncover new clues, to open up new dimensions of a problem and to secure vivid, accurate inclusive accounts that are based on personal experience" (Burgess as quoted by Walker, 1985:4).

The interview schedule used in the semi-structured interview guided the interviewer and helped him to steer the interview, while also acting as a checklist to make certain that all areas needing to be explore were covered (Schurink, 1988). The interview was tape recorded for later analysis and to provide a permanent record. It also prevented the unwitting selection of data that might occur with note-taking. The information captured on the tape recordings was transcribed, creating a reliable resource for reference and verifications. The data were qualitatively analyzed using conceptual constructs (Kerlinger, 1986). Use of key words or phrases were considered unsuitable for use with respondents for whom English was not a first language.

3.4 THE RESEARCH SAMPLE

3.4.1 The sample size

The focus of the research was on Regional Governors and Councillors and senior or Chief Headmen in their capacities as senior decision makers in the O-4 regions. It was originally intended that the sample size should be 20 but due to time pressure, the geographical vastness of the O-4 regions and the limited scale of the research made a sample of twelve more realistic and practicable. The final sample consisted of one Regional Governor, one Councillor and one chief headman from each of the regions thus giving;

four Regional Governors - one from each region
four Regional Councillors - one from each region
four Chief Headmen - one from each region.

3.4.2 Characteristics of research respondents

The characteristics of the sample relevant to the research are summarized in Table 3.1.

Table 3.1 Characteristics of respondents

Code	Age	Educational level	Previous work experience	Years in region	Farming experience	Farming activities
AG1	66	Std. 8 + Teacher diploma	School Inspector	3	C.F.	Liv./Crp.
BG2	63	Std. 10	Regional Commissioner	5	C.F.	Liv./Crp
CG3	49	B.A.	Exile	2 + exile	C.F.	Liv./Crp
DG4	71	Std. 3	General Dealer.	3 + exile	C.F.	Liv./Crp
AC5	39	Std. 7	Artisan	14	Cm.F.	Liv.
BC6	45	Dip.Pub. Admin. & Com.	Journalist	42 + exile	C.F.	Crp
CC7	45	Std. 7 + Teacher certificate	Exile	42 + exile	N.F.	-
DC8	35	Univ. Teacher diploma	Teacher	2 + exile	C.F.	Liv./Crp
AH9	73	No formal education	Headman	35	C.F.	Liv./Crp
BH10	42	Std. 8	Clerk	42	C.F.	Liv./Crp
CH11	68	Std. 7	Police	11	C.F.	Liv./Crp
DH12	64	Std. 4	General Dealer.	64	C.F.	Liv./Crp

Symbols used:

C.F. =	Communal Farmer	Crp. =	Crops
Cm.F. =	Commercial Farmer	AH-DH =	Chief Headmen
N.F. =	Not a farmer	AC-DC =	Regional Councillors
Liv. =	Livestock	AG-DG =	Regional Governors

All respondents were male and except for one all were married. It is unusual for women to have major decision making role in agriculture among the Owambo people (Van der Laan, 1993). The youngest respondent was 35 years of age and the oldest was 73 years of age giving a range of 38 years or two generations. The educational qualifications of the respondents covered a wide range

from the possession of a university degree to no-formal education at all. All respondents had spent more than two years in their respective regions or constituencies. Five had spent more than thirty years in their respective regions, while five had spent some time in political exile. In the case of these five it was assumed that they would have a fairly good sense of the environmental situation in their respective regions before and after their return from exile. With respect to the previous working experience of the respondents there was again a wide range. All respondents, except for one were farmers. Ten of the respondents had their farming operations in communal areas, while one respondent was farming in the commercial area. Nine were farming with both crops (mainly *omahangu* and sorghum) and livestock (mostly cattle and goats). One respondent farmed with crops only, while the other one with livestock only. All but one of the respondents have considerable farming experience and it was assumed that they would relate problems of desertification associated with farming to their own experience.

3.5 DATA COLLECTION

3.5.1 Pre-data collection procedures

At the time of the data collection the researcher was based in Windhoek, approximately 800 km. away from the O-4 regions. Before the actual collection of data the following were first accomplished:

i. A semi-structured interview schedule in English was compiled and pilot tested with three people of different experience, all of whom were from the O-4 regions. The pilot test furnished an opportunity to improve the questions in the interview schedule as well as upgrading the researcher's interview skills. All the necessary changes were made to the interview schedule and this pilot tested research schedule was translated into *Oshindonga* (one of the eight 'dialects' of *Oshiwambo* language which is predominantly spoken in the O-4 regions). *Oshindonga* interview schedule was not pilot tested, because the researcher assumed that it would yield the same responses as the English one. (See section 3.5).

ii. The researcher arranged appointments by telephone with each one of the four Regional

Governors. Every Regional Governor was requested to arrange and to facilitate an appointment with one councillor from his region. Appointments with chief headmen were not pre-arranged as it was very difficult for the Governors to contact them.

iii. Owing to the fact that the Regional Governors and Councillors were government employees, the researcher obtained a letter of introduction from the Permanent Secretary of the Ministry of Agriculture, Water and Rural Development.

iv. Accommodation was arranged with the Rural Development Centre at a reasonable rate. This reduced expenses substantially.

v. Transport from Windhoek to the O-4 regions was arranged and obtained from the sponsor of the research programme - the Rössing Foundation.

3.5.2 Data collection procedures

After all the above preparations were completed, the actual data collection started on 28 March 1995 with the Regional Governor of Oshikoto region. Before every interview, the researcher first explained the purpose of the interview, the kind of questions to be asked, the confidential nature of the information given, and that the respondent could ask the researcher any questions. Every respondent was given a choice of language in which the interview could take place. Six respondents opted for English and six for *Oshindonga*. Furthermore, permission was sought from every respondent for the use of a tape recorder. All were agreeable.

Interviews with three Regional Governors, four councillors and one headman were conducted in their offices during the day. The interview with one Regional Governor was conducted at his house during the evening, while three headmen were interviewed at their houses during the day. The length of the actual interview was on average two hours each. A small tape recorder using micro cassettes was used. The advantage of using a small tape recorder seems to be that it does not 'scare' the respondents and the atmosphere during the interviews remained generally relaxed. Furthermore, a small pocket sized tape recorder was more convenient to travel with and provided

the batteries were of good quality it did not seem to exhaust them easily. The collection of data was completed on 5 April 1995.

3.5.3 Data analysis

The data analysis was qualitative. Shortly after the completion of data collection, each respondent's interview was carefully transcribed. Translation from *Oshindonga* to English was done by the researcher during transcription. The actual analysis of data was done at Rhodes University in August 1995. All the data on individual transcripts was categorised according to the questions and entered on a master sheet. Concepts, rather than key words or phrases, were used during the completion of the master sheet. This was done because as mentioned in section 3.2 no respondent had English as his first language and therefore using key words or phrases could be problematic. The data was further categorised into three categories namely; ' conceptual understandings', perceptions of causes and consequences of deforestation, overgrazing, overcultivation and desertification' and 'possible solutions of the processes of the four factors mentioned above'.

For every questions asked during the interview, a mass of responses were received from the respondents, many overlapping question and many repetitive. For the researcher to gain a clear picture, a content analysis of all responses for a particular question was done (Miles & Huberman, 1984). The responses were totalled and summarised into tables. From the tables the researcher could then see which particular, reasons, causes or effects occurred most and which were most often grouped together. It was from these tables that the researcher could than make judgements about whether something was perceived to be more 'important' or 'significant', by counting the frequencies which the concept was cited by different respondents.

The responses (conceptual explanations) were then compared to concepts found in the general literature in order to evaluate the degree of understanding and knowledge of the respondents. It should be noted that where answers to particular questions were given in other questions, these answers were regarded as given in the question they would have been asked. People did not provide responses in the neat categories in which questions were asked. The researcher then

exercised subjective licence to enable him to make interpretations and to add to the general meaningfulness of the answers.

3.6 EVALUATION OF RESEARCH METHOD

As opposed to the case with most research programmes the research method used presented both opportunities and constraints. In terms of the former, the research method lent an opportunity to the researcher to go out in the field to interview the respondents. Nine of the respondents were known to the researcher through his work and the exercise thus enabled old acquaintances to be reunited. It was also a good opportunity for the researcher to meet with the highest decision makers in the O-4 regions and to meet most of them in their working environments. Any initial tensions and reluctance on the part of the respondents usually associated with such interviews seem to have been minimised by the fact that the majority of the respondents knew the researcher.

The researcher could sense an initial tension with the use of the tape recorder, especially during interviews with the chief headmen. Similarly, heavy rains during two interviews interrupted the interviews and resulted in a poor voice quality.

The use of English during the interview was a constraint to some of the respondents. The researcher could sense that a respondent had more to say and could say it more clearly were it not for the language used. The researcher could however not do much about this problem since the respondents were given a choice between English and *Oshindonga*, and it would not have been good if the researcher had switched over to *Oshindonga* against the will of the respondent. Perhaps the biggest shortcoming was that the *Oshindonga* interview schedule was not pilot tested. Translation of the schedule from English to *Oshindonga* was problematic - which resulted in respondents not providing responses in neat categories in which questions were asked. Moreover, the translation from English to *Oshindonga* was done directly using the nearest word translation. For instance, the direct translation from English to *Oshindonga* for 'what are the consequences' was '*oshi landuli osha shike*'. *Oshindonga* translation however turned out to mean more or less 'what would be the punishment'. So instead of naming the consequences, some of the respondents

actually responded by giving the punishment that would be meted out. The researcher only realised that the respondents tended to give the required responses to the following translation; '*oshi ke tashi holoka po ngele* ...', meaning more or less 'what will come about if ...' (eg. what will come about if there is deforestation?)', near the end of the interviewing process. Had the '*Oshindonga*' interview schedule been tested, the problem could have been detected and rectified before the interviews. It is an oversight that will not be repeated by the researcher in any future research.

Another problem was that a very fruitful and enjoyable interview with one of the Regional Councillors had to be hastened because it was closing time and the secretary wanted to close the office. Time for probing was therefore shortened and the researcher believes that valuable information could have been lost as a result. Likewise, another problem encountered during the interviews was that the researchers' interview with one of the Regional Governors turned out to be too long and in the process the researcher missed an appointment with a Regional Councillor. This problem has cost the researcher dearly, because he had to travel about 320 km in order to secure another appointment with that Regional Councillor. Furthermore, *iishana* were full of water and as a consequence the researcher's movement was either restricted to those areas with passable roads, or the researcher had to make unnecessary detours to get to the right respondents. Such a situation made the actual data collection procedure more expensive than had been anticipated.

A further problem experienced was that the researcher did not explain clearly enough to the Regional Governors to arrange appointments with Regional Councillors, who possessed specific experiences. It turned out that one Regional Councillor was not the right person to interview; - firstly he did not practice cultivation and therefore could not answer questions on overcultivation and secondly he could only comfortably converse with the researcher in Afrikaans - while no Afrikaans interview schedule was prepared. Thirdly, this particular respondent did not possess experience of deforestation because he lives in a constituency where they have a problem of bush thickening.

CHAPTER 4

CONCEPTUAL UNDERSTANDING OF DEFORESTATION, OVERGRAZING, OVERCULTIVATION AND DESERTIFICATION

4.1. INTRODUCTION

This chapter deals with the conceptual understanding of the respondents *vis-a-vis* desertification and its causes as identified in the general literature *viz.* deforestation, overgrazing and over-cultivation. The conceptual understandings of the identified three causes of desertification are studied and given, together with that of desertification, to look for possible links that might exist Questions put to respondents will be referred to, hereafter, by the number sequence used in the questionnaire provided in Appendix A. The section is denoted by a capital letter and number, followed by the number of the question, eg. C1:1 for question one of section C1..

4.2 CONCEPTUAL UNDERSTANDING OF DEFORESTATION

Respondent's understandings of the concept of deforestation were explored by means of an open-ended question C1:1: "To make sure that we are speaking the same language, what do you understand by the term 'deforestation'?" (See Appendix A). Responses to this question are summarised in Table 4.1.

Table 4.1 Responses to question C1:1 (re deforestation).

Conceptual clarification of deforestation	Frequency
Removal of trees and bushes	4
Removal of trees	3
Removal of trees of all kinds	2
Complete removal of trees and bushes	1
Decreasing of natural vegetation due to veld fires, cutting of trees and population increases	1
Decreasing rainfall	1
Factor - Aesthetics	1

4.2.1 Signs and degree of deforestation

To further explore understanding that deforestation was taking place in their regions or constituencies, the respondents were asked to express their perceived signs of deforestation C1:2. "Do you notice any sign of 'deforestation' in your constituency/region?" The researcher further probed to what extent they perceived the process of deforestation to be taking place in their respective regions or constituencies. Their responses are summarised in Table 4.2.

Table 4.2 Responses to question C1:2 (re deforestation).

Signs	Frequency
Bushes have disappeared	1
Trees have disappeared	1
Where you could find a thick forest 20 years ago, now there is nothing	1
People are shifting to other areas due to environmental degradation	1
Disappearance of bushes, trees and shrubs only in 15 years' time	1
The area was forested but only after 45 years there are no trees left, only stumps	1
People who fenced off areas say 10 years before find within their fences there are a lot of trees, but outside there is nothing	1
Degree of the process	
Deforestation started a long time ago	1
Deforestation has taken place to a great extent	7
It is not so serious	1
It was taking place at an alarming rate but now it is reduced	1
It is taking place due to population increases (not valid)	1
It is high in the village/constituency but not in the region	1

4.2.2 Discussions

All but one of the respondents perceived deforestation to mean the removal of trees or trees and bushes. The largest group (4) perceived deforestation to mean the removal of trees and bushes, and three perceived it as the removal of trees only. One related deforestation to the loss of beauty (aesthetics). Another factor worth mentioning is that one respondent has added that the removal of tees and bushes will result in the 'veld becoming a desert without trees'. This understanding of a 'veld' without trees being a 'desert' will have implications (as will be seen later) on the respondent's general understanding of the concept of desertification. One definition given by a

respondent is that "deforestation is the decreasing of vegetation due to veld fires, removal of trees and population increases". This particular definition suggests some deep understanding of the concept. It does not merely reflect the obvious act of removing trees, but goes deeper and portrays deforestation as a process which decreases the natural vegetation as a result of certain causal factors, including veld fires, removal of trees and increasing population.

It is necessary to mention that there is no one-word translation for 'deforestation' in the local language of the respondents. In most cases the translation used (for the respondents who were interviewed in the local language) was *ekekopo lyomiti*, directly meaning the 'cutting down of trees'. Not surprisingly therefore most of the conceptual clarifications given referred to deforestation as the 'cutting down of trees and bushes'. Indeed, the *Heritage Illustrated Dictionary of the English Language* (Morris, 1973) has defined 'deforest' (noun 'deforestation') as "to cut down and clear away the trees or forest from". Similarly, 'deforest' has been defined in *Larousse Illustrated International Encyclopedia and Dictionary* (1972:215) as "to cut down trees in (an area) and not replant" and 'deforestation' as the act of doing this. Jones *et al.* (1990) have defined 'deforestation' as "the permanent clearing of forest land and its conversion to non-forest uses", while the Desert Research Foundation of Namibia (1994) has defined it as the unsustainable harvesting of trees for building poles, fuelwood, carving or to clear land for agriculture.

By and large, the views expressed by the respondents reflected a fair understanding of the concept of deforestation. The majority of the respondents perceived deforestation as the cutting down of trees and bushes. Furthermore, this understanding clearly shows that the respondents perceived the process of deforestation as being brought about by human activities. Deforestation due to the natural dying out of certain tree and bush species as a result of, for instance, depletion of groundwater and diseases was only mentioned by one respondent when he was describing the process of desertification. This conceptualisation of man as the principal cause of deforestation may be used to good effect. If man is responsible for the destruction then surely man should be made responsible for the reconstruction.

With respect to the degree of deforestation, data from Table 4.2 suggests that seven of the

respondents perceived deforestation to have taken place to a great extent. In fact, two of the seven (from Oshana region) claim complete deforestation in their regions and constituencies. This observation confirms earlier findings by NEPRU (1991) which stated that the area in the neighbourhood of Oshakati and Ondangwa in northern Namibia are the most densely populated areas in Namibia. Within the last 30 years land clearing for cultivation, firewood, fencing and building has transformed large areas of savanna woodland into an almost treeless plain. One respondent perceived deforestation as 'not serious' while another perceived deforestation to have been taking place at an alarming rate but that it has been reduced. Both of these respondents are from Oshikoto region reflecting different conditions within the region and their perceptions tend to be confirmed by the researcher's own observations.

The decrease or sometimes the total disappearance of forested areas were given as signs that deforestation has taken place. As one respondent from Omusati who has spent 15 years in political exile has noted, "The whole veld here was full of bush, full of big trees like marula trees (*Sclerocarya birrea)*, some bushes that are known as '*iimbu*', '*omishegele*' (*Grewia* species), one could not see someone walking some 10 metres from you." This tends to confirm earlier studies done. Erkillä & Siiskonen (1992) for instance, reported that the missionary Hugo Ham noted in 1866 that between the communities of Ondonga and Uukwanyama existed a forest area about 60km wide. Half a century later the width of the forest area was only 40km. The wooded area was still about 10km wide in the 1950s - today there is no forest left between Ondonga and Uukwanyama. It is quite interesting that some could even give the time frame in which deforestation has taken place.

More interesting is the fact that no respondent perceived a shortage of fuelwood or poles for building houses and for fencing as a sign of deforestation. According to Mlava (1989) fuelwood scarcity is perhaps the most visible effect of deforestation amongst the rural population (see further section 5.3.1).

Most respondents perceived the process of deforestation as taking place to a great extent in their respective constituencies or regions. Generally, respondents from Oshikoto region perceived deforestation to be slight (or not so serious) in the region as a whole, but to be moderate to severe

in certain constituencies of the region. The respondents from Oshana region perceived deforestation to be severe and even very severe (complete deforestation). Degrees given centred on the extent to which disappearance of forested areas has taken place. The destruction of vegetation cover (especially trees and bushes) was a major factor for the estimation of the degree of deforestation by respondents. It can therefore be concluded that most respondents have an idea of what the environment looked like before total deforestation and their contribution may be considered informed opinions.

4.3 CONCEPTUAL UNDERSTANDING OF OVERGRAZING

A similar open-ended question (C2:1) to explore the respondent's understanding of the concept of overgrazing was put forward as follows: "To make sure that we are speaking the same language, what do you understand by the term 'overgrazing'?" The responses to this question are summarised in Table 4.3.

Table 4.3 Responses to question C2:1 (re overgrazing).

Conceptual clarification of overgrazing	**Frequency**
More livestock for the area that is available for grazing	3
Continuous overstocking of the same area	3
Degradation of range lands by too many vehicles driving off-road and the decreasing of grazing areas due to illegal fencing	1
Disappearance of grazing areas due to increase in human population and livestock densities	1
Deterioration of rangelands due to decreasing soil fertility	1
The fencing off of large areas by individuals reducing the grazing area and the concentration of too many animals on areas around water sources	3
The conversion of rangelands to cultivation fields	2
Too many animals on a farm	1

4.3.1 Signs and degree of overgrazing

To further explore the understanding of the respondents of the concept of overgrazing, all were asked the question C2:2. "Do you notice any sign of overgrazing in your constituency/region?" The researcher further probed to what extent they perceive the process of overgrazing to be taking place in their constituencies/regions. The summary of the responses is given in Table 4.4.

Table 4.4 Responses to question C2:2 (re overgrazing)

Signs	**Frequency**
Due to population growth grazing areas have disappeared	2
Encroachment of grazing areas by *omahangu* fields	2
Lack of grazing (areas)	3
Complaints from the community	1
Grass doesn't grow as it used to	2
Signs of completely overgrazed areas around water points	1
Degree of process	
There is overgrazing	4
Only in the constituency but not in the region itself	1
Three quarters of the region is overgrazed, only a quarter in western Omusati is not overgrazed	1
Sixty per cent of the region is overgrazed	1
Overgrazing is not much of a threat	2
Overgrazing is threatening	3

4.3.2 Discussions

As can be seen in Table 4.3 the respondents gave a broad range of descriptions for their understanding of 'overgrazing'. It is interesting to note that 'continuous grazing of the same area' and 'too many livestock for the area that is available for grazing' were cited most frequently by the respondents. It is interesting because, as will be seen in the discussions later, this is an indication of a deep understanding of the concept. One respondent has put it more succinctly as "continuous overstocking of the same area without rotating and as a consequence grasses are not given a chance for regrowth."

It should be mentioned that, again as with 'deforestation', there is no one-word translation for 'overgrazing' in the local language. Following Grainger (1990:77) "overgrazing occurs where too many animals are concentrated in one area, either throughout the year (on pastures surrounding villages) or on a seasonal basis (around boreholes or water points)." Likewise 'overgrazing' has been described by Goldsmith & Hildyard (1990) as the overstocking of land with grazing animals - cattle, donkeys, goats or sheep for example - which eliminate edible plant cover, particularly when the animals are clustered in small areas, such as around artificial waterholes, or kept on the same land for a long period. One factor which came out clearly in both these conceptual clarifications is the overstocking of an area with grazing animals. Looking then at the various definitions given by the respondents, the overstocking of an area as well as the decreasing of the grazing areas are two factors clearly distinctive in most of their conceptual clarifications.

It can be concluded that the respondents in general have formed their own definitions of overgrazing. In most cases causal factors of overgrazing have been incorporated into the definitions. Interesting, however, is the fact that the activities of man due to circumstances were perceived to be central to the process of overgrazing. It should be pointed out that the problem of definition is important, since the way in which overgrazing is defined will influence the identification of the process operating to cause it. Therefore the causal factors given in the various definitions will influence the methods which will be recommended to combat overgrazing in the O-4 regions. (See section 7.5).

Following Table 4.4, three respondents perceived the process to be threatening while another two as not threatening. Obviously the sign mentioned most frequently is lack of grazing. Complaints from the community was also expressed as a sign. Likewise, encroachment of the grazing areas by *omahangu* fields and the obvious signs of degraded areas around waterpoints. The respondents from Oshikoto region perceived a slight degree of overgrazing, while the respondents from Oshana perceived severe to very severe overgrazing. The destruction of vegetation cover is of course the first sign one would identify when estimating the degree of overgrazing.

Most significant is that all the respondents have observed some signs of the process of overgrazing in their respective areas. It is, however, also noticed that advanced gulleys, rills and

sheet erosion are signs of overgrazing (Oppong, 1993). Given that the O-4 regions have an overall gradient of less than 2 per cent, the most common type of erosion is usually sheet erosion which is very difficult to detect compared to gulleys for instance. This may explain why soil erosion was not mentioned as a sign of overgrazing. Moreover, it has been pointed out that the major factor used to estimate the degree of overgrazing is the destruction of vegetation cover, soil erosion being of secondary importance on grazing land (Middleton, 1991).

4.4 CONCEPTUAL UNDERSTANDING OF OVERCULTIVATION

An open-ended question (C3:1) for the exploration of the conceptual understanding of the respondents was repeated here: "To make sure that we are speaking the same language, what do you understand by the term 'overcultivation'?" The responses are summarised in Table 4.5.

Table 4.5 Responses to question C3:1 (re overcultivation).

Conceptual clarification	**Frequency**
It is the increasing of croplands by using tractors and the ploughing of the fertile topsoil underneath and the infertile subsoil on top without adding manure to the land until the land becomes unproductive	1
The increasing of cultivated area at the expense of other land uses	1
Increasing the cropping land by ploughing with tractors and heavy implements without applying manure onto the land until it becomes unproductive	1
The continuous cultivation of land unsuitable for cropping without applying manure	4
Continuous cultivation of a small area of land without giving it a rest or manure	2
Ploughing with tractors and heavy implements without applying manure or fertilizers	2
Over-using the land to the capacity where it does not produce any more	1
Not familiar with the concept	3
Ploughing the land not allocated by the headman for ploughing	1
When a person wants to get more from the land than is permitted by that land	1

4.4.1 Signs and degree of overcultivation

The respondents' understanding of the term 'overcultivation' was further explored by asking them the question C3:2. "Have you noticed any sign of overcultivation in your constituency/region?" The researcher further probed to what extent the process of overcultivation has taken place. The summary of the responses is given in Table 4.6.

Table 4.6 Responses to question C3:2 (re overcultivation)

Signs	**Frequency**
People are ploughing unsuitable areas for cropping	1
Poor soils without manure - use of tractors and heavy implements - there is no way out however	1
People cultivating areas one can clearly see are not suitable for cultivation - people cultivating in *Iishana* (even though they obtained no yields)	1
People not applying manure on the field - because there is no manure due to overgrazing	1
People ploughing anywhere they want	1
Poor yields due to decreasing fertility	1
Degree of the process	
Yes, overcultivation is taking place in the constituency and region	8
Is taking place to some extent, signs are there	2
Fifty per cent of the fields are overcultivated	1

4.4.2 Discussions

The continuous ploughing of the same area without replenishing the fertility by applying manure or fertilizers was cited most frequently as meaning overcultivation. For example, one respondent has put it as follows: "It is overusing the land to the capacity where it does not produce anymore". Furthermore, the continuous cultivation of land unsuitable for cropping without applying manure was mentioned four times to mean overcultivation. The cultivation of land with

tractors and heavy implements without applying manure or fertilizers was cited as meaning overcultivation. 'Not familiar with the concept' was cited three times.

It should firstly be pointed out that the nearest translation of the word 'overcultivation' is *eshunduko lyepya*, directly meaning 'land becoming unproductive'. Another translation was *elimo lya pitilila*, meaning more or less 'to cultivate more than is needed'. The researcher is of the opinion that this problem of translation will have a bearing on the responses. The exhaustion of the soil fertility clearly came out in most of the conceptual clarifications given by the respondents. This is supported by a study done by Renaud & Pelkonen (1994:11) in the Ohangwena region in which it was concluded that "soil fertility is probably the biggest problem farmers are facing in Ohangwena region." Similar concerns were expressed in an earlier study by NEPRU (1991:304) which pointed out that "the loss of soil fertility is a major source of concern to farmers in northern Namibia." The *Heritage Illustrated Dictionary of the English Language* defined 'overcropping' (which is the same as 'overcultivation') as "to exhaust the fertility of (land) by overcultivation" (Morris, 1973). Similarly Grainger (1990:65) has defined overcultivation as "the cropping of land more intensively by reducing the fallow period and increasing the number of crops planted each year without replenishing fertility through the application of fertilizers, manure or organic matter (crop residues) and the ploughing of marginal land."

It is interesting to note that most of the conceptual clarifications given by respondents (see Table 4.5) contain parts of Grainger's definition of overcultivation as given in section 2.2.4. Also interesting is the observation made by a respondent that in the past, when people used to plough with simple implements like hoes, overcultivation was not there, but now that people are using tractors and heavy equipment that turn the fertile topsoil under and brings the infertile subsoil on top overcultivation is caused. The increasing use of tractors in communal areas also has a bearing on the ploughing of marginal lands not suitable for cropping (Seely, 1991).

Only three of the respondents did not comprehend the concept of overcultivation. This can be explained in part by the fact that one of these is not a crop farmer and only farms with livestock. The other was a headman, whose concern was the undermining of the headman's power by not allowing him to point out to the prospective farmers where they should plough. As he saw it, this

kind of action has resulted in people ploughing on marginal lands not suitable for cropping. It can be concluded that the concept of overcultivation is fairly well understood by the majority of the respondents. This understanding, however, may stem from the translation of the word 'overcultivation' in the local language. Most of the respondents only comprehended the term after it was translated to them in the local language. It is therefore significant that public education on the concept is needed if results are to be expected from any method decided upon to remedy the situation.

All but one of the respondents perceived the process of overcultivation to be taking place in their constituencies/regions. One respondent from Oshana region has observed that 50 per cent of the fields in his region are overcultivated. Poor yields, non-application of manure, ploughing of distinctively unsuitable areas (like *iishana*) and the indiscriminate and uncontrolled ploughing were the main signs expressed by the respondents. One respondent observed that 'poor soils without manure - ploughing with tractors and heavy implements' are the signs and added 'there is no way out however'.

The signs mentioned by respondents are generally associated with the decreasing soil fertility and poor yields. Grainger (1990) has pointed our that overcultivation reduces the fertility of the soil, damages its structure and exposes it to erosion. It is further interesting to note that those respondents who expressed their concern about decreasing soil fertility attributed the lack of manure to overgrazing. In short, due to overgrazing, the farmers have taken their animals to *oohambo* resulting in a shortage of manure in the villages. The researcher is of the opinion however, that loss of soil productivity given as a reason to indicate the process of overcultivation and even the degree of the process, is misleading and may actually stem from the translation of the term 'overcultivation' in the local language. No-one can tell by simply looking at the soil without some kind of soil testing that the soil has lost its fertility. Indeed, following Middleton (1991), the major factor for estimating the degree of overcultivation of rainfed cropland is soil erosion. Factors such as fertility loss, crusting and compaction are of secondary importance on rainfed cropland.

4.5 CONCEPTUAL UNDERSTANDING OF DESERTIFICATION

The respondents' notions of what is meant by 'desertification' were explored by means of an open-ended question D:1. "To make sure that we are speaking the same language, what do you understand by the term 'desertification'?" (See Appendix A). The responses to this question are given in Table 4.7.

Table 4.7 Responses to question D: 1 (re desertification).

Conceptual clarification of desertification	Frequency
It is the making of deserts through deforestation and overgrazing	1
It is an area of land without trees and grass as a result of overgrazing and deforestation	1
It is a place that has lost its productive capacity as a result of disruption and may result in a desert	1
Desertification is related to deforestation and overgrazing	1
It is the process of complete removal of bushes and grass for construction of houses and the clearing of land for cultivation which may result in desert-like conditions	1
It is an area of land that has become infertile to such an extent that no vegetation can grow there anymore. This might be brought about by the continuous tilling of the land without a rest	1
It is a condition created by the movement of people, cars and animals all over the place resulting in the place losing all its grass cover and even its seed bank. It is an extension of deforestation in a dangerous way whereby all vegetation has disappeared, soil became infertile, and no new plants can grow	1
It is the end result of deforestation	1
Desertification includes deforestation, which will bring about low rainfall, land degradation due to overgrazing and overcultivation as a result of lack of manure	1
It is something to do with deforestation and encompasses veld fires, deforestation, overgrazing and removal of grass from the veld	1
It is a process that can be stopped by reducing overgrazing	1
I am not fully aware of the concept	2
It is confusing	1

4.5.1 Signs and degree of desertification

In order to further elicit the respondents' understanding of the concept of 'desertification', they were all asked D:2. "In your opinion, is the process of desertification taking place in your constituency/region?" The researcher further probed to what extent they perceive the process of desertification to be taking place in their respective constituencies or regions. The responses to this question are given in Table 4.8.

Table 4.8 Responses to question D:2 (re desertification).

Signs	**Frequency**
Population growth	1
Vanishing of certain tree species	2
Less fruits produced by traditional fruit trees, especially as compared with Angola	1
Non-existence of mopane worms, small animals, spring-hares and snakes as compared with Angola	1
Loss of livestock, good grazing and a good environment, especially as compared with Angola	1
Depletion of ground water	1
Loss of soil fertility	2
Grass in *iishana* not growing good any longer as it used to	1
Overgrazing and deforestation	2
Degree of the process	
Not much visible	3
It is not easy to notice	1
It is taking place on a large scale	4
It is taking place	1
Only in some parts	1
Only desertification due to veld fires	1
It is there especially during the drought	1

4.5.2 Discussions

The respondents have formed their own definitions. Some incorporated their ideas of the causes behind desertification and its consequences.

Eight of the conceptual clarifications given have an element of deforestation and overgrazing. In five of the concepts, the element of soil fertility has been mentioned. This, however, is attributed more to a lack of manure due mainly to overgrazing. (See section 4.4). Three of the respondents perceived desertification as a process of creating desert-like conditions through land degradation.

It is interesting to note too that in all the conceptual clarifications given, the destructive behaviour of man was perceived as a cause and no respondent actually attributed desertification to climatic variations. (Desertification was however attributed to climatic variations in section 5.2.4). The tendency to associate desertification with deforestation may be explained in part by the fact that the term 'desert' in the local language (*ombuga*) refers to a treeless grassveld. As one respondent has put it, "It is not easy to understand desertification, because in our region a place that is called 'desert' is a treeless place that is covered by grass." It is therefore not surprising that three respondents retorted by saying that they are not fully aware of the concept or that it is confusing. The concept was then further clarified to the three respondents by the researcher to elicit further discussions on the issue.

Not surprisingly, the concept of 'desertification' was seen to be related to deforestation and overgrazing, as the main factor in desertification is the destruction of vegetation cover (Oppong, 1993). Generally speaking, the process was perceived to be reducing the productivity of the resource base, be it land or vegetation. A point of interest is that almost every respondent gave a different conceptual clarification. This is not surprising since, even among the scientists, there exists a considerable difference of opinion with regard to the meaning of desertification and its causes (Odingo, 1990; Oppong, 1993; Seely & Jacobson, 1994). Kassas *et al.* (1991) for instance has defined desertification as referring to the various processes of ecological degradation by which the bio-diversity of land (in economic terms) is reduced. Likewise, a respondent from Ohangwena describes the process of desertification as follows: "It started slowly - destroying off

natural vegetation and due to population growth - certain tree species are noticeably vanishing, mostly because of lack of ground water and diseases."

Oppong (1993:46) described the process of desertification as follows: "It is a slow process and it operates through systems of land use that overtax the inherent bio-productive capacity of land, the most conspicuous feature of desertification includes the rapid reduction in the amount of vegetative cover (deforestation and overgrazing) and in the quality of vegetation (bio-diversity)". Indeed, this observation by Oppong offer confirmation to some of the conceptual clarifications given by the respondents. This is further significant in the sense that the conceptualisation of the problem of desertification which placed man at the centre of the issue called for further studies to determine the extent to which man can make a contribution to solving the desertification problem.

Nevertheless it is rather odd that while the process of desertification was related to deforestation, no respondent perceived acute shortages of wood, including firewood, poles and twigs for building houses, as a sign of desertification. On the other hand, all the respondents, except for four, perceived desertification to be taking place in their regions. Understandably three of the four respondents who said desertification is not so visible came from the Oshikoto region. Of all the four regions studied, Oshikoto region has the lowest population density of 4.8 persons/km^2 (Republic of Namibia, 1994). Deforestation, a process related to desertification by the majority of respondents, was not perceived to be a problem in Oshikoto region. (See section 4.2.2). The various definitions given by the respondents reflect a conceptualisation of a desert. Images such as 'making of desert'; 'land without trees and grass (lifeless)'; 'place that has lost its productive capacity'; 'desert-like conditions'; 'area that has become infertile'; 'area that has lost its grass cover and seed bank', and others are all perceptions conjuring a typical desert.

The process however was perceived to be most closely related to deforestation and overgrazing. This is of particular important, since it follows that the best way for 'curing' desertification in the O-4 regions is to grow back the forest through massive afforestation programmes and to improve grazing areas by resettling cattle owners in thinly settled areas. Unfortunately factors such as water availability, among other things, need further investigation. (See section 7.5).

It is interesting to note that all three causes identified in the general literature (deforestation, overgrazing and overcultivation) were incorporated into the conceptual clarifications of the respondents. Furthermore, the idea that human action plays a role in producing desertification is well entrenched in the various conceptual clarifications. The perceptions and understanding of desertification that were expressed by the respondents disproved, in a way, the researcher's pre-conceived notion that the concept of desertification is not widely understood in the O-4 regions. Be that as it may, if we want to 'combat' the process of desertification, it is significant that we recognise the problems of the definitions of desertification as expressed by the respondents. This is because the way in which desertification is defined will influence the identification of the processes operating as perceived by those it is directly affecting. This in turn will influence the methods decided upon to 'combat' the problem.

Eight respondents perceived the process of desertification to be taking place in their respective regions and constituencies to different extents. Four perceived the process as taking place on a large scale and posing a threat to the people. One respondent perceives desertification as taking place especially during the drought.

Four respondents classified the degree of desertification as severe (taking place on a large scale). Three perceived it as slight to moderate (those who said only in some parts, only due to veld fires and especially during the drought). One respondent stated that it is not easy to notice. A major factor in the estimation of the degree of desertification is the degradation of the natural vegetation. This notion was confirmed by the signs given by the respondents, namely vanishing of tree species, bio-diversity and general degradation of vegetation due to overgrazing. A comparison was also made between the environmental situation in Namibia and its neighbour, Angola. This was done to further substantiate the perceived signs of desertification.

Knowingly or unknowingly, the majority of the respondents have a fair understanding of desertification. The loss of bio-diversity for instance was mentioned by not less than three respondents as signs of desertification. As one respondent has explained, "In Angola one finds mopane worms, various small animals, spring-hares and snakes, but here is nothing - one can stay for even one year without seeing a single snake, this shows that we have desertification." Unknowingly this respondent was talking about the loss of bio-diversity.

The researcher is still of the opinion that desertification is confused with the local term for 'desert', which simply means a treeless grassland. This notion is confirmed by the perceptions of the signs of desertification as well as some of the incorporated ideas of the causes behind desertification that were expressed by the respondents.

4.6 CONCLUSIONS

By way of conclusion, the researcher is of the opinion that from the data presented in this chapter all the respondents have a general idea of the concepts dealt with. With regard to deforestation and overgrazing, the views expressed reflected a fairly deep understanding of these two concepts. This conclusion is supported by the general clarifications as well as the signs given by all respondents with regard to these two concepts.

With regard to overcultivation and desertification, the researcher would suggest that a large proportion (perhaps 10) of the respondents have a fair understanding of the two concepts. A small proportion (perhaps 2) of the respondents have only a more general idea of the two concepts. Similarly, signs given by the respondents for deforestation, overgrazing and desertification, were the most obvious and visible ones. Signs given for ovecultivation relate mainly to soil fertility. Most of the respondents generally perceived the processes of deforestation, overgrazing, overcultivation and desertification as taking place in their respective constituencies or regions to different extents.

Considering the fact that not all the respondents have an extensive education (see chapter 3), this situation is cause for some satisfaction. Notwithstanding this satisfaction, the overall results as presented in this chapter suggest that there is much room for improvement and 'public education' is needed with regard to the concepts studied and especially the concepts of overcultivation and desertification. This matter is taken up in chapter 7.

In summary, this chapter has reflected the respondents' perceptions, understanding and knowledge of the concepts of desertification and the three factors which are widely held to be amongst the most important causes. We will now go on to examine the respondents' perceptions, understanding and knowledge on the causes and effects of each of these issues.

CHAPTER 5

UNDERSTANDING OF CAUSES AND CONSEQUENCES

5.1 INTRODUCTION

There are two main schools of thought regarding the causes of desertification. The one believes human action to be the culprit while the other believes that natural factors are the key elements. This chapter will examines the understanding and perceptions of the study sample on the major ***causes*** and ***consequences*** of desertification, deforestation, overgrazing and overcultivation. The results will be reported on in the following order: the perceptions of causes of all the factors; perceptions of the consequences and perceptions of the social/cultural/economic changes brought about by these factors.

5.2 PERCEPTIONS OF CAUSES

5.2.1 Perceptions of the causes of deforestation

In order to explore their perceptions of the causes of deforestation, the respondents were asked the following question C1:3: "From your understanding of the term 'deforestation', what do you perceive as the causes of it?" The responses are summarised in Table 5.1.

Table 5.1 Responses to question C1:3 (re deforestation).

Perceived causes	**Frequency**
Population growth	4
Construction of traditional houses	9
Clearing for *omahangu* fields	6
Commercial purposes (selling as poles)	7
Veld fires	1
Construction of fences	5
Drought	1
Loss of power by chiefs	1
Open up for grazing	1
Charcoal production	1
For firewood	2
For fun	1
Due to road construction	1
For making implements and tools	1
Carelessness	1
Unemployment and poverty	2
Lack of understanding of the importance of trees	1

As can be seen from Table 5.1, deforestation in the O-4 regions was attributed mainly to the most obvious human activities namely construction of traditional houses (9) cutting of trees for selling (7), clearing for *omahangu* fields (6), and construction of fences (5). While these factors were the most obvious causes that could be perceived and experienced on a daily basis. Another perceived cause, which is not an obvious human activity, but mentioned by four respondents is 'population growth'. In lending support Shanyengana (1994) has stated that the rate of deforestation is directly proportional to population growth, thus population growth could be regarded to be a significant factor in the process of deforestation. Loss of power by chiefs was cited by a respondent as a cause. As he put it, "I think the chiefs were protectors of the forest - after the chiefs have lost some power, deforestation accelerated." Erkillä & Siiskonen (1992) have pointed out that the

high demand for poles for construction may be the main reason for deforestation in Owambo. It is this demand for poles that makes the selling of poles to be seen as a major cause of deforestation.

Other studies done in the area confirm the results in Table 5.1. Marsh (1992), for instance noted that under normal circumstances trees were felled to clear lands for growing crops. He suggested that population growth, and to a lesser extent overstocking, were leading to rapid deforestation. Findings from Table 5.1 do not however support the notion of overstocking. Similar studies done in other parts of the world tend to support the perceived causes of 'population growth' and 'clearing for cropping fields' as major causes of deforestation. In his study on desertification in northern Ghana for example, Oppong (1993) indicated that increased population pressure and the corresponding increase in agricultural expansion, especially in cultivation, are the main causes of deforestation.

Firewood has been pointed out in several studies as one of the major causes of deforestation in rural areas (NEPRU, 1991; Renaud & Pelkonen, 1994). This study (see Table 5.1) indicates however that firewood is not perceived to be a major cause of deforestation in rural areas of the O-4 regions. A respondent commented on this issue as follows: "Rural people don't cut trees for the purpose of firewood. If we don't have wood, we even use cattle dung or makalani seeds for fuel." Similar sentiments were expressed by a farmer in a study by Mlava (1989:12), "... the forests are being depleted by commercial firewood suppliers for the urban and industrial markets - these do cut trees - we villagers rarely chop down trees for firewood; the women and children will collect dead branches or cut them from trees." Similarly, Darkoh (1994) found that live trees are rarely considered a source of firewood by the rural population, but they are a major source of building and fencing poles. Similar views were expressed by a respondent in this study as follows: "the cutting of bushes for the purpose of firewood is a major problem." Following this quotation, rural people are cutting bushes for the purpose of firewood and not trees. As noted in chapter 4 the majority of respondents understood deforestation to mean 'the cutting of trees' and not so much the cutting of bushes.

It should, however, be realised that if deforestation needs to be 'combatted' in rural areas, serious

attention should be given to those major causes identified. For instance, the introduction of fuel saving stoves will not stop deforestation, but merely ease the plight of fuelwood scarcity. Changing attitudes towards the construction of traditional houses and fences would be more appropriate.

To further explore the respondents' perceptions of the causes of deforestation, they were asked the following question C1:8. "(a) Who are mostly responsible for cutting trees? (b) Why do you think this is so?" Responses are summarized in Table 5.2.

Table 5.2 Responses to question C1:8 (re deforestation).

Responsible	**Frequency**
Community at large	5
Angolans	2
Older generation	1
Illegal traders of tree poles	4
Young people (recruited by businessmen)	1
Owners of traditional houses	2
Unemployed people	4
Woodcarvers and toolmakers	1
Men (responsible for cutting of trees for construction)	1
Women (responsible for cutting bushes for firewood)	1
Poor people	1
Reasons	
For commercial purposes (to make money)	8
For construction of houses and fences	6
Unemployment and poverty	5
For firewood	1

The most frequently mentioned persons or groups responsible for cutting trees were the 'community at large'. This observation tends to confirm the testimonies in Table 5.1 (causes of

deforestation) which indicated that the construction of traditional houses and fencing were major causes of deforestation. Logically, the community at large could be regarded as the culprit in this regard.

It is quite interesting to note that 'illegal traders' and 'unemployed people' were cited four times each as being responsible for the cutting of trees, and that 'unemployment and poverty' were pointed out five times as the reasons for the cutting of trees. It has been pointed out by some respondents that the illegal traders are taking advantage of the unemployment situation by recruiting the unemployed to cut down trees which they then sell. These poles are then used for construction of traditional houses and fences. The selling of poles was pointed out eight times as the reason for the cutting of trees. (See also section 6.2.1.1). One respondent pointed out that men are responsible for cutting trees for the construction of houses while women are cutting trees for firewood (it could mean cutting bushes and not trees since women do not cut trees generally).

5.2.1.1 Perceptions of the main uses of wood.

The respondents' perceptions of the main uses of wood were explored by means of an open-ended question C1:7. " What are the main uses of wood in your constituency/region?" Responses are summarised in Table 5.3.

Table 5.3 Responses to question C1:7 (re deforestation).

Main uses of wood	**Frequency**
Construction of houses	7
Firewood	9
Carvings	1
Selling	3
Medicines	1
For tools and implements	1
Fencing	3
Shelter	1

Most frequently cited uses of wood were firewood and the construction of houses. Studies done in the area confirmed this observation (Ollikainen, 1991; Renaud & Pelkonen, 1994). Firewood was further singled out to be the major use of wood, while it was not perceived as a significant cause of deforestation. This observation of course is not surprising in rural areas were poles are seen as products of live trees and are responsible for deforestation while firewood, a product of dead wood, is seen as the major usage of wood. (See sections 4.2.2; 5.2.1; 5.3.1 & 7.2.2).

The respondents were also asked to indicate other fuel sources used besides wood by means of the following question C1:9. "Besides wood, what other fuel sources do people use?" Responses to this question are listed in Table 5.4.

Table 5.4 Responses to question C1:9 (re deforestation)

Fuel source used	**Frequency**
Gas (few - mostly in urban centres)	5
Electricity (few - only in urban centres)	4
Paraffin (few)	4
Charcoal	1
Cattle dung	5
Palm tree branches and leaves	3
Grass	3
Makalani seeds	2
Omahangu stalks	2
Stumps	1
Tree bark	1
Shrubs, young bushes and thorny plants	2

Gas, electricity and paraffin were cited five and four times respectively. All the respondents who indicated these alternative fuel sources pointed out that these sources are used by a few who are mainly in and around urban centres. Cattle dung was cited five times as used for fuel.

Four of these respondents have added that nowadays even the cattle dung is difficult to get. Two

are of the opinion that cattle dung is only used in *ombuga* areas. In the area of one respondent people do not use cattle dung for fuel, but as mortar to cover their huts.

These testimonies support Marsh's (1992) earlier findings that deforestation has become so serious in parts of Owambo that villages are now using cattle dung as cooking fuel. It seems however that the practice of using cattle dung for fuel is not new in the O-4 regions. One respondent had indicated that since time immemorial people have used cattle dung to fire clay pots and make them strong. Cattle dung provides the required heat for that process better than any other fuel source. This practice of using cattle dung for fuel may have negative effects on soil fertility, because it 'robs' the soil of important nutrients.

Grass and palm tree branches and leaves were also pointed out to be alternative fuel to firewood. The use of these sources is of particular significance. As Grainger (1990) has pointed out, it contributes to overgrazing since the shrinking of rangelands includes a reduction of assemblies of fodder like grasses, shrubs and small trees which all form valuable food sources.

5.2.2 Perceptions of the causes of overgrazing

In order to explore the understanding of respondents *vis-a-vis* the causes of overgrazing the following question (C2:3) was put to them: "From your understanding of the term 'overgrazing', what do you perceive as the causes of it?" Responses are summarised in Table 5.5.

Table 5.5 Responses to question C2:3 (re overgrazing)

Perceived causes	Frequency
The non-selling of cattle	3
Loss of grazing to cultivation and homesteads	7
Village headman only after money (selling cultivation land indiscriminately and at the expense of pasture land)	1
Increasing stock populations	5
Human population growth	3
Lack of water in certain areas with good grazing	4
Too many donkeys	4
Fencing of communal pasture by a few rich individuals	8
Off-road vehicles	1
Drought	2
Cutting of bushes that used to be food for small stock (deforestation)	1
Army worms	1
Lack of knowledge of stock farming	1
Poverty	1
Veld fires	1
Over concentration of animals at certain areas only	1
Saline water	1
Communal grazing system	1

From Table 5.5, it can be seen that fencing of communal pasture by a few rich individuals was by far the most obvious perceived cause, as one respondent stated. "The uncontrolled fencing of grazing area decreases the already small grazing area. Some don't even have a single goat but fenced off the area for no purpose." This observation confirmed findings of other important studies on the subject (De Lange, 1994; Tapscott, 1994). The lack of clearly defined rights and obligations for farmers using communal grazing, together with the realization of the impending scarcity of grazing land due to cultivation, may have created a tendency among rich communal farmers to fence off tracts of grazing for their own animals (NEPRU, 1991). Reckers (1994),

suggested that the problem of overgrazing was possibly due to population pressure and the fencing off of large tracts of areas by individuals. (See also Grainger, 1990; Seely & Jacobson, 1994; Tapscott, 1994). It was also interesting to note that the construction of fences was indicated to be a cause of both deforestation and overgrazing. This practice reduces the accessibility livestock owners have for their herds to the common pasturage. Tapscott (1994), has further pointed out that in the former Owambo, enclosure of pastures into private farms is being undertaken by the rich and sometimes politically powerful individuals at the expenses of the small powerless farmers.

The loss of grazing to cultivation and homesteads, increasing stock populations, lack of water in certain areas with good grazing and too many donkeys were all seen as problems related to overgrazing as was human population growth and the non-marketing of cattle. The latter part supported the widely held view that rural farmers are not interested in selling their cattle. NEPRU (1991), has pointed out that the majority of cattle owners in rural communities are not interested in selling cattle except to raise cash for a special need. They are more interested in acquiring cattle (NEPRU, 1991). It should also be noted that the colonial administration strongly discouraged marketing of cattle in the communal areas of Namibia, especially in the O-4 regions. Markets were manipulated with official trade restrictions and a ban on cattle export from the O-4 regions (Marsh & Seely, 1992; Van der Laan, 1993). This ban still continues after independence.

Another factor worth mentioning is that the general picture that can be drawn from table 5.5 is that the communal grazing in the O-4 regions has become limited. This factor also has historical underpinnings. Following Van der Laan (1993), before introduction of the homeland policy, people in the O-4 regions were used to moving their cattle further south or north to better rainfall areas in times of drought,but because of the red-line (a cordon fence dividing the commercial areas from the communal areas) on the south, the Angolan border to the north, and the new 'homeland borders' of Kaokoveld (now part of Okunene region) and Okavango to the west and east, they now have no new lands to migrate to. (See also Pallet, 1994, and Werner, 1994). The spread of grazing pressure more evenly over the available range through more effective land use planning and equitable water distribution may be an appropriate proposition to ease overgrazing in communal areas of the O-4 regions.

5.2.2.1 Perceptions of the livestock density.

Respondents' perceptions of the livestock density in their constituencies/regions were explored by means of an open-ended question C2:8. " Do you think there are the right number of livestock in your constituency/region?" The researcher further probed the type of livestock they think are in the majority. Their responses are summarised in Table 5.6.

Table 5.6 Responses to question C2:8 (re overgrazing).

Responses	**Frequency**
Too many livestock for grazing area available	4
Donkeys are unnecessarily too many	3
Not many livestock - cattle taken to *oohambo* (cattle posts)	3
Not too many, only grazing area that is too small	3
Just enough (in commercial areas)	1
Livestock is enough	1
Not too many - only over concentration of certain areas due to uneven distribution of water	1
Type of livestock	
Cattle and goats	2
Cattle, goats and donkeys in that order	3
Donkeys have died of internal parasites	1

Four respondents indicated that there are too many livestock for the area that is available for grazing. Interestingly, three respondents have pointed out that the number of livestock were right - it was only the grazing area that was too small. Three other respondents felt that there were not many livestock anymore in the villages because most of the cattle had been taken to *oohambo* (cattle posts). One respondent pointed out that livestock numbers are not too high, the problem is that animals are concentrated only in certain areas with good water while areas without water or with saline water are unused. Five of the respondents stated that cattle were in the majority, followed by goats and donkeys in that order. Three respondents felt however that donkeys were unnecessarily too many. The general feeling is that overgrazing can be attributed in most cases

to the number of donkeys. The issue of donkeys grazing 24 hours non-stop was also raised and several respondents have indicated that donkeys should be kraaled at night to prevent them from grazing day and night. Looking further at the other responses gives a picture that the general perception is that livestock numbers were not too high.

5.2.3 Perceptions of the causes of overcultivation

A similar question (C3:3), to those above, "From your understanding of the term 'overcultivation' what do you perceive as the causes of it? [Probe → are you aware of any social/cultural activities which might influence the process of overcultivation]" was employed to explore causes of overcultivation. The responses are summarised in Table 5.7.

Table 5.7 Responses to question C3:3 (re overcultivation).

Perceived causes	**Frequency**
Human population growth	4
Lack of fertilizers (chemical)	3
Deep ploughing with tractors and heavy implements without adding manure	5
Cultivation of too large an area (cannot maintain its fertility)	3
Scarcity of land	2
Continuous cultivation of the same land without adding manure [intensification] or resting it	2
Kinship	2
Lack of manure	8
Unemployment	2
Lack of knowledge of crop farming	1
Tilling of land not suitable for cropping [extensification]	3
Not allowing people to cut down trees	1
Lack of fallowing	1
Pests	1
Carelessness	1
Lack of money to buy fertilizers	1

Data from Table 5.7 shows that the causes mentioned most frequently were lack of manure (8), deep ploughing with tractors and heavy implements without adding manure (5), and human population growth (4). Interestingly, not allowing people to cut down trees was mentioned as a factor. The respondent expressed it as follows: "Stopping people to cut down trees contributes to overcultivation, because now people are not able to practice *shifting cultivation.*"

Observations from Table 5.7 confirmed Spooner & Mann's (1982) earlier estimates that overcultivation arises when the practice of rainfed cropping is extended onto marginal lands that can not support it. This extensification (the extension of rainfed cropping onto marginal lands) is due to population growth, increased economic demand and increasing availability of mechanical aids to labour, such as tractors.

Even though Table 5.7 does not reflect continuous tilling of the same land year after year as a significant cause, Table 4.3 (conceptual clarifications) has indicated that continuous tilling of the same piece of land is a major cause of overcultivation. According to Table 5.7, it seems that the lack of manure resulted in decreasing soil fertility of *omahangu* fields. Together with the increasing population growth, increased pressure was put on the limited arable lands, leading to the extensification of cultivation onto unsuitable lands and the continuous cultivation of lands without rest. This pressure on land has further reduced the soil fertility with the resultant poor yields.

5.2.3.1 Perceptions of fallowing

The lack of fallowing as a cause of overcultivation was only mentioned once. To further explore this important aspect of maintaining soil fertility, the respondents' perceptions of fallowing were further probed by means of an open-ended question C3:6. "(a) Is land allowed to lie fallow? (b) For how long?" The responses are summarized in Table 5.8.

Table 5.8 Responses to question C3:6 (re overcultivation)

Responses	**Frequency**
Not done - but not prohibited	3
Not done because of shortage of land	4
Depends on the owner of the land	2
I am doing it	1
It cannot be done here in the north	1
People will never rest their land	1
No - everyone has to work his land	1
Only rich people are doing it	1
Shifting homesteads is a form of fallowing	1
Not aware of value of resting	1
It is not allowed	2
Length	
Approximately one growing season	2

Following Table 5.8, it has been pointed out by the respondents that; fallowing was not done mainly because of shortage of land (4). It can be seen, however, that the majority of respondents are in agreement that fallowing was not prohibited even though it was not widely practised. It is important to point out at this juncture that most of the communal farmers are subsistence farmers with relatively small plots for cultivation and living only from one growing season to another. To them the notion that "it is better to be safe than to be sorry" is particularly relevant. As one respondent, who himself practices fallowing, pointed out. "The danger of fallowing the land in areas of unpredictable rainfall is that one might rest the land for one growing season and that season happens to be a good rainy season - the next growing season, when you have to cultivate your land, might turn out to be a bad rain year. This will make one suffer more." 'Fallowing is not allowed' was pointed out twice. One respondent put it bluntly as follows: "Traditionally it is not even accepted to rest your land for a year - it is a disgrace - it does not work!"

Support for the situation was expressed by Renaud & Pelkonen (1994:11). "Small farmers in the

more densely populated areas have the totality of their fields cropped. There is therefore no possibility of introducing a fallow." It should, however, be pointed out that communal farmers have traditionally maintained the productivity of their land by cultural practices such as applying manure to the land before ploughing, inter-cropping of cereals with leguminous crops (beans and groundnuts) and the practice of homestead shifting. The latter practice involves the shifting of the homestead and animal kraal every two to three years (Reckers, 1994). The best yields are obtained in the area where the homestead and animal kraal were standing. A respondent from the Oshikoto region pointed out that, "Shifting houses is a form of resting for the purpose of maintaining fertility."

Unfortunately, except for inter-cropping, cultural practices of maintaining soil fertility are slowly dying out. Nowadays people are applying less manure due to overgrazing. (See section 5.3.2 and 5.4.2). Deforestation has taken its toll and the practice of shifting houses (*omaludhilu*) is dying out fast. The main stumbling factors to fallowing are surely the size of cropping fields and the inherent 'risk evasion' mentality of rural people. These factors are all important from the point of maintaining soil fertility of the fields. Even though fallowing was not perceived as a cause by the majority of respondents data from Table 5.8 suggest that it is a major cause. Likewise, Seely *et al.* (1994) has indicated that due to increasing population, farmers are forced to overcultivate their plots without adding fertilizers or giving them a chance to rest. Fallowing can only be encouraged and implemented if farmers have sufficient lands.

5.2.4 Perceptions of the causes of desertification

The respondents' perceptions of the causes of desertification were explored by means of an open-ended question D:3: "From your understanding of the term 'desertification', what do you think are the causes of it? [Probe → major causes as perceived]." Their responses are summarised in Table 5.9.

Table 5.9 Responses to question D:3 (re desertification).

Perceived causes	Frequency
Deforestation	9
Veld fires	5
Overgrazing	9
Drought (lack of rainfall)	5
Overcultivation	7
Attitudes and conservative understanding of desertification	1
Depletion of groundwater	1
Human population growth	3
Natural decreasing of vegetation	1
Off-road vehicles (absence of proper roads)	2
Developments in rural areas (e.g. earth dams, roads)	1
Army worms	1
Soil erosion	1
Soil trampling	1
Lack of manure	1
People who don't want to listen	1
People who want to get rich	1

An overview of Table 5.9 shows that the major perceived causes of desertification in the O-4 regions were: deforestation (9), overgrazing (9), overcultivation (7), veld fires (5) and drought or lack of rainfall (5). (See also section 4.5.2). Seven respondents further perceived deforestation to be the first or major cause of desertification. In confirmation, Grainger (1990) has argued that deforestation may be regarded as the first step in the process of desertification. Population growth (3) was also seen as a significant cause. Only one respondent perceived soil erosion as a cause, while another perceived attitudes towards desertification as a cause. As he had put it, "Our conservative understanding that there is nothing we can do to stop it (desertification), let's leave it that way, is a major cause - we should change our attitudes and plant trees." It is important to point out at this stage that overcultivation was only pointed out as a cause after probing. Five

respondents were of the opinion that it is a minor cause only. Results in Table 5.9 support Anderson's (1992) findings which indicated that desertification was a human-induced phenomena brought about mainly by overgrazing, overtillage, the overcutting or burning of woodland and in recent years, rapid increases in human population.

Of particular interest was the respondents' perception of drought as a cause. This was of interest because debates among scholars are still going on whether drought is a cause or just a facilitating factor in the process of desertification (Dregne *et al.*, 1991; Kassas *et al.*, 1991; Oppong, 1993). Grainger (1986), for instance, is of the opinion that climatic changes are only contributing factors influencing the processes of desertification. In contrast, Middleton (1991) is of the opinion that drought was the most obvious cause of desertification. (See section 4.5.2).

To further explore the respondents' understanding and perception of the causes of desertification, they were all asked the following question D:4. "Are you aware of any social/cultural activities which might influence the process of desertification?" The responses are listed in Table 5.10.

Table 5.10 Responses to question D:4 (re desertification).

Socio-cultural causes	**Frequency**
Construction of traditional houses	4
Cultural behaviours	1
Beliefs	1
Custom of cutting and burning crop residues	2
Custom of burning veld to stimulate regrowth	1
Social activities	1
Tradition of owning big *omahangu* fields	1
'A little knowledge is dangerous'	1

It was pointed out by one respondent that 'beliefs' contributed to desertification as there are people who do not want to accept family planning and have fewer children. Most believe in God's commandment 'fill the earth'. The respondent was of the opinion that it was because of them that the rapidly increasing population was putting pressure on the scarce available land resources.

Another had put it succinctly, "A little knowledge is dangerous".

Construction of traditional houses and the cultural practice of cutting and burning crop residues as well as the burning of rangelands to stimulate regrowth of grasses were recognised as causes of desertification by some respondents. These observations confirm Lambin's (1993) findings that anthropocentric causes of desertification included *inter alia* reduced fallow time, the practice of annual bush fires during the dry season and the land tenure system. Similarly, Oppong (1993) has indicated that the use of crop residues for building and fuel, traditional building of houses and fences and the use of tractors are among the socio-cultural factors that contribute to desertification. Renaud & Pelkonen (1994) have reported that after harvesting, communal farmers remove the millet and sorghum stalks needed as building material from the fields, and the remaining stalks are grazed by livestock. The grazing of crop residues reduced the humus content of the soils and promotes general degradation of the lands.

Looking at the causes mentioned (Tables 5.9 and 5.10), it may be inferred that the respondents are placing man at the centre of the issues of desertification. We need however to assess the extent to which man is really contributing to the process of desertification in the O-4 regions. It was not within the scope of this study to carry out this assessment and this problem therefore calls for further research. Any programme designed to address the anthropocentric causes of desertification should take into account the overriding socio-economic imbalances of power and access to strategic resources between the different groups in rural areas and society at large (Dregne *et al.*, 1991). In conclusion, the researcher considers that the respondents have a fairly deep understanding of the causes of desertification as pointed out in the general literature.

The researcher tried to find out from the respondents what they thought about population density in their regions/constituencies. Responses to the question D:12, "Do you have too many people in your region/constituency for the amount of land that is available?" elicited mixed views, eight respondents feeling that there 'were too many people' and four that there were not. As one respondent from the Oshana region said, "We are over-populated. People don't even know where to stay, if possible some people may be resettled in the south of the country." (For further discussions on this particular issue see section 6.3.4). There were also sub-regional differences.

Two respondents from the Oshikoto region thought that there were enough people in their region while one respondent was of the opinion that there are too many people.

All three respondents from the Ohangwena region thought that there were too many people. As one pointed out, "You will find that one has only one hectare of land from which he has to feed ten children." In comparison, two respondents from the Oshana region and one from Omusati indicated that there are too many people in their regions. Two respondents from Omusati did not clearly indicate their positions and were reluctant to make it quite clear after probing.

Following the latest census result, Oshana is the most densely populated region with a density of 26,0 persons/km^2, followed by Ohangwena with a population density of 17,9 persons/km^2 (see Chapter 1). It is perhaps not surprising then that respondents from Oshana and Ohangwena felt the effects of the population density most. Interestingly however, in Table 5.9 three respondents pointed out human population as a cause of desertification. One would expect most, if not all three to have come from the Oshana region. No respondent from the Oshana region perceived desertification to be caused by population growth; more surprisingly one respondent who attributed desertification to population growth was from the Oshikoto region, while the other was from Omusati. Not surprisingly, however, one respondent was from the Ohangwena region. This problem confirms similar findings by Seely & Jacobson (1994).

5.3 PERCEPTIONS Of CONSEQUENCES

This section examines perceptions of the consequences of deforestation. overgrazing, overcultivation and desertification.

5.3.1 Perceptions of the consequences of deforestation

The respondents' perceptions of consequences of deforestation were explored by asking an open-ended question C1:4. "What do you think are the consequences of deforestation? [Probe → advantages and disadvantages, do people understand these consequences etc.]" Their responses are summarised in Table 5.11.

Table 5.11 Responses to question C1:4 (re deforestation).

Perceived consequences	Frequency
Health problems (due to lack of fresh air)	2
Drought (i.e. decreasing rainfall)	11
Decreasing soil fertility	2
Loss of beauty (aesthetics)	3
Exposure of the soil to baking of sun	2
Appearance of dust bowls	1
Increased temperatures	1
Starvation	1
Loss of bio-diversity (wildlife and tree species)	3
Bring about deserts	2
Poverty and hunger	1
Decreasing grazing	1
Lack of shade	1

Following Table 5.11, the consequence of deforestation most frequently mentioned was drought or general decrease in rainfall (11). One could expect the respondents to mention perhaps the most visible effects of deforestation such as 'fuelwood scarcity' (Mlava, 1989). Surprisingly, however, no respondent mentioned this. One explanation that could be given is that all the respondents were male and except for one all were married. According to Van der Laan (1993), collection of fuel wood is the work of women and children. It could be concluded therefore that men are generally not responsible for the collection of firewood, and therefore would not experience the effects of firewood scarcity on a daily basis.

Drought as a consequence of deforestation has been supported by various studies all over the world. For instance Banks (1989) stated that cutting down the forest will reduce the rainfall of the region, eventually to the extent that desert conditions prevail. This is a source of great concern, because the mere fact that 'drought' was perceived as the major consequence suggests that the point of 'prevailing desert conditions' may have been reached.

Loss of beauty and bio-diversity were the next most frequently mentioned consequences of deforestation. This observation perhaps indicates a greater appreciation of aesthetic aspects and general concern for the protection of bio-diversity that rural peasants are sometimes given credit for. (See section 4.2.2). Perhaps also, 'lack of beauty' is the most visible effect of deforestation the rural communities perceive. If this is the case, then surely the implementation of massive afforestation programmes to literally 'grow back' the 'beauty' and 'bio-diversity' of the land and to increase the likelihood of rainfall would be more attractive to the rural people. (See also section 7.5).

After probing, eight respondents perceived some people to have an understanding of the consequences of deforestation. As one respondent stated, "People do understand (the consequences of deforestation) but there is no way out for them?" All the respondents are of the opinion that there are no advantages in deforestation. Similar statements have been expressed in Marsh (1994:2) as follows: "Without trees there is no life."

5.3.2 Perceptions of the consequences of overgrazing

The respondents' perceptions of the consequences of overgrazing were explored by means of an open-ended question C2:4. "What do you think are the consequences of overgrazing? [Probe → advantages and disadvantages, do people in your constituency understand these consequences etc.]." Responses are summarised in Table 5.12.

Table 5.12 Responses to question C2:4 (re overgrazing).

Perceived consequences	**Frequency**
Force people to take their cattle to cattle posts	3
Lack of manure - decreasing fertility of *omahangu* fields	2
Lack of milk	2
Poverty	6
Overcultivation	1
Grass will not grow easily	1
Cattle will die of starvation	6
Create artificial shortage of food for livestock	1
Soil erosion	1
Create a risk of spread of diseases	1
Poor health of people	1
Bring sorrow	1
Suicides	1

Perceived consequences of overgrazing most frequently pointed out in Table 5.12 were: poverty (6), and starvation of cattle (6). Three respondents pointed out that overgrazing would force people to take their cattle to cattle posts and in turn would cause lack of milk (2) and lack of manure which would result in decreasing soil fertility (2).

The findings in Table 5.12 confirmed earlier research (Grainger, 1990; Tivy, 1990; Reckers, 1994) that have shown that as the area of pasture and its quality declined due to overgrazing, so the health of the animals declined along with their production of milk and meat. This might result in deaths of cattle, which means poverty. Reckers (1994) has pointed out that livestock, and especially the milk, plays an important role in the economic independence of the rural people. Grainger (1990) has further pointed out that overgrazing around settlements is a greater problem than overgrazing at *oohambo*. It is therefore logical to expect the livestock owners to take their animals to cattle posts. In the O-4 regions this trend has been observed by Renaud & Pelkonen (1994), who have stated that animals now generally stay for shorter periods on the farm.

In general, respondents have pointed out interesting consequences. Soil erosion, poor health, sorrow and suicides were also amongst others mentioned. A respondent has indicated incidence of suicides after the owners' losses of cattle to starvation. This is understandable, since once cattle are gone, so also the economic independence and therefore the ability to care for one's family. Finally, it is interesting to note that poverty was pointed out both as a cause and a consequence of overgrazing. On further probing, five respondents did not perceive any advantages in overgrazing, while two thought that people are aware of the consequences of overgrazing.

5.3.3 Perceptions of the consequences of overcultivation

The respondents' perceptions of the causes of overcultivation were explored by means of an open-ended question C3:4. "What do you think are the consequences of overcultivation? [Probe → advantages and disadvantages]." Responses are given in Table 5.13.

Table 5.13 Responses to question C3:4 (re overcultivation)

Perceived consequences	Frequency
Overgrazing	1
Deforestation	1
Poor yields	6
Decreasing land productivity	1
Shortage of food	1
Shortage of living space	1
No more big traditional houses	1
Extreme displeasure (anger, indignation, '*ehandu*')	1
Poverty	1

Interestingly overgrazing and deforestation were pointed out once respectively. This is surprising because 'clearing for *omahangu* fields' was pointed out frequently (6) as a perceived cause of deforestation (see Table 5.1). Interestingly, but not surprising, no-one pointed out desertification as a consequence of overcultivation. (See also section 5.2.4). Following Table 5.13, 'poor yields' was the most frequently mentioned consequence of overcultivation. The observation confirms results of other studies done (Spooner & Mann, 1982; Grainger, 1990; Renaud & Pelkonen,

1994). As had been pointed out earlier in this chapter the major perceived cause of overcultivation is the lack of manure. On its part overcultivation further reduces soil fertility and plant growth. The soil becomes exhausted, losing further nutrients and eventually this has the effect of reducing crop yields (Seely *et al.*, 1994).

Two respondents saw advantages in overcultivation and one expressed it as follows: "Yes, overcultivation has advantages, if there are good rains, overcultivation will give you big *omahangu* yields and you will fill up many *omashisha* (storage baskets)."

5.3.4 Perceptions of the consequences of desertification

In order to explore the consequences of desertification as perceived by the respondents, they were each asked question D:5 " In your opinion, what are the effects of desertification?" The responses are summarised in Table 5.14.

Table 5.14 Responses to question D:5 (re desertification).

Perceived consequences	**Frequency**
Shifting of people from desertified areas (environmental refugees)	2
Hunger and poverty	8
Loss of land productivity	2
Development will cease and economy will go down	2
People will be forced to take their cattle to cattle posts	2
"Will force one to become a father of poor people"	1
Loss of livestock	2
Shortage of firewood	1
Poor crop yields	1
Vanishing of grazing areas	3
Deserts and sandstorms	1
Loss of beauty (aesthetics)	1
Drought	2
Lack of milk	1
Lack of water	

The most obvious consequences identified are related to humanitarian aspects of desertification. Hunger and poverty were cited most frequently as the major effect of desertification (see Table 5.14). Similar aspects are well documented in Dregne *et al.* (1991). Other consequences mentioned, which have a direct bearing on the human population was 'shifting of people to other areas (environmental refugees)'. These observations confirm similar findings by Middleton (1991), who has observed the consequences for human population of desertified areas include *inter alia,* mass migration of environmental refugees away from desertified areas. Vanishing of grazing areas, drought, and loss of land productivity were also mentioned as consequences of desertification. Similarly, these aspects are well documented in Goldsmith & Hildyard (1990). Further studies have produced similar findings which indicated that the results of desertification *inter alia* are; reduction of available water due to decrease of river flow or groundwater sources (Dregne *et al.,* 1991; Kassas *et al.,* 1991; Oppong, 1993).

Perhaps it should be pointed out that drought was perceived both as a cause and as a consequence of desertification. The researcher is of the opinion that the consequences of desertification, as pointed out by the respondents, can be used as indicators of the process of desertification. According to this criteria, it can be concluded that the process of desertification is indeed taking place and is already at an advanced stage. One respondent has brought in the aesthetic factor, explaining that "desertification will bring that nature loses its beauty - no more beautiful flowers during the rainy season."

In order to find out which section of the population was mostly affected by desertification, the respondents were asked the following question D:10: "In your opinion, which section of the population is mostly affected by the process of desertification?" The responses are summarized in Table 5.15

Table 5.15 Responses to question D:10 (re desertification)

Section of population	Frequency
Cattle owners	2
Unemployed communal people	4
Women and young children	1
The rural communities	3
Lazy people	1
Widows	1
Poor people in our community	1

Following Table 5.15, some sections of the population of the O-4 regions were perceived to be more affected then others. 'Unemployed communal people' was mentioned most frequently (4). Human suffering due to desertification is well documented in Goldsmith & Hildyard (1990). (See chapter 2). It can be concluded that the section of the population most affected are the communities living in rural areas in general and the poorest of the poor section of those communities in particular.

5.4 PERCEPTIONS OF SOCIAL/CULTURAL/ECONOMIC CHANGES IN THE O-4 REGIONS

This section examines perceptions of social/cultural/economic changes that come about as a result of deforestation, overgrazing, overcultivation and desertification.

5.4.1 Perceptions of the social/cultural/economic changes due to deforestation

In order to explore their perceptions of the social/cultural/economic changes due to deforestation, respondents were ask the following question C1:5. "In your opinion, did deforestation bring about social/cultural/economical changes in your constituency/region? [Probe → examples, explanations]." Responses are summarized in Table 5.16.

Table 5.16 Responses to question C1:5 (re deforestation)

Social/cultural/economic changes	Frequency
Backwardness in social life	2
Socio-economic implications of shifting people from deforested areas (environmental refugees)	2
Socio-economic instability due to drought	1
Interference in social life of maturing people	1
Changes in celebration of wedding feasts	1
Lack of cultural implements and tools	2
Lack of trees of cultural importance	2
People forced to buy firewood and poles	2
Selling of scarce *omahangu* to buy tools	1
People are forced to buy food	1
Prevent development (especially tourism)	1
Poverty and hunger	2
Changes in constructing traditional houses and huts	1
Grain storage baskets not strong anymore	1

Responses in Table 5.16 relate mainly to the interference in socio-cultural lifestyles of the peoples. One respondent who mentioned lack of trees of cultural importance for instance, was concerned that they used to have trees like *ominkunzi* (shepherd's tree - *Boscia albitrunca*) from which they take roots to make traditional curdled milk, but now people are no longer doing it because those trees are no longer there. The other respondent from Oshana has pointed out that trees like *omitundungu* (red syringa - *Burkea africana*), from which they use to make mortars have disappeared and people have to buy mortars as a result. (See also section 5.4.4). These observations tend to support various studies such as Erkillä & Siiskonen (1992); Marsh (1992; 1994). Marsh (1992) for instance, has pointed out that rapid deforestation in northern Namibia is threatening the cultural traditions of the people. To indicate effect on poverty and hunger, one respondent stated, "When I was young, and trees were plentiful, there was no hunger or drought." Trees provide materials that could be used for various items that are useful in the day to day social life of the people (see for instance Erkillä & Siiskonen, 1992; Marsh, 1992; Marsh & Seely,

1992). Following Ollikainen (1991) forests and trees provide fruits, nuts, honey and small size wood for tool handles, other utensils and carving.

It is quite interesting to note that a respondent has observed one of the economic consequences of deforestation as that of forcing people to buy firewood and poles. This is interesting because the same respondent, or any other, did not perceive 'fuelwood scarcity' as an effect of deforestation. This in turn suggest that people are not necessarily seeing cause - effect relationships. Data from Table 5.16 indicates that in general, people have noticed the changes in their social/cultural/economic life due to deforestation.

5.4.2 Perceptions of the social/cultural/economic changes due to overgrazing

The respondents' perceptions of the social/cultural/economic changes due to overgrazing were explored by means of an open-ended question C2:5. "In your opinion, did overgrazing bring about changes in your constituency/region? [Probe → social/cultural/economical]." Responses are summarized in Table 5.17

Table 5.17 Responses to question C2:5 (re overgrazing)

Social/cultural/economic changes	Frequency
Lack of slaughtering animals	2
Expenses of travelling to cattle posts	2
Expenses of paying herdboys at cattle posts	2
Cultural grazing system of seasonal migration of cattle herds	5
Forced to take cattle to cattle posts	2
Lack of milk, meat, manure etc.	4
Disruption of cultural practices and customs	3
Malnutrition	3
Decreasing soil fertility	1
Food aid (due to hunger)	2
Poor health (both animals and people)	1

The cultural grazing system of seasonal migration of cattle herds was reported by five respondents as the major social/cultural/economic change brought about by overgrazing. Following the traditional system, during the dry period herdsmen guide their cattle to *oohambo*. At the end of the dry season, and usually a few weeks after the first rains, some of the herds (mainly lactating cows and calves) return home to the villages. After the harvests, the remainder of the herds return home to graze the crop residues (*olwenge*) and for the purpose of cattle shows in some regions (Ohangwena/Oshikoto). Usually smallstock and donkeys do not need to migrate to cattle posts. (See also section 5.3.2).

Today, due to overgrazing, all that has changed. Some '*oohambo*' do not exist anymore due to population pressure which has caused '*oohambo*' and homesteads to grow into each other. Cattle no longer return home after the first rains or after harvest due to overgrazing (thus traditional cattle shows no longer take place). Small stock are now also taken to cattle posts (goats and sheep remaining behind was necessary for meat supply, especially for visitors and for manure). Lack of milk, meat and manure were cited by four respondents. Economic changes mentioned by the respondents related to *inter alia* expenses of travelling to cattle posts. (See particularly Quan *et al.*, 1994). The important role livestock plays in the social/cultural/economic lives of the rural communities is known and documented.

According to NEPRU (1991), livestock in communal areas, especially cattle, are not produced primarily for sale as beef animals, but rather to fulfil a number of different functions in multifold livelihood strategies (e.g. for ploughing, as a source of manure and milk, as an asset for the income security of the extended family). Like NEPRU, Reckers (1994) has pointed out that livestock is important for maintaining the social network of rural people (e.g. bride price - *iigonda*, livestock presents, ritual slaughter for festive occasions etc.). Reckers further stressed that livestock contributes to the economic independence of the rural people.

5.4.3 Perceptions of the social/cultural/economic changes due to overcultivation

The respondents' perceptions of the social/cultural/economic changes due to overcultivation were probed in question C3:3. Economic decline - poverty and hunger, were seen as the major

social/cultural/economic changes that were brought about by overcultivation. Similar ideas were expressed by Darkoh (1994) who stated that among other things overcultivation poses the principal threat to the livelihoods of the peoples of Africa's drylands. Following Goldsmith & Hildyard (1990), overcultivation disrupts the social/cultural and economic life of traditional farmers. They argued that traditional farmers aim mainly to produce food for consumption by their own families and to fulfil such obligations and giving feasts. Surely, poor yields will have a bearing on these obligations.

Other social/cultural/economic consequences mentioned were shortage of living space, food aid, and young married couples not moving away from their fathers' places. The respondent who mentioned the latter explained that "culturally, when a boy marries, he moves away from his father's house and puts up his own house somewhere else - this culture has stopped due to overcultivation." Overcultivation is caused by pressure put on the available land. Overcultivation also puts pressure on the scarce land resources. It therefore creates a shortage of living space with the result that when young boys marry there is no place for them to go and so they remain at their father's places, causing further overcultivation in the process.

5.4.4 Perceptions of the social/cultural/economic changes due to desertification

The respondents' perceptions on the social/cultural/economic changes due to desertification were explored by means of an open-ended question D:11. "In your opinion, what social/cultural/economical effects does desertification have?" Responses are given in Table 5.18

Table 5.18 Responses to question D:11 (re desertification)

Social/cultural/economic changes	Frequency
Destruction of social life	1
Poverty and hunger	4
Economic decline	2
Increase in ecological refugees	1
Disruption of cultural way of rearing livestock	3
Disruption of cultural practices (e.g. marriages/*iigonda*/deaths)	1
Disappearance of knowledge of wildlife (biodiversity)	1
Loss of beauty, 'nature looks naked'	1
Crime (Botsotsos)	1
Disruption of social responsibilities (e.g. taking care of families and relatives)	1
Disruption of family life	1

Major factors mentioned in Table 5.18 were, ' poverty and hunger' (4) and disruption of cultural way of rearing livestock (3). One participant has expressed himself as follows: "We used to have many indigenous trees like *omuye* (Bird plum - *Berchemia discolor*), *omilunga* (Makalani palm - *Hyphaene petersiana*), *omigongo* (Marula - *Sclerocarya birrea*) producing fruits from which we make traditional drinks, but due to desertification, these trees are not producing enough fruits anymore." This has surely disrupted the social life of people because the merrymaking they used to have during those seasons where these trees produced in is no longer taking place. (See also Marsh, 1994).

Similar aspects are well documented by Spooner & Mann (1982) and Middleton (1991). Other aspects mentioned relate mainly to the disruption of social and moral aspects. Middleton (1991) has found that desertification disrupts social structures that are important during times of crisis' where a complex network of extended families can help poorer relatives with gifts of food during bad times. Other changes mentioned relate to aesthetic aspects, economic aspects, environmental aspects, and include loss of beauty, crime and an increase in ecological refugees as well as the disappearance of knowledge of wildlife (loss of bio-diversity). These social/cultural/economic

changes are well documented in Spooner & Mann (1982), Dregne *et al.* (1991) and Kassas *et al.* (1991). The general indication in Table 5.18 is that all factors mentioned are all negative and disruptive. It can be concluded that 'disruption' of the lifestyle of people was seen as a major factor.

5.5 CONCLUSIONS

From the data presented in this chapter, the construction of traditional houses and fences and the clearing for *omahangu* fields are seen as the biggest problems in terms of deforestation in the O-4 regions. It has also transpired that illegal trading in tree poles plays a detrimental role in deforestation. The community at large was perceived to be responsible for much of the processes of deforestation that is taking place. Fuelwood was not perceived as a problem but it was seen as the main usage of wood. As a general conclusion on this issue, respondents have a fairly deep understanding of the causes of deforestation.

With regard to overgrazing, the biggest problem perceived was the fencing of communal pasturage by a few egocentric rich individuals. This practice has robbed the small communal farmers of much of their common pasturage (Tapscott, 1994). Extensification of cultivation and an increase in the stock population were seen to have a detrimental role in overgrazing. The majority of respondents, however did not perceive the cattle densities to be too high, but perceived common pasturage to be limited. Even though, the cattle were perceived to be in the majority, donkeys were seen to contribute more to overgrazing. As a general conclusion to this issue, the majority of the respondents have a fairly deep understanding of the causes of overgrazing.

Evidence presented further suggested that respondents saw a lack of manure and the inappropriate ploughing with tractors as the biggest problem of overcultivation. A general comment is that fallowing was not perceived to be prohibited, but was also not widely practised because of the limited sizes of *omahangu* plots. As a general conclusion, most of the respondents, perhaps 10, have a fairly deep understanding of the causes of overcultivation. The rest have a general idea.

The processes of deforestation, overgrazing, overcultivation and drought were seen to be the biggest problems in respect of desertification. Socio-cultural behaviours were seen to have a detrimental effect on desertification. Population growth was singled out to have a detrimental role in the processes of all the four factors. As a general conclusion, most of the respondents have a fairly deep understanding of the most obvious causes of desertification, but failed to identify the underlying factors behind these causes.

In the case of the consequences, the responses presented have pointed out that the local rainfall was perceived to have declined due to deforestation. Pasturage in and around villages are almost non-existent due to overgrazing. This has resulted in decreasing milk production and manure which has resulted in decreasing soil fertility and a concomitant decline in yields. The result was hunger and poverty and economic hardship which was perceived by the majority of respondents as consequences to overcultivation and desertification. Rural people were singled out to be more susceptible to the processes of desertification. It can be concluded that most of the respondents have a fairly deep understanding of the consequences of all the four factors investigated.

Several implications on the social/cultural/economical lifestyles of the people due to the four factors have emerged from responses given in this chapter. All the issues mentioned are negative and the general conclusion is that 'disruption' of the lifestyles of the people was seen as a major factor. This realisation indicates a deep understanding of the most visible causes and consequences of the four factors examined in this chapter. Notwithstanding this point, it is the firm view of the researcher that there is still much room for improvement in clarifying the causes and consequences of these four factors, especially with regard to the underlying causes. We should , however, bear in mind that the community's perceptions and beliefs relating to the causes of environmental degradation needs to be understood and recognised in order that effective plans are drawn up to counter any negative factors (IISD, 1993).

We now turn to the next chapter to look at the steps that have been taken in the regions to stop the processes of deforestation, overgrazing, overcultivation and desertification. We will also asses the respondents' views on how they see the way forward.

CHAPTER 6

THE WAY FORWARD

6.1 INTRODUCTION

This chapter will report on the way forward as perceived by the respondents. As was noted in Chapter one, the respondents were also requested to engage in the generation of solutions. These suggestions are set out in this chapter and will reported to in the following manner: First, the ongoing or envisaged activities. Second, suggested solutions. Third, suggested plan of action and lastly conclusion.

6.2 ONGOING/ENVISAGED ACTIVITIES

This section will report on the activities that are currently going on or envisaged to stop the processes of deforestation, overgrazing, overcultivation and desertification.

6.2.1 Ongoing/envisaged activities to stop deforestation

In order to elicit their responses on the above issue, respondents were asked the following question C1:6: "In your constituency/region, what steps are taken or envisaged to stem deforestation?" Responses are given in Table 6.1.

Table 6.1 Responses to question C1:6 (re deforestation)

Ongoing/envisaged activities	Frequency
Topical issue at meetings of councillors/headmen with communities	6
Awareness campaigns on the importance of trees ongoing	4
Implementation of traditional regulations ongoing	4
Tree cutting permit system introduced by Directorate of Forestry	3
Tree planting programme at Ombuga and at schools ongoing	1
Encouragement of brick houses by councillors ongoing	1
Promotion and selling of trees by NGOs/other institutions ongoing	2
Placing forest caretakers in every village envisaged	1

Table 6.1 shows that some steps have already been taken in the regions and constituencies. The most obvious steps taken in all the regions are discussions between communities, councillors and traditional leaders. The majority of the respondents have it on their agenda during most of their meetings with the communities.

One respondent each from the Oshana and Omusati regions indicated that the cutting of trees for commercial purposes had stopped. Awareness campaigns and implementation of traditional regulations were cited by four respondents respectively. One respondent from the Oshana region indicated that they are planning to have 'forest caretakers' in every village in their region. An activity of significance is the ongoing tree planting programme at *Ombuga* and at schools. It was pointed out by a respondent that this activity was not only aimed at stopping deforestation but also at instilling in pupils an awareness of the beauty of trees by engaging them in the planting of trees at their schools. Another activity going on for the sole purpose of stopping deforestation was the 'tree cutting permit system' of the Directorate of Forestry. Under this system, every person who wants to cut trees for any purpose should get a permit from the nearest office of the Directorate. If found by the police cutting or transporting tree poles without a permit then an arrest or confiscation of poles or both may be made. It should be pointed out that this system is not a novelty of the DoF; in the past it has been used by *aakwaniilwa* (kings) to protect the forest of the O-4 regions (Erkillä & Siiskonen, 1992).

6.2.1.1 Introduction of prohibitive regulations to stop deforestation.

Respondents' perceptions of the implications of prohibitive regulations on cutting down trees were explored by means of an open-ended question C1:10: "If you introduce a prohibitive law/regulation on cutting down trees, what implications do you think it will have on the people of your constituency/region? [Probe → social/cultural/economical]." Responses are summarized in Table 6.2.

Table 6.2 Responses to question C1:10 (re deforestation)

Implications	**Frequency**
Appreciation	1
Socio-economic implications	8
A prohibitive regulation already exists	6
Unhappiness and complaints	4
Conservation and ultimate recovery of forests (fruit trees)	4
Forcing the herding of animals	1
Difficult to implement	3

The most obvious implications of a prohibitive regulation given by the respondents were related to the socio-economic and cultural aspects of the people. Most of the respondents were of the opinion that if such regulations are introduced it will affect the socio-economic life of the people. They argued that people are poor and do not have money to buy alternative materials for the construction of their houses and fences. As a result, their *omahangu* fields will be destroyed by the animals because there would be no fences around them. This, they continued to argue, will bring hunger and poverty. On the other hand, some of the respondents are of the opinion that such regulations would result in the recovery of the forest trees including fruit trees. As a result, there would be enough fruits for the people to eat and to sell in order to make money. Furthermore,increase in fruit trees and in fruits would mean improved diets.

One respondent pointed out that the introduction of such a regulation would not affect the rich people, who are responsible for the cutting of trees but would affect the poorest of the poor

whose *omahangu* fields would be destroyed by animals. (See section 5.2.1). There are, however, respondents who felt that such a regulation would be appreciated and would result in the conservation of nature.

Table 6.2 further suggests that there exists traditional regulations in the different regions that are protecting the trees. It has further transpired that in the past these regulations were mainly enforced by the chiefs, but since the traditional tribal systems have begun to break down, many chiefs have lost much of their influence and as a result, regulations pertaining to the cutting of trees are no longer enforced. In fact it was mentioned by a respondent that one of the causes of desertification was the loss of power by the chiefs. (See section 5.2.1). Similar findings have been noted in Erkillä & Siiskonen (1992).

Unhappiness and complaints were also perceived as implications. This is quite understandable because it was suggested that the lifestyles, traditions and cultural practices would be affected by such regulations. For instance, it was mentioned in chapter five that the cultural practice of 'rotating' the homesteads within the *omahangu* fields was a traditional way of maintaining soil fertility (in the absence of fallowing). From the point of maintaining soil fertility, this practice is desirable. The shifting of homesteads, however, consumes a considerable volume of wood for renewals and it is therefore undesirable from the point of protecting the trees. As a general comment, introduction of regulations to stop deforestation in the O-4 regions should take into account the sentiments expressed by the respondents but care should be taken not to accept these sentiments blindly. It is also relatively safe to say that some of the sentiments expressed called for re-evaluation of the actions that were taken so far. The socio-economic implications are real and deforestation can only be halted if alternative means of constructing houses in the O-4 regions are found. These means can only be of any real effect if accompanied by similar means of maintaining the soil fertility of the *omahangu* fields. A rural development strategy integrated with environmental education could be employed to achieve this objective (see chapter 7).

6.2.2 Ongoing/envisaged activities to stop overgrazing

The ongoing or envisaged activities to reduce overgrazing in the O-4 regions were elicited by

means of an open-ended question C2:6: "In your constituency/region, what steps are taken or envisaged to stem overgrazing?" Responses to this question are listed in Table 6.3.

Table 6.3 Responses to question C2:6 (re overgrazing)

Ongoing/envisaged activities	**Frequency**
No steps were taken	7
Illegal fencing stopped	1
Encourage marketing of and discourage buying of more cattle to reduce cattle numbers	6
Proposed demarcation of a large area to be devoted solely to grazing	2
Proposed distribution of water to areas with saline water	1
Encourage cattle owners to move their cattle to better grazing areas	1
Stop extensification of cultivation	2
Encourage farmers to keep good quality cattle only	1
Awareness campaigns ongoing	2

Of interest in Table 6.3 is that the reduction of cattle numbers in the O-4 regions was significant if overgrazing was to be arrested. This observation is interesting because, following Table 6.4 the majority of respondents did not see the need to reduce cattle numbers because they felt that there were not too many cattle. (See section 5.2.2). Following Table 6.3, the majority of respondents felt that no steps had been taken to reduce overgrazing. Reasons given for not taking steps included; it is too late to do anything, people are poor, it is a national question and not a regional one, and we are waiting for the land issue to be solved. Maybe the government should take cognisance of these concerns and address the overgrazing issue and all other environmental problems at national level to treat these problems with the urgency they require. Furthermore, public education is needed to make the people aware of the long term damage that can result from overgrazing if steps are not taken forthwith.

It is also interesting to note that, while the majority of respondents attributed overgrazing to 'illegal fencing' and 'encroachment of grazing by homesteads (*omagumbo*) and *omahangu* fields

only two respondents were stopping the extensification of cultivation onto grazing lands, while only one respondent addressed the issue of illegal fencing in his constituency. One respondent suggested that some cattle owners should be moved to commercial areas. This suggestion tends to imply that the real issue here is not overgrazing, but rather scarcity of land. Furthermore, proposals were given to the authorities to demarcate large areas of land to be devoted to grazing only. It was suggested that such areas should be fenced off and sub-divided into smaller units served adequately with water. Again, an undertaking of that nature would require large capital inputs which the cattle owners would be required to pay in the end. The researcher is of the opinion that such a move would eventually benefit the rich and cut out the small farmer and in the process create further impoverishment.

6.2.2.1 Implications for limiting the cattle numbers.

In section 5.2.2, increasing livestock numbers were mentioned as a cause of overgrazing. In order to explore their responses on this particular issue, respondents were asked the following open-ended question C2:9: "If you were to limit the number of cattle in the constituency/region for instance what implications would it have? [Probe → why etc.]." The responses are summarised in Table 6.4.

Table 6.4 Responses to question C2:9 (re overgrazing)

Implications	**Frequency**
Rather limit the number of donkeys	1
Not too many cattle to limit their numbers	9
Will have socio-economic implications	4

General sentiments expressed most frequently were, 'not too many cattle to limit their numbers' (9) and 'will have socio-economic implications' (4). Some respondents have expressed their views as follows: "We cannot limit the number of our cattle - they are our wealth (*emona*). If you limit the number of cattle it is like forcing people into poverty. Man without cattle is a non entity" (a respondent from the Oshana region); "Cattle have already died out because of drought" (a respondent from Oshikoto); "Limiting the numbers is not the solution, the solution is distributing

water to those grazing areas without water" (respondent from Omusati); "Some people keep cattle that are not theirs - so we cannot limit" (respondent from Ohangwena). These are all sentiments that should be looked at, especially with regard to the programme on land use planning and education. Aspects related to socio-economic implications were; "cattle are the sources of income, it would bring poverty and hunger." One respondent pointed out that "rather limit the number of donkeys." Another respondent has suggested that the number of donkeys could be reduced if an abattoir for donkeys could be established to produce pet food.

Table 6.4 gives a general impression that the majority of respondents are not in favour of limiting the number of cattle in their regions and constituencies. This observation is rather important and should be taken seriously into consideration when planning strategies to decrease overgrazing in the O-4 regions. Similarly, this observation should be compared with the findings in chapter five regarding the causes of overgrazing (see chapter five Table 5.5). The ever decreasing rangelands was most frequently associated with overgrazing. Furthermore, illegal fencing of communal land by a few individuals and extensification of cultivation onto marginal lands were given greater emphasis in the process of decreasing rangelands. (See chapter 5). The question of decreasing stock numbers was less appealing to the respondents and it is in this context that planning of range management should take place. We should also look here at Table 6.3, and study the activities that were going on in the regions. Some of the activities mentioned included 'encourage marketing of cattle' in order to reduce the number of cattle. It seems that there are contradictions in opinions on this issue in Table 6.5 and Table 6.4.

The general feeling is however that the respondents are in favour of marketing but felt that limiting the number of cattle is like putting a limit on the numbers of cattle each person can have. If this is the case, then proper education to address this problem would be appropriate. Similar studies carried out in the region offered support for the views expressed by the respondents (NEPRU, 1991; Tapscott, 1994). NEPRU (1991) for instance pointed out that overgrazing results when livestock owners have insufficient accessibility to the pasturage of their herds. This accessibility may be due to the loss of grazing due to cultivation and fencing off of communal land. The fencing off of communal land means that those who fenced off vast tracts of grazing lands, grazed their livestock in the common grazing areas, and only moved them to their 'fenced

off farms' once the communal pastures are exhausted. Small farmers, who generally lack the means to fence, are forced to continue grazing their livestock on these limited and exhausted areas with the result that these small farmers' livestock suffered more from overgrazing. The uninformed, however, by seeing large numbers of animals on these small grazing areas usually exclaim 'too many cattle' and think in terms of 'stock reduction' and 'marketing' without investigating the circumstances that have given rise to the situation (De Lange, 1994).

6.2.3 Ongoing/envisaged activities to stop overcultivation

Respondents' views on the ongoing or envisaged activities in their constituencies or regions to stop overgrazing were explored by means of an open-ended question C3:5: "In your constituency/ region what steps are taken or envisaged to stem overcultivation?" Responses are listed in Table 6.5.

Table 6.5 Responses to question C3:5 (re overcultivation)

Ongoing/envisaged activities	Frequency
Discussions with communities ongoing	2
Encourage the use of fertilizers and organic matter	3
MAWRD contacted for assistance	2
We encourage overcultivation	1
Assist in identification of areas suitable for cultivation	1
Nothing was done	3

Three respondents encouraged the use of fertilizers and organic matter (manure, grass, crop residues, and ash). One respondent indicated that fertilizers are made available to the farmers. This move is quite understandable considering the fact that the majority of the respondents cited lack of manure as the principal cause of overcultivation. (See chapter five). On the other hand, there are three respondents who have taken no steps whatever to stop overcultivation. Two of these are from the Omusati region and one from Oshikoto. One respondent has put it as follows: "Overcultivation is a new concept to us - hence nothing has been done yet." This sentiment is of particular importance because it suggest that overcultivation is not a well understood concept among the farmers in the O-4 regions. Education in this regard should play a very prominent role

if this process is to be arrested. (See also section 4.4.2).

Interestingly one respondent from the Oshana region 'encourages overcultivation'. He expressed himself as follows: "There will be no steps taken. It is where our food comes from. We encourage people to plough wherever they want - we encourage overcultivation - we don't want food aid from the government. We even encourage people, if it was possible to plough even in *iishana* to plant rice - it is only that *omahangu* don't grow in *oshana*." The plight of this respondent is understandable because, as it has been noted earlier, the Oshana region is the most densely populated area in the O-4 regions.

Sentiments expressed above are of grave concern since it is well documented that poor soil fertility in northern Namibia poses a threat of desertification (Renaud & Pelkonen, 1994). Given the fact that generally, cultivated soils in the O-4 regions are mostly of sandy texture, with only low clay and silt contents, such soils, when containing little or no humus, are prone to erosion, especially wind erosion, during the dry season. It is therefore important to take a fresh look at the soil fertility issue in the O-4 regions and to urgently introduce appropriate and workable moves that would ensure the improvement and maintenance of the soil fertility.

6.2.3.1 Perception of the use of organic/inorganic materials

The respondents' views on the use of organic matter and fertilizers were explored by means of an open-ended questions C3:7. "When people are ploughing the lands, do they put something back? What? Why? If not what are the reasons? [If not mentioned probe → do people use fertilizers?]." The responses are summarised in Table 6.6.

Table 6.6 Responses to question C3:7 (re overcultivation)

Materials	**Frequency**
Manure when available	6
Fertilizers by a few	5
Crop residues	4
Ash	2
Rubbish mixed with chicken litter	1
Nothing was added	3

The obvious indication of Table 6.6 is that the use of livestock manure was still widely practised by those farmers who have access to it. The impression was also that this old cultural practice of maintaining soil fertility was increasingly hampered by the unavailability of manure. It was pointed out in chapter five that increasingly farmers are taking their livestock to cattle posts, depriving their lands of this valuable source of soil fertility. It was reported by some respondents that the cost involved in transporting the manure from the cattle posts was enormous and not worth while.

Table-6.6 also gives an indication that fertilizers are being used increasingly. All five respondents who mentioned fertilizers are in agreement that only a few are using it and it is used in such small quantities. The common practice of fertilizer use was the mixing of the fertilizer with *omahangu* or sorghum seed. One respondent criticised the practice, saying that when seeds are mixed with fertilizer granules and put in a small basket it usually happens that instead of taking seeds from this basket in many instances, people take the fertilizer granules! In contrast one respondent defended the practice and indicated that one should be careful and only mix one kilogramme of seed with half a kilogramme of fertilizers when planting. Even though it was generally pointed out by the respondents that only a few farmers are using it, it is still a move in the right direction. The practice of mixing the fertilizer with the seeds before planting should be investigated to determine its usefulness.

This study also indicated that the ploughing in of crop residues was restricted to those who could afford to hire tractors. Small farmers who could not hire tractors simply cut down the crop residues (*okushesha*), burn it (*okuwowola*) and plough the ash in. Furthermore this practice was generally hampered by the use of crop residues, particularly *omahangu* and sorghum, for construction of houses, fuel and grazing. These observations confirmed findings of earlier work in the area. (See for instance Renaud & Pelkonen, 1994).

It is the researcher's view that the problem of soil fertility in the O-4 regions will continue for some time to come. If the process of desertification in the O-4 regions is to be arrested then surely a concerted effort from all stakeholders i.e. farmers, NGOs, and various government institutions would be needed. This effort should be seen in an integrated programme of rural development and environmental education.

6.2.4 Ongoing/envisaged activities to stop desertification.

In order to elicit the responses regarding the activities that are going on in their constituencies/regions, respondents were asked the following question D:8. "Are you aware of any attempt/endeavour/projects/programmes of stopping desertification in your constituency/region?" This question was followed by Question D:9. "If yes, who are involved?" The responses to both questions were categorised in regions and are summarised in Table 6.7.

Table 6.7 Responses to question D:8 & 9 (re desertification)

Region	Ongoing/envisaged activities
Oshikoto	Tree planting project at Oshivelo under FFWP
	RDC project at Onalulago
	Those involved
	Community around Oshivelo and Onalulago; RDC
Oshana	Own endeavour - planting trees and putting out veld fires
	FFWP planting trees
	Onakele forestry project
	Those involved
	Schools, unemployed people, DAPP, RDC, DoF, governor, DEES
Ohangwena	Campaigns/regulations
	Tree planting programmes
	Those involved
	Police, traditional leaders, community liaison officers, life science teachers from Ongwediva College, Swedish cooperating partners
Omusati	Information campaigns on desertification by MAWRD and ME&T
	DAPP project
	RDC project
	Those involved
	DAPP, community, village headmen, MAWRD, ME&T, chief headmen, RDC

In the Ohangwena region there were tree planting programmes and campaigns and regulations to stop the cutting of trees. It was pointed out that the police, traditional leaders, community liaison officers, life science teachers from Ongwediva College and Swedish cooperating partners were involved. These people and institutions were involved in different activities. The life science teachers were promoting the use of solar energy while the Swedish cooperating partners were encouraging the planting of trees.

In Oshana, own endeavour of planting trees and putting out veld fires, Food For Work Programme (FFWP) of planting trees, and Onakele forestry project were pointed out by the respondents. Schools, unemployed people, Development Aid from People to People (DAPP), Rural Development Centre (RDC), Directorate of Forestry (DoF), Directorate of Extension and Engineering Services (DEES) and the governor were cited as being involved. DAPP and DoF were mainly involved in providing seedlings to the communities. RDC is providing water and energy saving devices. DEES was providing extension work to the farmers.

In the Oshikoto, projects mentioned include; a tree planting project at Oshivelo under FFWP and the RDC project at Onalulago. The community around these two projects and RDC were reported to be involved. In Omusati, mention was made of information campaigns on the dangers of desertification by the Ministry of Agriculture, Water and Rural Development (MAWRD) and the Ministry of Environment and Tourism (ME&T), DAPP project and the RDC. Those involved in these projects and campaigns included DAPP, community , village headmen, MAWRD, ME&T and chief headmen.

Four of the respondents stated that they were not aware of any projects in their regions or constituencies of stopping desertification. Two of these respondents are from Ohangwena, one is from Oshikoto, while the other is from the Oshana region. The respondent who mentioned the tree forestry project at Onakele stated that this project had been discontinued because the chosen area does not grow trees. Trees planted three years ago did not grow any higher.

The RDC project at Onalulago was aiming at providing water and creating income while the DAPP was reported to be selling various tree seedlings to the communities. It is interesting to

note that all the projects and endeavours mentioned by respondents were to do with the planting of trees. This observation clearly indicated that emphasis was put on deforestation as a cause of desertification.

Responses given have however, indicated that progress on most of the activities are slowed down by certain factors. The tree planting programmes under FFWP, for instance, were reported to be hampered by scarcity of water. Only two institutions were perceived to be involved in the stopping of the process of desertification. These institutions were the RDC and DAPP. The RDC is a project of MAWRD run by a private contractor on behalf of the government. It was started in Ongwediva (Oshana region) in 1988. It produces among other things, energy saving stoves and demonstrations with alternative building materials. This project also includes a plant nursery; seedlings consist of fruit, ornamental and timber species. Seedlings are sold within the local community. The DAPP is an NGO with headquarters in Denmark. It built a tree nursery near Outapi in the Omusati region in April 1990. Different seedlings are produced at this centre and sold to the local community.

6.3 SUGGESTED SOLUTIONS

This section will set out the solutions that were suggested by the respondents to stop the processes of deforestation, overgrazing, overcultivation and desertification.

6.3.1 Suggestions to stop deforestation

Respondents were requested to engage in the generation of solutions to stop deforestation by means of the following question C1:11. "What else can possibly be done to stop the process of deforestation?" Responses to this question are summarized in Table 6.8.

Table 6.8 Responses to question C1:11 (re deforestation)

Suggestion	Frequency
Strict enforcement of regulations	6
Public education on the importance of trees	4
Protection of existing trees and planting of new ones	1
Planting of trees that use little water	2
Feasibility studies to determine trees that grow easily	1
Directorate of Forestry's cutting permit should be enforced	2
Discussion of deforestation with community and leaders	3
Encourage the building of houses with alternative materials	1
Provision of loans for fencing materials	1
Introduction of new regulations	1
Get the Ministry of Agriculture involved	1

Following Table 6.8, strict enforcement of regulations especially to stop illegal trading in tree poles was cited most frequently by the respondents (6). This indicates that the enforcement of regulations by the police to protect the existing trees was perceived to be of more importance than the planting of trees for instance. This is quite understandable considering the fact that it was pointed out in section 6.2.4 that the planting of trees was hampered by the shortage of water in the region. This observation was also the concern of the respondent who suggested the planting of trees that use little water. The researcher is fully in agreement with the idea of planting trees, but this move should be seen as addressing the symptoms and not the causes. The protection both of existing trees as suggested by one respondent *and* the planting of new ones would be more effective. One respondent felt that it was absolutely important that there should be co-operation between the communities and the village headmen in this regard.

Public education on the importance of trees was also given more emphasis. The researcher is of the opinion that public education is important and should be in the form of environmental education that will change people's attitudes towards the environment. (See chapter 7). The surprising observation from Table 6.8 is the fact that provision of loans for fences and the construction of houses with alternative building materials was only cited by one respondent. One

would have expected the majority of respondents to address those two issues more. In chapter five the construction of houses and fences were seen to be the major causes of deforestation. It was noted in Erkillä & Siiskonen (1992), for instance, that to build an average homestead at least 600 poles were needed. If two to three poles could be obtained from a tree then at least 200-300 trees were needed to build such a house. A concerned respondent suggested that instead of building palisades with poles, people should change to the use of hedge plants (e.g. *Dodonaca viscosa*). This method could be viable if water could be distributed to such an extent that the majority of the rural people have easy access to it. At present there is no visible sign in the O-4 regions of giving up the habit of building pole houses. It is the opinion of the researcher that probably this habit will only come to an end once the remaining woodland has been completely depleted.

6.3.2 Suggestions to stop overgrazing

Respondents were requested to engage in the generation of solutions to stop overgrazing by means of the following question C2:10. "What else can possibly be done to stop the process of overgrazing?" Responses are listed in Table 6.9.

Table 6.9 Responses to question C2:10 (re overgrazing)

Suggestions	Frequency
Public education	3
Discourage the buying of more donkeys	1
Income generating projects	1
Even distribution of water to reduce over-concentration of animals at existing water points	4
Discourage the buying of more cattle from Angola and encourage marketing to reduce the numbers	4
Provision of fodder	1
Introduction of new regulations	1
Land distribution	1
Stop illegal fencing	2
Stop selling rangelands to cultivation	1

The reduction of the cattle numbers through marketing was suggested most frequently as a solution to overgrazing (see also section 6.2.2). The distribution of water, especially to areas with good grazing was suggested as a solution to the serious overgrazing situation around existing water points. It is documented that the provision of water may have a negative impact on the vegetation cover in its vicinity due to overgrazing (Seely , 1991; Shanyengana, 1994). It is therefore important that the distribution of water is preceded by an environmental impact assessment to determine possible negative impacts on the environment around the planned waterpoints. Public education which was cited by three respondents, should be seen as playing a role in this regard, especially to make the farmers more aware of the impact such water points would have on the surrounding environment if the livestock numbers are not controlled. The control of illegal fencing as well as the cultivation of rangelands were amongst the viable solutions suggested. These suggested solutions will be taken into account when proposing recommendations. (See chapter 7).

6.3.3 Suggestions to stop overcultivation

Further solutions to the process of overcultivation as perceived by the respondents were explored by means of an open-ended question C3:8. "What else do you think can possibly be done to stop the process of overcultivation?" Responses are summarized in Table 6.10.

Table 6.10 Responses to question C3:8 (re overcultivation)

Suggestions	Frequency
Public education (e.g. on soil fertility, concept of overcultivation, consequences, use of fertilizers etc.)	7
Encourage the ploughing back of crop residues and the use of manure and fertilizers	5
Application of appropriate tilling methods	1

The most frequently cited solution was 'public education' (7) which should include aspects of soil fertility, concept of overcultivation, consequences and the use of fertilizers. The ploughing back of crop residues and the use of manure and fertilizers were cited by five respondents. Soil fertility has been cited by the majority of respondents in previous chapters as the biggest problem to

overcultivation. In Table 6.10 there is a call for public education specifically to address the problem of soil fertility. These suggestions are indicative of the seriousness of soil infertility in the O-4 regions. Since the lack of manure was attributed to overgrazing, the researcher is of the opinion that until something is done about the problem of overgrazing, overcultivation will remain a serious problem in the O-4 regions and as a result deforestation will continue unabated, giving rise to increasing desertification.

The facts are that overgrazing would force the farmers to take their livestock to *oohambo* far from *omagumbo.* (See chapter 5). Not many farmers would be able to collect manure from *oohambo* and because of further overgrazing and deforestation the farmers would be forced to remove *omahangu* stalks from the fields for fuel and construction materials and graze the rest. These practices would further 'rob' the soil of much needed organic matter and in order to maintain the soil fertility of their lands, farmers would continue to practice *oludhilu* or homestead shifting. For the renewal of poles needed for *oludhilu* further deforestation would take place. A combination of the processes of deforestation, overgrazing and overcultivation will ultimately give rise to desertification. Again the researcher would like to reiterate that an interesting solution to this problem has been suggested by the respondents - public education. The respondents felt that there is a dire need for changing attitudes and the destructive habits of the people. This change could only be cultivated through appropriate educational programmes and if the causes that moved the people to do it are addressed.

6.3.4 Suggestions to stop desertification

Respondents were asked to suggest solutions to the problem of desertification, and to suggest implementation strategies of these solutions as well as the people to be involved by means of the question D:7. "(a) What do you see as possible solutions to the problem of desertification? (b) How can these solutions be implemented? (c) Who should do it? [Probe → why them and do you see yourself as part of the solution?]." The responses are summarised in Table 6.11.

Table 6.11 Responses to question D:7 (re desertification)

Suggestions	Activities
Changing attitudes	Public education on environmental problems
	Awareness campaigns- use radio, workshop, demonstration days etc.
	Information dissemination through existing regional bodies
	Training of environmental trainees in villages
Tree planting	Provision of tree seedlings and water by government
Stop deforestation	Law enforcement
	Prevention of veld fires
	Provision of loans to buy building and fencing materials
Stop overgrazing	Through discussions with communities
	Prevention of veld fires
	Policy on land utilisation and range management
	Research
	Reduce large fences
	Access to better grazing areas
Access to land	Solving the land issue
	Viable economic policy (viable marketing strategies)
	More power to regional authorities
Stop overcultivation	Solving soil fertility problems
	Provision of manure and fertilizers by government
	Ploughing in of crop residues
Solve population overconcentration	Resettlement schemes
	Equitable distribution of land
Those to be involved in the activities	Government ministries, community and political leaders, the community, regional councillors and governors, village headmen, chief headmen, development committees, professional bodies, churches, other regional structures

It is interesting to note that most of the solutions suggested by the respondents related to what they perceived as the causal processes of desertification. Most emphasis was placed on solving the problems of deforestation and overgrazing. Sentiments like 'people should not chop down the

whole tree but only branches' were among the many others that were expressed. Likewise, aspects of overgrazing, especially the controlling of uncontrolled and illegal fencing of communal grazing as well as the control of the uncontrolled tilling of marginal lands at the expense of grazing areas were seen as viable propositions. Furthermore, the problem of overgrazing was attributed by a respondent from Ohangwena to the issue of overconcentration of people in certain areas only. He has expressed himself as follows: "We have to solve the problem of overcrowding ... we have too many people at one area, and they take all land, including the one for grazing ... if we solve the problem of overgrazing - desertification will decline." This particular respondent related the problem of desertification, even if he did not mention it directly, to the unfair past policies of bantustans. Maybe the following quotation will illustrate this point more vividly: "It is a question of solving the land issue ... so that the majority of people are not confined only on a small piece of land which is infertile, while there is fertile land only occupied by a few people." This statement suggests that desertification is not merely the result of destruction of land resources by man, but it is the injustices of the past policies that have forced people to eke out a living on non-viable units of land. These sentiments correlated with the sentiments expressed by a respondent from Oshana in section 5.2.4 where he suggested that some people should be resettled in the south of the country. The researcher is of the opinion that in order to change this thinking maybe public education should start with educating people on the general geography of the country. People should be taught that the O-4 regions consist some of the best cropping lands of the country and that the south is not suitable for cropping at all. It is better to take care and to utilize available land in the O-4 regions than to resettle people in the lower rainfall and desert areas of the south.

One consolation is that two respondents have attributed desertification to the lack of awareness and understanding of desertification. One can add to that the lack of understanding and knowledge of the agro-ecological zones of the country. Even if they did not mention it directly, they have suggested that environmental education to change people's attitudes will solve the problem of desertification. They have suggested that only through public education will people become aware and understand the problem of desertification and consequently, possibly change their attitudes. Indeed the researcher is of the opinion that these are viable suggestions and need to be taken into consideration. One respondent has forwarded the following proposal: "We have

constituencies - take centres in these constituencies and place approximately two people at these centres who are trained in all these things and they in turn will educate the communities - then we can solve the problem of desertification." The suggestion implies that it is only through awareness, understanding, and changing of attitudes that the problem of desertification (and other environmental problems) will be solved. This awareness can only come about through environmental education integrated with rural development programmes on land use planning.

In order to solve the problem of desertification therefore, environmental education could play a crucial role in helping communities in the affected areas acquire an awareness of and sensitivity towards the environment; to help them gain understanding of the environment and its associate problems, so that they could gain values and feelings of concern that would change their attitudes to motivate them to acquire the skills necessary to solve environmental problems, including desertification.

6.4 SUGGESTED PLAN OF ACTION TO BE USED IN AN EDUCATIONAL PROGRAMME ON LAND USE PLANNING.

The respondents were requested to engage in the generation of a plan of action that could be used in an educational programme on land use planning by means of an open-ended question D:13. "The Ministry of Agriculture, Water and rural Development would like to have an educational programme for land-use planning. What would you see as a possible plan of action which could be used in this programme?" The responses are summarized in Table 6.12.

Table 6.12 Responses to question D:13 (re desertification)

Plan	Activities
Educational plan	Teach:- appropriate land and animal husbandry- educational materials to be in the local language.
	- and encourage use of manure and fertilizers
	- concepts of desertification, overgrazing, overcultivation, deforestation
	- how to plant and the importance of trees
	- trainers of environmental trainees
	- the wise use of water
	- and promote construction of brick houses
Supportive plan	Provide and subsidise fertilizers, manure, quality bulls
	Provide loans for tractors, agricultural implements, building and fencing materials
	Provide ploughing services
	Facilitate and promote marketing of cattle
	Job and income generating projects e.g. bricks and fence making
	Even distribution of water
Pilot resettlement schemes plan	Identify and fence off one large communal cropping unit - sub-divide into smaller units for individual families
	Identify and fence off one large grazing unit sub-divide into smaller units for the purpose of rotational grazing

From responses received three plans of action could be derived at namely, an educational, supportive, and resettlement pilot scheme plan. All respondents were in agreement that whenever such an educational programme for land-use planning was going to be planned, the land users (communal farmers) should be involved in the planning. This concern has also been recognized in IISD (1993), when it was stated that local communities should be involved in information collection and should be kept informed by their governments about all projects, policies and programmes that will affect them. The three action plans will now be discussed separately as follows:

(a) Educational Plan of Action

Education and awareness campaigns were singled out to be effective mechanisms through which many of the desertification problems could be tackled. The use of radio was emphasised, especially for the awareness campaigns and easy information dissemination. The respondents (two from Omusati) indicated that many people own and listen to radios. They would like to see technical people, preferably from the Ministry of Environment and Tourism, to address the issue of desertification over the radio and to answer technical questions from the listeners.

Educational activities suggested under this plan included the teaching of appropriate land and animal husbandry, specifically, farmers should be encouraged and taught how to apply fertilizers and manure. The deep ploughing with tractors was criticized, and was blamed for overcultivation. The respondents suggested that proper training should be given to those who are ploughing with tractors. The respondents further felt that many rural farmers did not quite understand the concepts of the four factors studied, they therefore suggested that these concepts should be taught to the farmers. In order to achieve this goal, they suggested that firstly, environmental educators should be trained who will educate other environmental trainees on a voluntary basis in the regions. In every region there should be environmental educators based in the regional centres. These educators should train and teach the farmers about environmental issues, including how to plant and look after the trees, how to use water wisely and they should also promote the construction of brick houses. The respondents have further suggested that all educational materials should be in the local language for all to comprehend. The researcher is of the opinion that this plan , if executed judiciously could begin to solve much of the environmental problems in the O-4 regions. The only stumbling block would be to find people in the regions who could be trained as environmental educators and do the training work on a voluntary basis. Alternatively, they could be paid by the state.

(b) Supportive Plan

Under this plan, most of the respondents have suggested that the government should provide manure, fertilizers and quality bulls at subsidised prices to the farmers. Furthermore, they also

suggested that the government should provide loans for the buying of tractors and implements as well as building and fencing materials. The researcher is however of the opinion that, these activities would mainly benefit the relatively well off farmers who would be in a position to pay back the loans. Small farmers would not be in a position to pay back the loans and therefore other possibilities should be looked at in order to cater for them. It was further suggested that the government's ploughing services should be continued. Most of the respondents were however of the opinion that these services should be upgraded and the people doing the ploughing should receive training in the method of ploughing.

Some very interesting activities under this plan were also suggested. One such suggestion is the promotion and creation of livestock marketing strategies and facilities in the O-4 regions. The respondents have pointed out that at the moment there is only one marketing facility for all farmers in the O-4 regions. This factor makes it very difficult for those farmers who are living far from this facility to market their cattle. Another activity suggested was the creation of income generating projects. The researcher is of the opinion that this idea should be taken up seriously. Much of the causes and effects of desertification were related to poverty and hunger. Poverty and hunger as such do not necessarily mean a lack of food *per se*. In most cases poverty and hunger means a lack of access to available food due to a lack of money. As long as people do not have money to buy food, they will always try to eke out a living through different means, even if these means may lead to the destruction of the scarce resources. It is therefore important that in our quest to solve environmental problems a deeper look is needed to establish not only the obvious causes but the underlying causes as well. Clearly then, addressing the question of income for the small farmers and their families not only on humanitarian and economic grounds, but also on ecological grounds will constitute a great contribution to solving the desertification problem in the O-4 regions.

(c) Pilot Resettlement Scheme Plan

The settlement patterns of farmers in the O-4 regions is such that the homesteads are scattered all over the region instead of being concentrated. Every household is surrounded by its own *epya* (*omahangu* field). Most of the respondents felt that this settlement pattern is reducing the grazing

area tremendously. Two activities were suggested to solve this problem. First, a large cropping land should be identified and fenced off to keep out the animals. This land should further be subdivided into smaller plots for individual farmers. Homesteads should be concentrated in one area that could be well served with water and electricity if possible. The rest of the area should be left for communal grazing. The researcher is of the opinion that this particular scheme would not entirely solve the environmental problems of the O-4 regions. Similar patterns are practised in other countries like Lesotho (Van der Laan, 1993). The problem with such a scheme is that where at present every household was surrounded by its own *epya*, and people have easy access to it and could work on it most of the time, under the proposed scheme, people would have to walk long distances to their fields. They would be required to carry heavy implements and tools and where one household has more than one such plot it would be difficult to work on both in the same day because of the distance. On the other hand, the concentration of the homesteads in one place would make provision of services easy for the government but there is a probability that the rate of crime would increase in such concentration areas. The social life will break down and decay. The other scheme suggested under the plan was the identification, demarcation and fencing off of a big area for the sole purpose of grazing. Similar schemes are practised in Botswana. The problem with such a scheme would be that if the government was to implement such a scheme on the cost-recovery principle then only well off farmers would generally benefit from it, because the small farmer would not be able to pay the required fees.

Lastly, the researcher would like to point out that there is a strong link between Table 6.11 and 6.12 and most of the suggestions in Table 6.11 were repeated in Table 6.12 by the respondents.

6.5 CONCLUSIONS

Most of the activities indicated by the respondents address specifically the question of deforestation and overgrazing. Furthermore, most of these activities related to the tree planting projects under the FFWP. Relatively few activities are going on directed to the question of overcultivation. Responses received have indicated that the concept of overcultivation is relatively new to the people. It is here were environmental education could play a significant role in rural development programmes. Furthermore, from the data presented in this chapter, public education

was given emphasis as the most viable solution to stop the processes of the four factors studied. Changing of attitudes through awareness campaigns and education was seen by the majority as a viable proposition to the problems investigated. It can be concluded that most of the suggestions given in this chapter are worth looking at, and should be addressed firmly. In summary, this chapter has reflected the views of the respondents as they perceive the way forward to solving the problem of desertification and its three factors which were investigated in this study. We will now go on to give a general conclusion of the whole study.

CHAPTER 7

CONCLUSIONS

7.1 INTRODUCTION

Chapter four, five and six described and examined the results of the research, the purpose of which was to study the perceptions, knowledge and understanding of the respondents *vis-a-vis* desertification and its three main identified causes. This final chapter consolidates the research findings and explores their implications for Environmental Education for farmers in the O-4 regions. The research results are also evaluated. In the last section, recommendations are made which might be used to resolve some of the problems discovered and perceptions which have emerged.

7.2 GENERAL CONCLUSIONS

7.2.1 With respect to conceptual understanding.

The understandings given by the respondents for desertification and its three identified causes were measured against the working definitions given in chapter two. As a general conclusion all respondents demonstrated a general idea of the four concepts dealt with, although some had a clearer idea than others, giving clearer definitions, and displaying a clearer understanding of the processes. Those who had been in political exile could even give the time frame in which deforestation had taken place. The concepts of deforestation and overgrazing were fairly well understood by all the respondents (see sections 4.2.2 and 4.3.2), but there was a small proportion who did not comprehend fully the concepts of overcultivation and desertification.

Desertification was not perceived to be much of a threat. The concept was generally associated with that of deforestation and overgrazing. Most of the respondents indicated that the extent of overgrazing is more severe in and around *omikunda* and around waterpoints (example

of Omatale waterpipe line was given). The researcher is of the opinion that the reason why desertification is most closely associated with deforestation and overgrazing probably results from the term 'desert' in *Oshindonga* which means *ombuga. Ombuga* is mainly used as grazing land and very few people have *omahangu* fields there (see section 4.5.2). This is significant in the sense that overcultivation was not perceived as a major cause of desertification as compared to deforestation and overgrazing. This perception does not however reflect the general reality. The researcher's own observations, supported by studies done in the area (Seely, 1991), suggested that overcultivation was more severe than overgrazing and desertification due to overcultivation was widely evident. (See section 1.3.6).

The respondents further cited a broad range of signs for the processes of the four factors studied. The most frequently cited signs for deforestation and overgrazing were the most obvious ones that could be seen and experienced on a daily basis. (See section 4.2.1). Table 5.4, for instance, has shown that cattle dung were perceived to be increasingly used, but the use of this fuel source was not seen as a sign of deforestation.

7.2.2 With respect to the understanding of causes and consequences

A broad range of causes and consequences regarding the four factors studied were cited by the respondents. These were compared to those found in the general literature and reported for similar situations, to determine the degree of understanding of the respondents. The most frequently mentioned **causes** were the most obvious ones that could be experienced on a daily basis in the respondents' biophysical and social environments. The respondents tended to see specific rather than general issues.

From their own point of view the major causes of ***deforestation*** were the construction of traditional houses and fences and clearing for *omahangu* fields. Firewood was not perceived as a major cause of deforestation, but it *was* perceived as the main usage of wood. This apparent contradiction needs to be studied further because it may have implications for deforestation. If, for instance, firewood is found to be a cause of deforestation, then another approach to this problem may be needed. It is the researcher's opinion that the socio-economic conditions and

lifestyles of the rural people, rather than the construction of traditional houses and fences *per se* may have a greater influence on the process of deforestation. (See section 5.2.1).

As far as ***overgrazing*** is concerned the biggest problem perceived was that of uncontrolled illegal fencing of communal land by a few individuals and the loss of grazing to cultivation and *omagumbo*. The respondents also stated that rangelands are further under continuous pressure due to increasing stock numbers and drought and grazing has become almost non-existent around *omagumbo* and in *omikunda*; as a result livestock were taken to *oohambo*, far away from *omagumbo*. Some respondents pointed out that while there were some headmen who were concerned about the problem of overgrazing, and felt their authority being undermined by people who simply fenced off vast tracts of grazing areas without consent, it seems that many were falling pray to the money offered to them by these few rich farmers to allow them the right to fence off the common grazing. No respondent actually mentioned illegal fences as a sign of overgrazing. From the researcher's observations, illegal fences were not found in the more populated areas, but were found in areas were the population density was not so high. It is the researcher's opinion therefore, that population growth with a concomitant increase in *omapya* and livestock densities, have decreased the grazing areas more than illegal fences and could be viewed as the principal reason for overgrazing. (See section 4.3.2 and section 4.3.3).

The general feeling with regard to ***overcultivation*** was that shortage of manure was the major problem with a concomitant negative impact on soil fertility. The absence of fallowing and the disappearance of 'traditional' fallowing of homesteads shifting (*oludhilu*), has a bearing on the productivity of lands and ultimately on the yields obtained from that land. (See section 5.3.2.1). The researcher is of the opinion that population pressure and the socio-economic conditions of the people could have a greater role in overcultivation than the deep ploughing with tractors which for instance, was mentioned. (See Table 5.7). It was also mentioned that due to population pressure, grazing areas in villages have disappeared, that this has resulted in lack of manure and that many small farmers do not have the means to collect manure from *oohambo*. The researcher's observations and experiences would support this view.

Concerning ***desertification***, the three factors *viz.* deforestation, overgrazing and overcultivation

were seen to be the major problems. Deforestation and overgrazing were specifically singled out to be the major causes of desertification. The social/cultural/economic causes of desertification identified were the building of traditional houses and the burning of crop residues. These factors suggested that the lack of alternative construction materials and appropriate and affordable tilling methods (eg. animal drawn implements) that could be employed to plough in crop residues were the driving force behind these practices. Drought and veld fires were also seen by them to be playing a meaningful role in the processes of deforestation, overgrazing and ultimately desertification. It is well documented that poverty is the driving force behind environmental degradation in rural areas (Irwin, 1984., Bembridge, 1986., Timberlake, 1993), but poverty was not perceived by the respondents to be a cause of desertification in this study. (See section 5.2.4).

Respondents perceived population growth to be a growing problem. There were respondents who suggested the relocation of people from the O-4 regions to the south of the country as a solution to this problem, forgetting or not knowing that the south of Namibia was much drier than the north and that the human carrying capacity there was correspondingly very low. (See section 5.2.4 and 6.3.4). The problem was perceived as rooted in population overconcentration or generally localized population pressure on land due to the confinement of the majority of Namibians to the O-4 regions. The feelings of the respondents were that this situation has been exacerbated by the absence of a land-use policy, which has resulted in few individuals fencing off communal pasturage. The researcher is of the opinion that generally, the absence of a land-use policy and the existing land tenure system may well be among those factors that could be blamed for desertification. In general, respondents displayed a reasonably informed understanding of the causes that were obvious, but did not fully comprehend the underlying forces behind these causes. It is therefore important that the issue should be explained to the people through education. (See also section 7.4).

With regard to the **consequences**, as a general conclusion, poverty and hunger were singled out to be consequences of all the factors studied. On the other hand the respondents failed to attribute the *processes* of the four factors to poverty and hunger. (See further section 7.4). The researcher is of the opinion that there is a strong link between the causes and consequences of desertification. Once the people are caught in a web of poverty they cannot easily break out and as a result

degrade their environment further and further. It is also the researcher's view that since the respondents were themselves rural people, it could not be expected from them to point out that they were poor and degraded their environment as a result, but it was recognized in phrases such as "there is no way out." (See section 5.3.1). Rainfall was perceived to have decreased as a consequence of deforestation. Indeed, Figure 1.4 shows that there has been a decrease in rainfall since 1978, it was, however, not within the scope of this study to determine whether this decrease was due to deforestation alone or due to a combination of several factors. It is however the researcher's view that the effect of drought now seems more severe because in the past, even if it did not rain much the effect was counter-acted by the availability of wild fruits. (See section 5.4.1). Poor yields and loss of milk due to fewer cattle or cattle far from the homesteads also have a bearing on the diet and health of the people. Decreasing availability of manure as a result of overgrazing and changing patterns of cattle mobility has in turn a bearing on poor crop yields. Lost of beauty and bio-diversity were also cited as consequences of deforestation and desertification. An interesting comparison was made between Namibia and neighbouring Angola that shows the effect of environmental degradation in Namibia. (See section 4.5.2). These perceptions were supported by the researcher's own observations.

Fuelwood scarcity was not perceived by the majority of respondents as a problem in the O-4 regions, but as has been explained by the researcher in chapters 4 and 5, the reasons for that are obvious. The researcher can only conclude that since deforestation was perceived as a problem in the O-4 regions- firewood scarcity should be assumed as a growing problem and evidence for that is the increasing use of crop residues and cattle dung as fuel sources.

Small rural farmers and their families were perceived to be most affected by desertification. As Agarwal (1986), has pointed out, environmental destruction is largely caused by the consumption of the rich, with the poor suffering from its effects. As far as the social/cultural/economic changes are concerned, the 'disruption' of the lifestyles of rural people was seen by the respondents to be a major factor. It was pointed out by some of them that as the processes of the four factors increases more and more expenses are incurred for daily survival. (See for instance section 5.4.2). It is therefore concluded by the researcher that desertification increased the economic hardship of people in rural areas and this resulted in increased demand on the natural resources. The socio-

economic implications of the processes of the four factors are enormous and real. Environmental resources are the lifeblood of socio-economic development, and the state of the environment is a vital aspect of human well-being everywhere.

7.2.3 With respect to the way forward

A broad range of solutions were suggested by the respondents. Education and awareness campaigns to change attitudes being the most frequently cited. Specifically, the training of environmental educators in villages was proposed. Stricter enforcement of regulations and the introduction of new ones were also seen as viable solutions. These points tend to support recommendations made in Agenda 21 (UNCED, 1992).

The respondents indicated that there were some activities going on in the O-4 regions to stop the processes of the four factors studied. Most of these activities were however specifically addressing the processes of deforestation and overgrazing. Little was being done to stop the process of overcultivation. It was pointed out by the respondents that there is no effective livestock marketing strategy in the O-4 regions a situation which has a historical underpinning. (See section 5.2.2). Likewise, there seemed to be no effective control, except for the cutting permit system, (see table 6.1) on the depletion of woodland (deforestation) in the O-4 regions. The researcher is of the opinion that this situation will lead to total exhaustion of the remaining woodland in the not too distant future.

As far as ***overcultivation*** is concerned, increasing soil fertility was the most frequently cited solution. The researcher is of the opinion that this may be achieved through the promotion of the traditional way of maintaining soil fertility. The use of manure and the ploughing in of crop residues using animal drawn implements are particularly relevant in this regard. Furthermore, equitable distribution of land and improvement of water distribution especially to areas with good grazing and no water or saline water were suggested as possible solutions.

Most of the solutions provided to stop desertification concerned deforestation, overgrazing and

overcultivation. (See tables 6.11). These are all good suggestions but are technical solutions only. According to Timberlake (1993), the answer to environmental `bankruptcy' is not purely a technical one, but the socio-economic factors which force rural people to degrade their environment should be given more priority if real changes are to be expected. In this regard a plan of action to be included in the land-use programme was suggested by the respondents. This plan comprises three components, *viz,* an educational, a supportive and a resettlement plan. The researcher is of the opinion that these plans warrant further investigation to bring to light their feasibility and viability and the implications involved in implementing them. (See discussion of this issue in section 6.4).

In general, this study has shown that the senior decision makers in the O-4 regions have a surprisingly good understanding and knowledge of desertification and the three factors which are widely held to be amongst its most important causes. They have suggested solutions worth examining further.

7.3 EVALUATION OF RESEARCH.

The primary aims of the research were to provide initial information about how decision makers in northern Namibia currently perceive desertification and its causes, and so provide a basis for the development of an educational programme on land-use planning for the farmers in the O-4 regions. The researcher considers that these aims were achieved. A small but significant amount of data has resulted which has brought many problems to light. Tentative results have emerged providing material for the development of an educational programme on land-use planning. The researcher is further of the opinion that other aims of the research as given in chapter one were also reached in that the results helped the researcher to clarify the respondents' thinking about and understanding of the process of desertification. The respondents' knowledge and understanding of the concepts and causes of desertification with particular reference to the three main causes identified in the general literature on the subject were also established. Furthermore, the aim of engaging the respondents in the generation of solutions was achieved in that a small number of insightful solutions were suggested in this study by the respondents.

The researcher also considers that the qualitative approach used in this study offered an appropriate basis for investigating the perceptions, knowledge and understanding of the senior decision makers in the O-4 regions. On the other hand, because it was a qualitative research approach, much of data analysis necessitated some speculations on the part of the researcher who was confronted with the issue of subjectivity. The researcher considered the use of interview as a method enlightening as it offered him an opportunity to probe and receive first hand knowledge of the respondents' perceptions of the environment. This assisted him to gain insights and served as a basis for assessing the perceptions and degree of their understanding and knowledge *vis-a-vis* desertification and its related processes.

The strength of the work was in the wide range of questions which covered a number of aspects. These questions produced a substantial amount of information, which had to be scaled down to manageable proportions to fit within the limit of the half thesis. On the other hand, the range of questions could also be viewed as a disadvantage. Too many questions over a wide range of problems did not allow, in some cases, in-depth probing and discussions of every question. (See chapter 3). The research has however, provided useful data for future comparative analyses, validation or rejection and the construction of questions necessary for future research. With regard to the sample, the researcher considers that the size of the study group was appropriate for a half thesis. What is extremely valuable in the study is that the highest decision makers in the O-4 regions were involved. Unfortunately, no women could be interviewed due to the reasons given in chapter three. This, no doubt, robbed the study of important information which may have revealed some interesting and different results pertaining to the perceptions of women on environmental issues in their regions. It is therefore hoped that similar studies that might be undertaken in the future should include both women and men in their research samples.

Another evaluative consideration was that the researcher investigated three pre-determined causes of desertification, which may have influence the results, and should be a reason to view the study results as tentative. Caution is appropriate in the general applicability, of results from small studies such as this one. The concept, causes and consequences of desertification are complex and the researcher doubts that any single individual could do real justice with small scale research of this nature to effectively investigate all these complexities. Future studies, probably large scale

coordinated programmes of interdisciplinary research, to investigate the problems identified in this study as well, as other possibilities would be needed. Human activities for example, were perceived to be the focal point of the problems, and population growth was seen to have contributed to all the processes involved. The weakness of this study in this regard was that it could not determine the extent to which man and especially population growth is really contributing to these processes. In the meanwhile, this thesis is considered as a contribution to the ongoing discourse on desertification in Namibia, and an opening of the debate on where to direct environmental education programmes when only limited resources for these are available.

7.4 IMPLICATIONS FOR ENVIRONMENTAL EDUCATION

From the research results supported by the literature, the researcher continues to suspect that the socio-cultural and economic situation of the community in the O-4 regions, are the underlying factors promoting and influencing desertification. On this basis, coupled with the fact that the perception was that there was a general lack of understanding of the negative effects of environmental degradation, environmental education may provide the answer to many of the identified problems. "Environmental Education is a process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his biophysical surroundings" (IUCN, 1971 as quoted by Irwin, 1989:2). Thus, people's attitudes may change as they develop deeper appreciation and understanding of the natural world around them. It has been recognised by writers such as Irwin (1984:8), that "the fundamental issues to be dealt with are those of poverty, the grossly unequal distribution of resources and wealth, and the day to day hardship of people if conservation is to become a reality". The researcher is of the opinion that eradication of poverty and hunger in the O-4 regions would be impossible if we do not increase and raise public awareness on environmental issues, promote environmental education and mobilize local communities to undertake measures such as energy saving and reforestation, and to be aware of issues such as deforestation, overgrazing, overcultivation and desertification. The researcher is further of the opinion that environmental education will enable the people to understand the interdependence of all life on earth, and the repercussions that their actions and decisions may have both now and in the future on resources in their local area (Fien, 1993).

Following the Tbilisi principles (UNESCO-UNEP, 1978), environmental education should consider the environment in its totality; be a continuous lifelong process; examine major environmental issues from local to national so that students receive insight into environmental conditions in other geographical areas; be interdisciplinary in its approach; involve active participation by learners; help learners to discover the symptoms and real causes of environmental problems; and stress individual responsibility towards the environment. Environment is the starting point for any kind of education in society and it is easily incorporated in socio-cultural values. It is therefore suggested that environmental education in the O-4 regions should take three forms, namely formal, informal and non-formal education. These three forms of education have been defined by Irwin and Janse van Rensburg (1991), as follows: *Formal education* is education which takes place in a planned way at recognised institutions such as schools, colleges and universities. *Informal education* is education which is given in situations in life that came about spontaneously such as within the family circle, the neighbourhood, social and cultural institutions and *non-formal education* is that education that takes place in a planned way outside the spheres of formal and informal education such as in-service training in the work situation.

Research results have further shown that some activities by NGO's are already going on in the regions to stop the processes of the four factors studied. (See chapter 6). Agenda 21 clearly stated that governments should strengthen NGO's to facilitate environmental education to the people (UNCED, 1992). There is a need to devise ways of sharing environmental information and knowledge, as widely as possible in a way which is meaningful to the people concerned. The radio has been suggested by the respondents (see chapter 6), since many people own and listen to the radio. Other mediums of changes are churches, extension officers, community development officers, community based health workers, the suggested trainers of environmental educators and all those involved in community work. Opportunities should be created for workshops, demonstration days, radio talks and other activities in order to clarify the concepts of the four factors studied and to increase the awareness of environmental issues in the regions. Education material should be in the local language, to make data accessible and useful to all levels of education.

Environmental education should provide the most appropriate and basic education on the causes

and consequences of environmental degradation. Through non-formal education for instance one could start where the people are: education, should build on the personal and working experiences of rural people. Teaching materials should be relevant and interesting and environmental themes should be incorporating into the extension messages. Through in-service training, rural extension officers, should all receive intensive environmental education related to the rural area of the O-4 regions in which they are working or will work.

Identified areas were Environmental Education intervention is needed are as follows.

With regard to conceptual understanding

- encourage positive changes eg. issues of fertilizers, manure, crop residues, tree planting, brick houses and alternative fuel sources. It was pointed out in Agenda 21 that the government should strengthen local knowledge to stop desertification (UNCED, 1992).
- the importance of trees
- the role of population growth
- the effects of soil erosion
- the recognition of signs for overcultivation and desertification
- the consequences of ploughing of marginal lands
- the importance of appropriate ploughing methods
- the understanding of concepts of overcultivation and desertification
- possible role of man in desertification (interconnectedness of man, his culture and his biophysical and social environment)
- the importance of bio-diversity
- the importance of habitats

With regard to causes

- the influence of unemployment
- the effects of the use of cattle dung as fuel source
- the implications of firewood not perceived as a cause of deforestation

- the implications of cutting of bushes not perceived as a cause of deforestation
- the socio-economic situation versus deforestation
- the results of the use of crop residues as fuel or construction materials
- the possibilities for the use of other fuel sources
- the effects of absence of fallowing
- the changing of traditional beliefs with regard to fallowing
- the importance of family planning
- the significance of increasing the knowledge of the general geography of Namibia especially with regard to its rainfall and agro-ecological and geographical areas.
- explain the underlying causes of the four factors studied
- the implications of cultural beliefs, customs and traditions

With regard to the consequences

- the effect of environmental degradation on rainfall
- the loss of beauty and bio-diversity
- the loss of knowledge on and disturbance of wildlife
- the loss of knowledge on and destruction of plant life
- the recognition of the possible link between poverty and environmental degradation

With regard to the way forward

- the role of awareness campaigns on desertification and other environmental problems
- the recognition of customary laws and regulations
- the importance of forest caretakers
- the role of tree planting projects at schools (as a means of EE in environment)
- problems of soil fertility
- the changing of attitudes
- the question on land issues
- effect of livestock numbers on grazing (stocking densities/carrying capacities)
- the use of fertilizers

- the importance of soil characteristics
- the effects of mixing of fertilizers with seeds and planting together
- the role of DAPP and other NGO's and RDC in EE
- the importance of marketing of cattle and marketing strategies
- the wise distribution and use of water
- illegal fencing and its impact on the environment
- the effect of land tenure system in communal areas
- ploughing of marginal lands and its impact on the soil
- the role of public education
- the positions of arable land in the country

With regard to the suggested action plan

- understanding of land and animal husbandry
- the role of environmental educators
- the importance of construction with alternative materials
- the investigation of income generating projects
- the possibility of common cultivation/grazing lands
- the recognition of interrelatedness of people/culture/surroundings
- the importance of equitable land distribution
- the role of the law and environment
- the role and use of media

7.5 RECOMMENDATIONS

It is recommended that all suggestions put forward by the respondents as solutions to the problems investigated should be looked at carefully and implemented were feasible. Environmental education is urgently needed in the O-4 regions, because eradication of poverty and hunger without the protection of the environment is a short term solution. Agarwal (1986), has strongly argued that development without the concern for environment can only be development for the short term because in the long term it can continue only at the cost of

enormous human suffering, increased poverty and oppression.

The following specific recommendations were made taking into account recommendations in Agenda 21 (UNCED,1992) and *Status of Desertification and Implementation of the United Nations Plan of Action to Combat Desertification* (UNEP, 1991), as was pointed out in chapter 2 and looking at the problems identified in section 7.4. The reader is furthermore reminded of the suggested solutions by respondents made in chapter 6.

The following are recommended:

To counter-act the effects of deforestation

- Promote, afforestation, reforestation and agro-forestry activities, using drought resistant, fast growing tree species, in particular indigenous ones. Bearing in mind that Namibia lacks adequate water, the planting of trees should preferably take place during the rainy season. Engage particularly school pupils in this project.
- In order to ensure the protection of bio-diversity, some remaining woodlands in the O-4 regions should be protected through legislations and environmental educational programmes. Local people should be involved in this regard.

To counter-act the effects of overgrazing

- The government should assist the farmers' association in the area to work out livestock marketing strategies and capacities (especially the marketing strategies for cattle).
- The regional councillors together with the headmen should be given more authority to effectively deal with the issue of illegal fences and the encroachment of grazing areas by *omahangu* fields in the regions.

To counter-act the effects of overcultivation

- Improve upon local practices of land and animal husbandry for the purpose of preventing

overcultivation. The ploughing with animal drawn implements rather than tractors should be encouraged and supported by the government through the provision of incentives. Traditional technologies are often more appropriate than the 'modern' ones (eg. fallowing and inter-cropping with legumes to increase soil fertility).

- promote the use of manure and crop residues. Environmental education programmes should focus on the role and importance of organic matter.

To counter-act the effects of desertification

- Poverty should be minimized by the introduction and creation of income generating activities and self help programmes.
- Establish anti-desertification committees within regions including bodies like the regional councillors. These committees could be utilized to mobilise the community for environmental programmes.
- Introduce environmental education through formal and non-formal and in-formal education in the community, especially those most affected by desertification. The environmental education programmes should involved the local people right from the planning stage. This approach will develop a sense of ownership among the community. They should see the programmes as theirs. Importantly, start where the people are, they are already doing things which have allowed them to survive for centuries.

In conclusion, the respondents to this study have tended to suggest that many of the problems to deforestation, overgrazing, overcultivation and desertification were the results of actions perpetrated by man while the small farmers and their families were the ones effected most. Environmental degradation in the O-4 regions are erroneously not perceived as rooted in poverty and hunger as such but poverty and hunger are perceived to be the consequences of environmental degradation. Eventually, environmental improvement should become, officially, a fundamental priority of the Government and one of the basic conditions for restoring economic and social stability in rural areas of the O-4 regions. It should be stressed that local people should be involved in the development of environmental education programmes which are aimed at them.

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APPENDIX A

Interview schedule

Title: A study of perceptions, knowledge and understanding of desertification and its causes among decision makers in Northern Namibia.

SECTION A: Introduction. Re: Interviewer

1. About myself

2. What I am going to ask about

   a) deforestation

   b) overgrazing

   c) over-cultivation

   d) desertification

3. Why I want to do this research

4. How much time is available for me?

5. Permission for using tape recorder

6. Confidentiality

7. SWITCH ON THE TAPE RECORDER!

NB: Take enough batteries and cassettes with me!

SECTION B: Personal information of participant.

[to put on tape before interview if possible]

1. Interview No. [ ]	2. Date [ ]
3. Constituency [ ]	4. Region [ ]
5. Village [ ]	6. Sex [ ]
7. Marital status [ ]	8. Position [ ]
9. Age [ ]	

10. How long has participant been in the constituency/region?

11. History of employment of participant

    (a) present

    (b) past

12. Are you a:

    a) full time farmer [ ]

    b) part time farmer [ ]

c) communal farmer [ ]

d) commercial farmer [ ]

13. What are you farming with?

SECTION C 1: <u>Deforestation</u>

1. To make sure that we are speaking the same language, what do you understand by the term 'deforestation'?

2. Do you notice any sign of 'deforestation' in your constituency/region? [probe → to what extent]

3. From your understanding of the term 'deforestation', what do you perceive as the causes of it?

4. What do you think are the consequences of deforestation? [probe → advantages and disadvantages, do people understand these consequences etc.].

5. In your opinion, did deforestation bring about social/cultural/economical changes in your constituency/region? [probe → examples, explanations]

6. In your constituency/region what steps are taken or envisaged to stem deforestation?

7. What are the main uses of wood in your constituency/region?

8. (a) Who are mostly responsible for cutting trees?

(b) Why do you think this is so?

9. Besides wood, what other fuel sources do people use?

10. If you introduce a prohibitive law/regulation on cutting down trees, what implications do you think it will have on the people of your constituency/region? [probe → social/ cultural/economical]

11. What else can possibly be done to stop the process of deforestation?

SECTION C 2: <u>Overgrazing</u>

1. To make sure that we are speaking the same language, what do you understand by the term 'overgrazing'?

2. Do you notice any sign of overgrazing in your constituency/region? [probe → how much over-grazing is taking place etc.]

3. From your understanding of the term 'overgrazing', what do you perceive as the causes of it?

4. What do you think are the consequences of overgrazing? [probe → advantages and disadvantages, do people in your constituency understand these consequences etc.]

5. In your opinion, did overgrazing bring about changes in your constituency/region? [probe → social/cultural/economical]

6. In your constituency/region, what steps are taken or envisaged to stem overgrazing?

7. Do people use cattle dung for fuel?

8. Do you think there are the right number of livestock in your constituency/ region? [probe → what type and too many, too few]

9. If you were to limit the number of cattle in the constituency/region for instance what implications would it have? [probe → why etc.]

10. What else can possibly be done to stop the process of overgrazing?

SECTION C 3: <u>Over-cultivation</u>

1. To make sure that we are speaking the same language, what do you understand by the term 'over-cultivation'?

2. Have you noticed any sign of over-cultivation in your constituency/region? [probe → how much is taking place etc.]

3. From your understanding of the term 'over-cultivation', what do you perceive as the causes of it? [probe → are you aware of any social/cultural activities which might influence the process of over-cultivation?]

4. What do you think are the consequences of over-cultivation? [probe → advantages and disadvantages].

5. In your constituency/region what steps are taken or envisaged to stem over-cultivation?

6. (a) Is land allowed to lie fallow?

   (b) For how long?

7. When people are ploughing the lands, do they put something back? What? Why? If not what are the reasons? [if not mentioned probe → do people use fertilizers?]

8. What else do you think can possibly be done to stop the process of over-cultivation?

SECTION D: DESERTIFICATION

1. To make sure that we are speaking the same language, what do you understand about the term 'desertification'?

2. In your opinion, is the process of desertification taking place in your constituency/region? [probe- how it started and to what extent it is taking place etc.]

3. From your understanding of the term 'desertification', what do you think are the causes of it? [probe → major causes as perceived.]

4. Are you aware of any social/cultural activities which might influence the process of desertification?

5. In your opinion, what are the effects of desertification?

6. (a) In your opinion, is there any threat of desertification in your constituency/region [probe → how serious?]

   (b) Explain.

7. (a) What do you see as possible solutions to the problem of desertification?

   (b) How can these solutions be implemented?

   (c) Who should do it? [probe → why them and do you see yourself as part of the solution]

8. Are you aware of any attempt/endeavour/projects/programmes of stopping desertification in your constituency/region?

9. If yes, who are involved?

10. In your opinion, which section of the population is mostly affected by the process of desertification?

11. In your opinion, what social/cultural/economical effects does desertification have?

12. Do you have too many people in your constituency/region for the amount of land that is available?

13. The Ministry of Agriculture, Water and Rural Development would like to have an educational programme for land-use planning. What would you see as a possible plan of action which could be used in this programme?

14. What else do you think can possibly be done to stop the process of desertification in your constituency/region?

15. Probe → Educational level of participant.[ask for instance, for how long have you been in school]

Lastly: For feedback purposes give address of participant here.

Address:

NB: Reflect on how the interview went → give comments on what was wrong etc.

☻ THANK YOU VERY MUCH FOR YOUR TIME ☻

APPENDIX B

Elandulathano Lyomapulo

Oshipalanyolo: **Ekonaakono lyo ntseyo, nuunongo nehuveko lye mbugaleko lyevi niilanduli ya lyo mokati kaaningi yoma tokolo mo Namibia yuumbangalantu.**

Etendo A: **Efalomo: Komupuli**

1. Kombinga yandje mwene.

2. Shoka tandi ka pula:

   (a) Ekekopo lyomiti/Embugaleko.

   (b) Okuguguka po kuulithilo/Okunapa kwa pitilila.

   (c) Okulima kwa pitilila/Ehekuko lyomapya.

   (d) Embugaleko lyevi.

3. Elalakano lyekonaakono lyopaunongononi.

4. Ethimbo li thike peni te vulu oku mona?

5. Epitiko lyoku longitha oteyipa.

6. Eyinekelo.

7. Patulula Oteyipa!

Ndhindhilika: Kutha omamanya nuukaseta wa gwana!

Etendo B: Omauyelele go paumwene ga nakukutha ombinga.

[Tula moteipa manga ino tameka nomapulo]

1. Onomola	[ ]	2. Esiku	[ ]
3. Oshikandjo	[ ]	4. Oshitopolwa	[ ]
5. Omukunda	[ ]	6. Oludhi	[ ]
7. Ondjokana	[ ]	8. Oposisi	[ ]
9. Oomvula dha nakukutha ombinga			[ ]

10. Ethimbo li thike peni nakukutha ombinga a kala moshitopolwa /moshikandjo?

11. Iilonga ya nakukutha ombinga

(a) Pethimbo lyongashingeyi

(b) Pethimbo lyapita

12. Ngoye:

(a) Omunafaalama ethimbo alihe? [ ].

(b) Omunafalama pampito? [ ].

(c) Omunafalama miitopolwa yomomikunda?[ ].

(d) Omunafalama miitopolwa yokuushimba? [ ].

13. Uunafalama woludhi luni?

Etendo C1: Ekekopo lyomiti

1. Opo tu kale tushi kutya otatu popi oshinima shimwe notu uvitathane, oshitya 'ekekopo lyomiti' oushi uviteko ngiini?

2. Owa ndhindhilika endhindhiliko lyasha lyekekopo lyomiti moshikandjo/moshitopolwa shoye [pula pula → ekekopo lyomiti oli thike peni?]

3. Paku uva ko koye koshitya 'ekekopo lyomiti' oto dhilaadhila kutya oshike tashi shi etitha po?

4. Pamadhilaadhilo goye mwene oshilanduli osha shike mbela shekekopo lyomiti [pula pula → omauwanawa nomauwinayi, aakwashigwana oyeshi uviteko tuu, nosho tuu]

5. Pamadhiilaadhilo goye ekekopo lyomiti olya etelela omalunduluko gasha kombinga yehumokomeho/yomithigululwakalo/yopaliko moshigwana shomoshikandyo/moshitopolwa shoye [fatulula, gandja iiholelwa]

6. Moshikandjo/moshitopolwa shoye oonkatu dha shike dha kuthwa nenge taku tengenekwa dhika kuthwe moku keelela oshinima shekekopo lyomiti?

7. Moshikandjo/moshitopolwa shoye iiti ohayi longithwa shike uunene?

8. (a) Oolye naana uunene haa kekepo omiti?

(b) Omolwashike to dhilaadhila kutya osho shili ngawo?

9. Kakele kiikuni iikwashike yilwe ishewe hayi longithwa kaantu onga oonzo dhiitemitho?

10. Ngele owa gandja ompango tayi keelele ekekopo lyomiti, oshilanduli oshini po tashi ka guma oshigwana sho moshikandjo/moshitopolwa shoye [pula pula → paputuko/pamuthigululwakalo/paliko]

11. Oshike ishewe tashi vulu okuningwa po opo ku keelelwe omukalo gwekekopo lyomiti?

Etendo C 2: Egugukepo lyelundu/Eyonuko lyuulithilo.

1. Opo tu kale tu shi kutya otatu popi elaka noshinima shimwe, oshitya 'enapo lyapitilila/okuguguka po kuulithilo/ eyonuko lyuulithilo' oushi uviteko ngiini?

2. Owa ndhindhilika 'egugukepo lyelundu' moshikandjo/moshitopolwa shoye[pula pula → egugukepo kutya oli thike peni].

3. Pakuuvako koye kegugukepo lyelundu, oto dhilaadhila kutya oshike oshi etithi po shalyo?

4. Pamadhilaadhilo goye oshike mbela oshilanduli shegugukepo lyuulithilo/ lyokunapa kwa pitilila.

5. Pamadhilaadhilo goye, uunapelo wa pitilila owa eta po elunduluko/omashendjo gasha moshikandjo/moshitopolwa shoye [pula pula kombinga yehumokomeho/omuthigululwakalo/paliko]
6. Moshikandjo/moshitopolwa shoye oonkatu dha shike dha kuthwa nenge taku tengenekwa dhika kuthwe moku keelela uunapelo wa pitilila?

7. Aantu ohaa longitha omapumba giimuna oku temitha?

8. Oto dhilaadhila kutya omu na iimuna ya eleka moshikandjo/moshitopolwa shoye [pula pula → oyoludhi luni, oyindji nenge iishona]

9. Ngele owa ngambeke natu tye omwaalu gwoongombe moshitopolwa/moshikandjo shoye, shino otashi ka eta po shike [pula pula → omolwashike nosho tuu]

10. Oshike ishewe tashi vulu okuningwa po opo ku keelelwe omukalo guunapelo wa pitilila?

Etendo C3: Elimo lya pitilila/Ehekuko lyepya

1. Opo tu kale tushi kutya otatu popi oshinima shimwe notu uvitathane, oshitya 'elimo lya pitilila/ehekuko lyepya' oushi uviteko ngiini?

2. Owa ndhindhilika endhindhiliko lyasha lyelimo lya pitilila/lye hekuko lyomapya moshikandjo/moshitopolwa shoye [pula pula → egugukopo lyomapya olithike peni, nosho tuu]

3. Pakuuvako koye koshitya 'elimo lya pitilila' oto dhilaadhila kutya oshi etipo shasho oshike mbela?

4. Oto dhilaadhila kutya iilanduli yehekuko lyomapya/ yokulima kwa pitilila oyini [pula pula → uuwanawa nuuwinayi]

5. Moshikandjo/moshitopolwa shoye oonkatu dha shike dha kuthwa nenge taku tengenekwa dhika kuthwe mo ku keelela okulima kwa pitilila?

6. (a) Oshapitikwa tuu oku vululukitha epya?

   (b) Uule wethimbo li thike peni?

7. Uuna aantu taa limi omapya ohaa shunamo/tula mo tuu sha momapya? Oshike? Omolwashike? Ngele hasho omatompelo ogashike? [pula pula → aantu ohaa longitha uushosho wopaunongononi].

8. Oshike ishewe tashi vulu okuningwa po opo ku keelelwe omukalo gwokulima kwa pitilila?

Etendo D: Embugaleko lyevi

1. Opo tu kale twe shi kwa shilipaleka kutya otatu popi elaka lya faathana oshike u uvite kombinga yoshi tya 'embugaleko lyevi'?

2. Pamadhilaadhilo goye, owa ndhindhilika embugaleko lyevi moshikandjo/ moshitopolwa shoye? [pula pula → sho lya tameke na olyeya sigo oponkatu yini?]

3. Pa uveko lyoye lyoshitya 'embugaleko lyevi' oshike to dhilaadhila shili osho oshi etithi shalyo [pula pula → oshi etithi oshinene]

4. Owa ndhindhilika sha shono hashi ningwa shina sha nonkalamwenyo/nomuthigululwakalo tashi vulika osho shi kale oshiyetithi po shembugaleko lyevi?

5. Pamadhilaadhilo goye iilanduli yembugaleko lyevi oyini na iikwashike?

6. (a) Pamadhilaadhilo goye embugaleko lyevi ota li thiminike (olya nika oshiponga) moshikandjo/moshitopolwa shoye?

   (b) Shi yelitha.

7. (a) Eenkambadhala dha shike wu wete odho tadhi vulu oku kutha po omukundu gwe mbugaleko lyevi?

   (b) Eenkembadhala ndhino otadhi vulu oku tulwa ngiini miilonga?

(d) Olye e na oku dhi ninga? [pula pula → omolwashike, ngoye mwene ou uvite nakukutha ombinga moonkambadhala dhino?]

8. Owa ndhindhilika omahetekelo/oonkambadhala/ooprojeka/oopoloholama dhoku keelela embugaleko lyevi moshikandjo/moshitopolwa shoye?

9. Ngele eeno, oolye ya kwatelwa mo?

10. Pamadhilaadhilo goye mwene okangundu keni kaakwashigwana oko uunene haka vulu ka kale ka hepekwa kembugaleko lyevi?

11. Pamandhilaandhilo goye oshike shopahumokomeho/shopamuthigululwakalo/shopamaliko tashi etwa po kembugaleko lyevi?

12. Omu na aantu oyendji uunene moshikandjo/moshitopolwa shoye?

13. Uuminisiteli Wuunamapya, Omeya nEhumo komeho lyomomikunda owa hala u ete po opoloholama yelongo tayi kwathele moku pulana elongitho lyevi. Oshike u wete shafa tashi vulu okulongithwa mopoloholama yatya ngeyi?

14. Oshike ishewe to dhilaadhila tashi vulu okuningwa po opo ku keelelwe omukalo gwembugaleko lyevi moshikandjo/moshitopolwa shoye?

15. Kambadhala oku mona omuthika gwelongo gwa nakukutha ombinga.

Hugunina: Moku galula oshizemo gandja ondjukithi ya nakukutha ombinga mpaka.

Ondjukithi:

Ndhindhilika: Kambadhala u popye shoka sha ende → gandja ookomenda komapuko ga li po nosho tuu.

☺ TANGI UUNENE KETHIMBO LYOYE ☺

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