



Land Use and Community Rangeland Resources Management Plan

Prepared for the Mokopi Conservation Trust
by the
Centre for Applied Research
November 2006



Table of Contents

List of Tables	4
List of Figures	4
List of abbreviations	5
Acknowledgements	6
Executive summary	7
1 Introduction	9
2 The physical resource base	10
2.1 The physical environment	10
2.2 Vegetation and veld products	14
2.2.1 Vegetation	14
2.2.2 Veld products	15
2.3 Animals	18
2.3.1 Livestock	18
2.3.2 Wildlife	19
2.4 Environmental concerns and opportunities	20
3 Socioeconomic resources and livelihoods	22
3.1 Population	22
3.2 Livelihoods	22
3.3 Infrastructure	25
3.4 Institutions	27
4 Resource use practices	28
4.1 Introduction	28
4.2 Livestock farming	29
4.2.1 Cattle post livestock farming	29
4.2.2 Village area livestock farming	30
4.3 Arable farming	31
4.4 Collection of veld products	32
4.5 Tourism and wildlife	34
5 Current land use and key spatial features	35
5.1 Introduction	35
5.2 Settlement	35
5.3 Infrastructure	36
5.4 Arable farming	36
5.5 Livestock grazing	37
5.6 Use of veld products and wildlife	39
5.7 Special sites	39
6 Opportunities and limitations set by existing land use and development plans	41
7 Review of resource management and development policies and legislation	42
7.1 Legislation	42
7.2 Policies	45
7.2.1 Community-focused policies	46
7.2.2 Development and sectoral policies	46
7.3 Opportunities and limitations for the MCT	51
8 Resource management and livelihood options	53
8.1 Introduction	53
8.2 Tourism development	54
8.3 Livestock production	55
8.4 Crop and fodder production	56
8.5 Use and management of veld products	57
8.6 Other options	58
8.7 Synthesis of options	58
9 Land use plan	61
9.1 Introduction	61
9.2 Proposed boundaries	62
9.3 Land use options	63

	9.4	Land use zoning	64
10		Range resources management plan	66
	10.1	Introduction	66
	10.2	Tourism development projects	66
		10.2.1 Rehabilitation and further development of Mopipi dam Area	66
		10.2.2 Wilderness camp sites on pans	67
		10.2.3 Extensive wildlife utilization and fenced game ranching	68
	10.3	Livestock and range resource management	71
		10.3.1 Village area grazing and resource management scheme	71
		10.3.2 Cattle holding pens and water distribution	72
		10.3.3 Control of bush encroachment	72
	10.4	Crop production and fodder	73
		10.4.1 Dry molapo farming	73
		10.4.2 Fodder production	73
	10.5	Veld products	75
		10.5.1 Community-based veld product management scheme	75
	10.6	Other projects	76
	10.7	Summary	77
11		MCT rangeland resources management regulations	78
	11.1	Introduction	78
	11.2	Preliminary regulations	78
	11.3	Regulations for tourism	79
	11.4	Regulations for livestock projects	81
	11.5	Regulations for arable and fodder production	82
	11.6	Regulations for veld products	83
	11.7	Regulations for other activities	83
	11.8	General regulations	84
	11.9	Capacity, training needs, finances and funding opportunities	84
	11.10	Relationship between the MCT Board and Communities	86
		References	87
		Maps	90
		Appendix 1: Statistical tables	
		Appendix 2: Main fodder trees and shrubs	
		Appendix 3: Suitable species for dust control	
		Appendix 4: Suitable species for game ranching	
		Appendix 5: Wildlife resources and the Makgadikgadi Pans	
		Appendix 6: Responsible tourism guidelines for the hospitality industry	
		Appendix 7: Brief analysis of proposed activities	

List of Tables

<i>Table 2.1:</i> Environmental problems and possible solutions as perceived by the community	21
<i>Table 3.1:</i> Agricultural involvement of the local population	23
<i>Table 3.2:</i> Ranking of rangeland-based livelihood sources (1 is most important; 5 least important)	26
<i>Table 3.3:</i> Existing facilities in the area	27
<i>Table 3.4:</i> Administrative and extension support institutions	25
<i>Table 4.1:</i> The major resources of the area	28
<i>Table 4.2:</i> Strengths, weaknesses and conflicts by activity	28
<i>Table 5.1:</i> Land-use categories of the MCT area.	35
<i>Table 7.1:</i> Opportunities and constraints for community-based rangeland management	52
<i>Table 8.1:</i> Summary of livelihood and improved resource management options and priorities.	60
<i>Table 11.1:</i> Funding and support opportunities for MCT	80

List of Figures

<i>Figure 3.1:</i> Trend in livestock numbers in MCT area (2000-2005)	24
<i>Figure 2.1:</i> Soil types in the area	90
<i>Figure 2.3:</i> Vegetation types in the area	91
<i>Figure 5.1:</i> Location of MCT area in northern Botswana	92
<i>Figure 5.2:</i> Surrounding land-use context for Mokopi project area.	93
<i>Figure 5.3:</i> Distribution of settlements in MCT area	94
<i>Figure 5.4:</i> Infrastructure in the MCT area (roads and fences).	95
<i>Figure 5.5:</i> Main field areas (molapo and dry-land) in MCT area.	96
<i>Figure 5.6:</i> Water points across the MCT area.	97
<i>Figure 5.7:</i> Cattle post distribution in the MCT area (approximate)	98
<i>Figure 5.8:</i> Archaeological sites in the MCT area.	99
<i>Figure 9.1:</i> Proposed land use zones	100

List of abbreviations

AGM	Annual General Meeting
ALDEP	Arable Land Development Programme
BIDPA	Botswana Institute for Development and Policy Analysis
BMC	Botswana Meat Commission
CAR	Centre for Applied Research
CBNRM	Community Based Natural Resource Management
CBO	Community Based Organisation
CEDA	Citizen Economic Development Agency
CHA	Controlled Hunting Area
CKGR	Central Kalahari Game Reserve
CRRMP	Community Rangeland Resources Management Plan
DAHP	Department of Animal Health and Production
DEA	Department of Environmental Affairs
DFRR	Department of Forest and Range Resources
DLUPU	District Land Use Planning Unit
DWNP	Department of Wildlife and National Parks
FGD	Focus Group Discussion
FMD	Foot and Mouth Disease
IFAD	International Fund for Agricultural Development
IVP	Indigenous Vegetation project
JVP	Joint Venture Partner
KCS	Kalahari Conservation Society
LB	Land Board
LSU	Livestock Unit
LUP	Land Use Plan
LSU	LiveStock Unit
LWDP	Livestock Water Development Programme
MCT	Mopipi Mokoboxane Trust
MoA	Ministry of Agriculture
MPNP	Makgadikgadi Pans National Park
NR	Natural Resources
NRM	Natural Resources Management
NTPD	National Tree Planting Day
OGP	Orapa Game Park
PA	Protected Areas
RAD	Remote Area Dweller
SLB	Sub-Land Board
SLOCA	Support Livestock Owners in Communal Areas
TCA	Tourism Concession Area
TGLP	Tribal Grazing Land Policy
UNDP	United Nations Development Programme
VDC	Village Development Committee
WAB	Water Apportionment Board
WMA	Wildlife Management Area

Acknowledgements

This report has been prepared by the Centre for Applied Research (CAR) for the Mokopi Conservation Trust (MCT). The project was part of the Indigenous Vegetation Project, which is operated by the Ministry of Environmental, Wildlife and Tourism and UNDP- Botswana office.

The consultancy team consisted of Dr.Jaap Arntzen (team leader), Mr. Baleseng Buzwani, Dr. Jeremy Perkins, Dr. Cornelus vanderPost and Dr. Onkemetse Tshosa. The plan was developed in close consultation with the communities of Mopipi and Mokoboxane and the MCT Board through focus group discussions, kgotla meetings and intensive dialogues with the Board. The Chiefs were consulted and regularly update during our visits, and they greatly supported our work. This report could not have been produced without the contributions and inputs from the community and Board. It is our hope and wish that they consider this plan as their own and that they are committed to implementing the recommended projects and resource management activities.

The consultants also had regular contact with Debswana about its activities in the area and possibilities to support the Trust in future. The consultancy team also benefited from assistance of extension workers and advisors, especially Mr. Mbakiso Sebina, IVP technical advisor based in Mopipi. We had discussions with the District Land Use Planning Unit in Letlhakane and DWNP staff frequently attended meetings with the communities. Staff from the Ministry of Agriculture assisted with data. We sincerely hope that technical advice and support from the public and private sector will continue after the IVP project comes to an end next year, as the young Trust will require such support for at least another five to ten years. It would be sad and wrong to leave the trust and communities to struggle by themselves at this early stage in their endeavours.

Jaap Arntzen
10.11.2006

Executive summary

This report contains the land use and range resources management plan for the Mokopi Conservation Trust. Improving livelihoods is considered central to local economic development and resource management and conservation.

The Mopipi and Mokoboxane communities are located east of Orapa in a rural communal area setting. Rainfall is low (average of 450 mm p.a.) and the sandveld renders the area unsuitable for commercial crop production. The area has lost key resources when the Boteti River dried up and wildlife resources disappeared. The area is at considerable distance from markets in eastern Botswana and South Africa. The advantages of the area include its location along a tourist route to and from Maun and the proximity to several National Parks and mining towns such as Orapa and Letlhakane. The proposed activities build on the strengths of the area and take into account its weaknesses.

The communities and Trust have prioritised projects that improve resource conservation and management *and* bring local economic benefits. Tourism development and strengthening of the livestock sector are the core components of the plan. Other sectors include gathering and crop production. The proposed activities for the short term are:

- *Tourism development:* Bay Club acquisition and rehabilitation; acquisition and development of Mopipi dam area; low service level pan development (starting on one pan); requesting access to Orapa Game Park and mine tours and requesting a community zone in the Makgadikgadi Pan National Park and part of CT 10;
- *Livestock development:* establishment of a community-based village grazing management scheme; awareness raising and information sharing about improved livestock management practices and government support;
- *Crop production:* Protection of molapo areas from further encroachment of settlements and infrastructure; pilot project with Sanitas ploughing method in 2006/07;
- *Gathering and veld products:* community-based veld products management scheme.

Medium to longer term activities are listed in chapter eight. Given the gaps in resource management and resource conditions, it is recommended that the MCT focuses on the establishment of community-based resource management for the village livestock grazing areas and for veld products on the entire proposed MCT area. The proposed MCT area is around 2 000 km² in size, mostly consisting of cattle post and village grazing areas (see Table 5.1). It is recommended that the MCT discusses details of the eastern boundary with the Xhumo community; elsewhere no overlapping resource claims or resource conflicts are anticipated.

The land use plan identifies zones for crop production (two for dry land farming and one for dry molapo farming), for livestock grazing (village grazing and cattle post grazing) and for gathering of veld products. It is recommended that molapo soils are protected from further encroachment as these are more fertile and productive than the other crop areas. The proposed land use is presented in Figure 9.1.

Detailed management tasks and responsibilities for the proposed projects are presented in chapter ten. These have been discussed in detail with the MCT Board. It is recommended that the Board further discusses their implementation with the IVP technical advisor and subsequently explains and discusses the activities with the

communities of Mopipi and Mokoboxane. The tasks and responsibilities can also be used in discussions with Debswana regarding the Bays Club and Mopipi dam area and forms of MCT support and assistance from Debswana. A medium to long term goal should be the development of areas with wildlife potential, for example in conjunction with the development of an integrated management plan for the Makgadikgadi Wetlands and the implementation of the Tourism Development Framework for the Pans.

Support from the UNDP-GoB supported Indigenous Vegetation Project (IVP) is currently expected to stop mid 2007. This will come at a time when the actual implementation of projects is just starting and the MCT needs significant support. It is therefore recommended that the IVP project will support the MCT in priority areas such as discussions with Debswana, the development of a business plan for the Bays Club and Mopipi Dam area and with a pilot project on water efficient dry land crop production propagated by Sanitas. It is further recommended that the IVP vehicle and office will be transferred to the MCT, and that Government and/or UNDP will continue to support the MCT for a period of at least five years. Support should include on-site technical support such as currently provided by the IVP.

Chapter one Introduction

This report is prepared for the Mokopi Conservation Trust (MCT) under the Indigenous Vegetation Programme (IVP) Botswana, a joint venture between the Government of Botswana and United National Development Programme (UNDP). The project was carried out by a team of consultants from the Centre for Applied Research over the period June-November 2006.

The study's main task was to develop a land use plan and a community rangeland resources management plan (CRRMP) for the MCT. The Land Use Plan would document resource use practices, produce a base map of major resources, establish the spatial boundaries of the area under community management and recommend land use zonation. The Community Rangeland Resources Management Plan (CRRMP) would then recommend options for resource management and produce a plan with resource management strategies, including byelaws and regulations. Both plans need to be compliant with existing land use plans, policies and programmes.

The Mokopi Conservation Trust was formally registered in December 2005. According to its Constitution, the membership consists of all adults (at least eighteen years) who resort under the kgotlas of Mopipi and Mokoboxane, and have been resident for at least one year. The objectives of the Trust include:

- Conservation and protection of local natural resources;
- Environmental education about wise resource use ;
- Use the local natural resources sustainably and for the benefit of both villages;
- Employment creation for villagers, including:
 - Engaging in cultural activities (e.g. cultural village);
 - Production of crafts
- Equitable sharing of the benefits from natural resources;

The Trust is run by a Board of at least thirteen Trustees; each village has a committee with representatives on the Board. The Board is accountable to the members through an Annual General Meeting (AGM). It has the right to operate bank accounts, enter into contracts, collect rentals etc. and employ staff. An audited financial report needs to be presented annually to the AGM. Operational expenditures of the Trust should not exceed a quarter of its revenues. The Trust may establish byelaws regarding, for example, joint venture agreements, code of conduct for members and collection of forest produce.

The MCT area is roughly around 2 000 km². The boundaries are discussed in more detail in chapter nine.

Chapter two

The physical resource base

This chapter describes the natural resource base of the MCT area (soil, climate, vegetation and wildlife). It is primarily based on existing reports and fieldwork. Trends in resource availability and conditions are indicated as much as possible together with indications about the productive potential, carrying capacity and sustainable harvests.

The resource base of the area is similar to that of many communal areas in western and northern Botswana. Unfortunately, the area has lost several resource advantages that it used to possess. Wildlife resources have dropped to a minimum and the Boteti River has dried up, reducing wildlife utilisation opportunities, molapo farming, fishing etc. Consequently, the area's productivity has declined. Pans, scenic beauty, seasonal birdlife and surface water remain natural advantages. In addition, the area has a locational advantage, as it is located between two protected areas with very different features (Makgadikgadi Pans and central Kalahari) and just north of one of the major livestock areas of the country.

2.1 The physical environment

Climate

The climate of the area is arid to semi-arid, which means that evaporation and/or transpiration exceed rainfall. Rainfall is relatively low (below 450 mm. per annum; see table 2.1) and highly variable in time and space. Rainfall variability is 35% and droughts are recurrent (Bhalotra, 1985). The rate of evaporation is around 2 000 mm annually. Over 90% of the rainfall occurs between November and March.

There are no full climatic stations in the area¹, but some rainfall records have been collected by the Department of Meteorological Services for Mopipi and nearby villages of Rakops and Letlhakane and Orapa town. The average annual is around 350 mm for Rakops and Orapa and 450 mm for Letlhakane. The average rainfall for Mopipi is given as 236.2 but this low may be due to incomplete records. Rainfall figures are given in Appendix 1. Long-term trends of Maun station are considered to be representative for trends in the Boteti area (Arntzen *et al*, 1994).

Temperatures are extreme. The coldest months of the year are June and July with average minimum temperature as low as 6 C°, while the hottest month is October with an average maximum of 35.2 C°.

Wind is an important factor, as deflation is one of the main processes of pan formation. Dense layers of finer silt size deposits can be observed in the atmosphere both during wind gusts and within the central column of wind-devils. Dense layers of dust can be seen throughout the pans region, especially at sunrise and sunset.

Soils

Local soils vary according to parent material and formational processes. Generally, the soils are characterised as sandy soils with poor drainage (east) and alkaline or saline soils with very poor drainage (Sims, 1981).

The Makgadikgadi pans are a vast expanse of grey coloured silt and sand, whose surface is sometimes covered by a continuous sheet of water or more often by a

¹ A full weather station records rainfall, temperature and wind.

large number of pools. The depression has been a focus of internal drainage for a long period of time and the concentration of the dissolved salts introduced by the endoreic rivers has resulted in the formation of a shallow, highly saline groundwater body, which underlies most of the area of the depression (Blair Rains and McKay, 1968).

The calcareous soils along the pan fringes are gradually replaced by deeper sandy soils (arenosols) to the north and to the west (e.g. in the Makgadikgadi Pans National Park). This zone of halomorphic soil around the main salt pan area has been formed by wind carried sands mixed with material from the underlying lacustrine deposits. The soils are grayish brown or brown and alkaline (pH 8.2 – 8.9) (Blair Rains and McKay, 1968). Woody vegetation is generally absent. The grass cover restricts the movement of soil but in the south where the cover is poor wind-blown sand accumulates where bushes form a windbreak (Blair Rains and McKay, 1968).

Halomorphic soils associated with sub-desert sands on riverine alluvium (fluvisols) are similar to the above mentioned group. However, the presence of scattered shrubs and trees indicates less extreme conditions and a higher level of fertility. The fluvisols of the Boteti distributary system are favoured agriculturally and contain a large number of molapo (or flood-recession) farms. Driving out of Mopipi it is striking how extensive the molapo system of farming used to be. The molapo fields tend to be located on relict point bar deposits where thin clayey sands overly sandier alluvial deposits. The lack of molapo fields away from the river channels is due to the increased salt content of the soils, with the aromatic shrub *peudsel-loschel* pronounced near many of the molapo areas. There can be little doubt that molapo farming has been in decline over the last decade due to the poor floods, with low yields (2 to 3 bags/ha on average) reported even for years of sufficient rain and flood (Ecosurv, 1994). In the past molapo farmers bemoaned the losses they regularly incurred from hippos and kudus, which damaged their crops and fences, and also the losses from birds. Today only the latter remain (with localized damage by small mammals) with yields expected to be lower due to the reliance upon rainfall, rather than the annual flood.

Isolated areas of heavy black clay (vertisols) occur along drainage lines. These soils are poorly drained and become hard and crack on drying. Although these soils are fairly fertile, they are very difficult for mechanised crop production. The arenosols, and chromic, ferric and haplic luvisols are very marginal in terms of their suitability for maize production. Their suitability for sorghum is somewhat better. Following Barnhoorn *et al.* (1994) the land suitability index for traditional dryland farming (maize, sorghum and millet) indicates that the majority of soils in the District are of marginal suitability for maize. The controlling factor is soil moisture, with severe deficits throughout the year attributable to the low rainfall and high evaporation rates.

As most rain falls as high-intensity showers high surface run-off volumes and widespread sheet and gully erosion can be a major problem. As a result, water stress is a major problem for crop production, with the potential of dryland crop production in the area extremely limited.

The uncertain, low-yielding and labour intensive nature of dry land farming explains the subsistence nature of arable production. Erratic rainfall is the primary constraint with yields of less than 50 kg/ha common (at least double in a good year). Millet is more drought resistant than sorghum but is not favoured. Maize is also planted, with watermelons and pumpkins often inter-planted. As with arable agriculture elsewhere in the country the application of manure is very restricted, and confined to the eating

of crop residues by cattle, donkeys and goats. *Cynodon dactylon* (*mothwa*) infestation is a problem, particularly on plots near the river, and is an indicator of declining soil fertility.

In terms of soil fertility, fluvisol soils such as in the area west of Mopipi are ranked as fertile. This is where molapo farming is carried out (see Figure 2.1). Cambisol soils in the north-western section of the region are also considered fertile, but limited cultivation is occurring there as these soils do not offer the water-holding advantages of the fluvisol soils in the Boteti valley. Most other soils have limited or poor fertility. The fields near Mokoboxane are situated on poor sandy arenosol soils.

Figure 2.1 at the back of this report summarises the soil types in the area.

Geomorphology-special features

The Makgadikgadi region as a whole is well endowed with fascinating landscapes. Mostly these are related to prevailing systems of pans and palaeo-lakes. The most dramatic of these landscape features are contained in the Makgadikgadi Pans National Park (MPNP), but smaller portions of interesting landscapes remain in the Mokopi area, particularly in the vicinity of the Boteti River and pans such as Rysana pan and Leupane pan.

The scenic beauty of these areas is a resource that can be used for tourism. A tour of pans between Orapa and Mopipi is described in the Shell tourist guide and other routes, including those that take in parts of Ntwetwe pan (in the dry season) are possible. It is, of course, a challenge to turn these into benefits for local residents.

Water resource and quality

The Mopipi region is traditionally known as one where surface water could be obtained. The many pans of the area provided surface water during most years at least for part of the year and several still do today. The Boteti also filled Lake Dow/Xau and the Mopipi Dam, a pan that was converted to a storage dam for the Orapa diamond mine. These days, the river is mostly dry and Lake Xau and Mopipi Dam have dried up. The surface water conditions have thus much diminished in recent decades, although shallow groundwater can in many locations still be obtained.

Consequently, groundwater is currently the most widely distributed and most important water resource of the region. Groundwater exists wherever: 1. water penetrates beneath the surface; 2. the rocks beneath the surface are permeable enough to transmit water; and 3. the rate of infiltration is sufficient that the rocks are saturated to an appreciable thickness. These conditions are met and groundwater exists at least intermittently in a very large part of the region, although vast differences exist in quality.

The main groundwater resources are found in the Kalahari Beds Group sediments and in the Ntane sandstones of the Lebung Group of the Karoo Supergroup. These regional aquifers take their name from the geological formations in which they reside:

1. the Kalahari Aquifer. The Kalahari Aquifer can be further divided into three units:
 - a. Upper (or Recent) Kalahari, consisting of river alluvium and delta deposits. This type of aquifer resides in the Boteti river deposits and is the source of water for most of the existing boreholes and hand-dug wells constructed for the supply of villages and minor settlements. Boreholes tap a shallow perched unconfined fresh water aquifer. Borehole yields are generally low (<5m³/hr) and water strikes are recorded from 5m to 15m of surface. Below fresh groundwater, at an average depth of 20m saline water is

- encountered. The aquifer was regularly recharged until 1982 by river flow, and again in 1984, 1989 and 1990, however following a prolonged period of no flow (1990 to present) water quality degradation is taking place in some areas, with saline groundwater intrusion from adjacent aquifers. This is particularly relevant in areas of sustained abstraction. In areas of relatively low abstraction, i.e. where small settlements abstract low quantities of water for their daily supply (say 2 to 5m³/day), groundwater is of good quality. This situation can be observed all along the river, where settlements and cattle post have constructed hand-dug wells tapping the alluvium. The Boteti River alluvial aquifer is a finite resource, and it is thus unlikely that it will support large-scale or prolonged abstraction
- b. Middle Kalahari silicified sandstone and karst (silcretes and calcretes). The Middle Kalahari Sediments, conspicuously present in a belt extending from Zoroga/Gweta villages in the east to the Gidikwe Ridge in the west, host a multi layered aquifer consisting of five layers in hydraulic continuity. Borehole drilling and testing has shown that this aquifer has good yields and fresh water.
 - c. Basal Kalahari conglomerate and sandstones. Groundwater occurs in the porous deposits throughout the entire thickness of the Basal Kalahari Beds. Boreholes drilled in this aquifer provide good yield but brackish groundwater.
2. the Karoo Aquifer. The Karoo Aquifer component relevant to the study area consists of Lebung Sandstones. The Lebung Group sandstones are well represented in many boreholes constructed in the south and southeastern part of the Makgadikgadi area. Given the proper conditions they are substantial groundwater resources. One of the most striking examples of how much this aquifer can produce is the Orapa-Letlhakane Wellfield. The Orapa mine was established in 1969. Three well fields tapping water from the Ntane sandstone were developed. Surface water from Mopipi Dam contributed an additional supply. In 1979 well field 4 was established west of Orapa to overcome shortfalls in the surface water supply. In 1980 the Boteti River, which feeds Mopipi dam began to dry up. In 1984 the dam dried up completely and since then Orapa has become totally reliant on groundwater. Additional wells were installed east and southeast of Orapa at well field 5 and in 1988 at well field 6. The total resource area has been estimated to extend 4,400km². The current well fields have a groundwater resource potential of at least 235 million cubic meters. Other well fields, of less magnitude, have been established tapping the Ntane sandstone to supply individual villages with water. One instance is the Mokoboxane Well field (7 boreholes), which supplies Mopipi, Mokoboxane and Kedia villages.

The major constraint for the use of water in the region is water salinity. Because of their nature as recharge zones, river channels and palaeo channels are likely to contain fresh waters, but the palaeo-lakes will invariably contain saline waters. Some locations, such as borehole no. 5495 situated at Mopipi, also have high nitrate levels.

The decline of groundwater levels and perhaps deterioration of water qualities are concerns in the MCT. The Orapa diamond mine is supplied by an extensive well field to the east of the MCT. The Central District Council has a well field that is adjacent to one operated for the mine and located in Mokoboxane village (Marata, 2000).

Within the influence of the Makgadikgadi Pans shallow lenses of potable water are often underlain by highly mineralised water. Such areas are characterised by calcrete and silcrete exposures – with recharge of the groundwater also possible – although these supplies are usually small and often fail or become unusable. Such supplies are utilized via shallow wells, typically on lower lying ground in close proximity to the pans.

Elsewhere deep boreholes have enabled cattle posts to be established within the MCT, although the water quality is often poor and the yield unreliable. The ranching feasibility study for the area known as 4B (Marata, 2000) reports that groundwater is saline with a TDS ranging from 2000 – 35,000 mg/l and points out that in general it can be used for cattle farming.

2.2 Vegetation and veldproducts

2.2.1 Vegetation

The vegetation offers grass and browse for animals and veld products in support of people's livelihoods. The following broad vegetation zones can be distinguished (Weare and Yalala, 1971):

- Mixed mopane tree and bush savanna; and
- Delta grassland close to the Pans.

Much of the area around Mokoboxane is dominated by *Colophospermum mopane* (commonly known as mopane) tree and shrub savanna. The mopane woodland changes to shrub land on poorly rained soils or to mixed woodlands, where drainage improves and soils are shallow. In areas of deep sands, where sand has been deposited onto the lacustrine soils, or originated in situ, mopane is replaced by the sand veld plant species, such as *Terminalia sericea*, *Acacia mellifera*, *Lonchocarpus nelsi* and *Acacia tortilis*.

At local level, the pans themselves are barren. Extensive grassland occurs on the slightly higher ground away from the spars vegetation of the pan fringes. In addition to the seasonally high water table the soils are often both saline and alkaline. Trees and shrubs are absent although there may be groups of *Hyphaene sp.* and *Acacia erioloba*, and on raised hummocks stands of *Terminalia prunioides*, *Albizia antunesiana* and *Acacia spp.* Among the grasses are *Cenchrus ciliaris*, *Panicum coloratum*, *Scmidtia bulbosa*, *Cymbopogon sp.*, *Eragrostis superba*, *Eragrostis rigidior*, *Eragrostis echinochloidea*, *Aristida uniplumis*, *Chrysopogon montanus* and *Odyssea paucinervis*. The low grey shrub *Catophractes alexandri* and the grasses *Enneapogon scoparius* and *Enneapogon cenchroides* occur together on limestone outcrops in these grasslands, but are of little or no forage value. Large areas of grassland such as around Lake Xau have been reduced to a sparse cover of the hard leaved rhizomatous grass *Odyssea paucinervis*. This type of grassland is seriously deficient in phosphate and trace elements, with the community members reporting the grazing to be of relatively higher value to horses than cattle.

Slightly raised ground and hummocks on the fringes of Makgadikgadi pans, to the north of Mopipi and south of the new electrified fence that forms the boundary of the MNP, can carry a sparse vegetation cover. Only a small number of species are adapted to the conditions of extreme salinity and flooding. Among this small number are succulent *Suaeda fruticosa* and the grasses *Sporobolus iocladius*, *Sporobolus spicatus*, *Cynodon dactylon* and *Odyssea paucinervis*.

Because of flooding these areas are inaccessible in the wet season and even for extensive periods of the dry season, in good rainfall years. Consequently, the amount of vegetation is limited, simply because soils subject to periodic flooding impeded drainage or with a seasonally high water table, are unfavourable to the development of woody vegetation. Various algae are found in brackish pools.

On the calcrete fringes of some of the pans, *Catophractes alexandri* and *Terminalia prunioides* can form dense thickets, periodically giving way to *Commiphora* trees, with the baobab like tree 'Seboaboane' often present.

The *Digitaria* and *Anthephora* species, usually regarded as good grazing, are the dominant grasses in the naturally occurring savanna grasslands whereas *Cynodon*

dactylon commonly occurs around settlements. *Anthehorsa pubescens* is a tufted perennial, which occurs throughout the sandveld and is regarded as a highly palatable grass for both livestock and wildlife.

However, the grasslands along the Boteti River, once regarded as having the highest livestock carrying capacity in the country, have become degraded with serious overgrazing particularly in the communal grazing areas +/- 10km wide belt along the Boteti (Arntzen *et al*, 1994).

Thicket like vegetation occurs around watering points including stream approaches and stock routes – such as the old Orapa – Maun road (Livingstone’s route). Its development can probably be attributed to the disappearance of the grass through heavy grazing pressure and trampling, which in turn reduces competition and eliminates any control of woody growth by fire. The woody species which dominate often include *Dichrostachys cinerea*, *Terminalia prunioides* and *Acacia spp.*, which often form impenetrable thorny thickets.

The overall vegetation zoning is summarised in Figure 2.2 at the back of this report. The area thus has valuable resources of mopane woodland with smaller areas of acacia woodland. Good quality grazing is found on the open savanna areas of the floodplains.

2.2.2 Veldproducts

The community possesses a wealth of knowledge concerning the uses and effects of the various plants that are found within the MCT. For example ‘*nkongwe*’ that is found on the pans is used for medicinal purposes, but if eaten by wild or domestic stock it taints the taste of the meat. Such insights can be gleaned from selected trust members wherever one stops within the MCT and this knowledge could be used during guided trails or walks for tourists interested in learning about traditional culture and survival strategies. The veld products occurring within the MCT are important for subsistence livelihoods, but have limited commercial value. The local population argues that most veld products are not (yet) in decline, and that rain rather than harvesting determines their availability.

Many veld products that occur to the west in the Kalahari sandveld are not found in the MCT, probably due to the saline nature of the soils. *Ximenia americana* (*moretologa*) is present, but in small numbers. The dominant veld products utilised are detailed below.

Grewia berries

There are twenty six species of *Grewia* in the southern African sub-region, twelve of which are found in Botswana (Roodt, 1998). The four most common species in the MCT are:

Plant name	Local name
<i>Grewia bicolor</i>	<i>Mogwana</i>
<i>Grewia flava</i>	<i>Moretlhwa</i>
<i>Grewia flavescens</i>	<i>Mokgompatha</i>
<i>Grewia retinervis</i>	<i>Motsotsojane</i>

The fruit of *Grewia flava* and *Grewia retinervis* are the most popular of these, as they are sweeter in taste than *G. flavescens* and *G. bicolor*, and are also the preferred species to be used for brewing beer (Bishop and Scoones, 1994). *Grewia* forms a

significant part of the diet, because of its easy availability and collection, and also because it can be dried and used throughout the year (Cashdan, 1977).

In all cases the fruits are obovoid-subglobulose, with a thin layer of dry, slightly fibrous flesh. According to Arnold *et al* (1985), *Grewia* fruits are fairly nutritious because of the high values for fibre, carbohydrates, some minerals and nicotinic acid. *Grewia* species are probably better suited to increased utilisation in the wild rather than domestication.

The *Grewia* berry harvest generally occurs between Jan-April, although the berries sometimes remain on the bushes well into the winter. Campbell (1986) reports a harvest of +/- 0.2kg for *Grewia flava* bushes, although in all cases the berry crop is highly dependent upon rainfall amounts and spacing. Relatively long dry or wet spells can result in crop failure, while other factors such as frost, hailstorm events and fire can destroy the harvest. Therefore, annual yields of *Grewia* berries are uncertain.

Fuel wood

Colophospermum mopane dominate the vegetation of the MCT, but is also a preferred fuel wood species (ERL, 1985). *Terminalia prunioides* is also abundant in the area and of value as a fuel wood. Head loads, donkey carts and small and large trucks are used to harvest fuel wood, the latter often by people coming from outside of the MCT. People also tend to combine fuel wood collection with other agricultural activities at the lands and cattle posts, with the clearance of new lands area generating much fuel wood, albeit in an unsustainable manner.

Construction poles

Construction poles are typically needed for structure frames and roofing timbers, and for fencing arable lands and kraals. *Colophospermum mopane* is most readily available in northern Botswana. Sawdon *et al* (1995) in their study along the Boteti River point to the use of *Terminalia sericea*, *Acacia nigrescens*, *Spirostachys africana* and *Terminalia prunioides*, for construction poles and timber, and emphasise the preference for hard woods that are resistant to insect attack. Nevertheless it seems likely that subsistence use dominates utilisation with localised areas of resource scarcity around settlements occurring, although the paucity of data should be emphasised.

Thatching grass

A variety of grasses are used for thatching including *Eragrostis pallens*, *Heteropogon contortus*, *Stipagrostis uniplumis* and *Cymbopogon sp.* with reeds (*Phragmites australis* and *P. mauritianus*) used for hut walls, roofs, yards and mats where available. In the MCT the latter are declining, as the annual flood has ceased to flow, but can still be seen around some compounds in Mopipi. In Botswana, Drought Relief Schemes in the 1980s paid an inflated price of one pula per bundle to gatherers, which tends to have remained to this day, and led to people purchasing, often higher quality thatch, from the Natal region of South Africa.

In northern Namibia LaFranchi (1996) points out that harvesting thatching grass tends to complement other available income-generating opportunities. It is strenuous work, not least because of the need to clean the grass before it is bundled and carried on foot to dispatch sites (LaFranchi, 1996). La Franchi points to its largely subsistence use and the fact that what is not harvested tends to be lost to veld fires.

Medicinal plants

A great variety of traditional medicinal plants occurs in Botswana and is used at a subsistence level across the whole spectrum of ailments. Many veld products in

South Africa have a commercial potential In South Africa, leading to the risk of over exploitation (Cunningham, 1991). This risk coupled with the general failure of law enforcement in protecting the key species, led Taylor (1985) to recommend that, apart from one exception, this admittedly lucrative market should not be developed in Botswana. The exception is *Harpagophytum procumbens* and the closely related *Harpagophytum zeyheri* (grapple), neither of which are found within the MCT.

The wild plants currently known to be used for subsistence and medicinal purposes in Botswana include a number of taxa across a diverse array of plant parts, that includes tubers, roots, fungi, bark, gums, resins, stems, leaves, fruits, flowers and seeds. The medicinal value of many veld products has undoubtedly yet to be formally discovered.

Palm trees Hyphaene ventricosa (vegetable ivory palm, fan palm) (Makola Palm) *Hyphaene petersiana* is synonymous with *Hyphaene ventricosa* and occurs on the high water table grasslands of northern Botswana (Cunningham and Milton, 1987). Within the MCT the latter appears to be disappearing as palms that were clearly visible along the main road to Rakops are no longer there today. It is unknown whether this is due to the drying up of the area or other factors such as fire. Its disappearance has led to the disappearance of local basket weaving and palm wine making. The slow-growing palms are difficult to cultivate, as the seeds do not germinate easily, and the long tap-root makes them difficult to transplant.

Gums and resins

Gums and resins from a wide variety of botanical sources have been important items of international trade for centuries (Anderson, 1985). In many parts of Africa gum trees have provided an important source of income and are valued resources, although their prices have been subject to the pronounced economic fluctuations that affect all natural commodities. The availability of more cost-effective natural products to major industrial gum users has also made some supplies economically non-viable and has decreased demand throughout the seventies and early eighties (Anderson, 1985). Many other *Acacia* species yield gums of little economic value (Anderson, 1985). Although its commercial viability is doubted, at a subsistence level Gum *Acacia* is nutritious and has known medicinal properties. Within the MCT a variety of *Acacia* gums are available, although none are plentiful.

Some water-insoluble exudates have a commercial value whose marketing and utilisation is a specialised business. Oriental lacquers (*Rhus spp.*) and resins, used in religious ceremonies, such as *Commiphora spp.* (myrrh) all have a commercial value, that has nonetheless been eroded by the increased use of petroleum-based products and synthesised chemicals. For those resins that still have a limited demand, the market is small and there economic potential decreased by the fact that the resin producing trees are often scattered over extensive geographical areas (Anderson, 1985).

Mophane worms

The mophane worm (*Gonimbrasa belina*) has both a traditional domestic market and an expanding regional one within Botswana and is collected for subsistence purposes within the MCT.

2.3 Animals

2.3.1 Livestock

Livestock development in the MCT appears to have progressed as far as is possible within the limits set by the availability of potable water. The increase in the number of boreholes and wells has reduced cattle movements and opened up pastures distant from pans and drainage lines. Consequently, livestock are kept in an area on a year-round basis. The switch to effectively sedentary herds of domestic stock has profoundly changed the foraging pattern with far reaching consequences for structure, composition and dynamics of the savanna. Permanent stocking by cattle totally changed the system.

Within the context of livestock keeping within the MCT a broad contrast can be made between the borehole-based and well-based systems. The former occur in the Mokoboxane area, particularly towards Orapa, and south of Mopipi towards Kedia, often on areas with calcrete. Unlike cattle posts in the Kalahari sand the MCT boreholes typically have several fields attached to the kraal in close proximity to the water point. The cattle posts lack an extensive bare ground or 'sacrifice zone', unless the *Colophospermum mopane/Terminalia prunioides* bushes have been cleared, with bush thickening evident and alleviated only by a clear browse line. In this respect the eastern part of the MCT area, especially along the old stock routes and around livestock watering points, is characterised by impenetrable woody vegetation and correspondingly poor grass cover. The tracks are lined with dense woody vegetation of low aesthetic value, until the open panoramic view afforded by a pan is reached.

According to Blair Rains and McKay (1968): *'Regular burning is the only practical method of controlling woody growth but this necessitates long resting periods to accumulate sufficient combustible material for an effective burn. These long resting periods will reduce the overall carrying capacity to about 1:24 ha and at these stocking rates the provision of water becomes prohibitively expensive.'* (p73). It is clear that fire has been excluded from such areas of the MCT for many decades and will remain so due to the low grass cover. As a result, in the absence of destocking and controlled burning the dense woody vegetation will remain, unless it is cleared manually.

The livestock-keeping areas based upon shallow wells comprise a series of isolated complexes of huts and neighbouring kraals. Each well area has a name, and while the hut/kraal complexes utilise the same cluster of wells they are typically at least 500m apart from one another. The grazing has been utilized to just above the ground for several kilometers around such wells, which typically have a small (<50m) sacrifice zone. There are no obvious signs of bush encroachment, as in the Kalahari, with a low density tree savanna often dominating. Calcrete outcrops within several kilometers of such wells are characterised by dense bush savanna – often dominated by *Terminalia prunioides* or *Catophractes alexandri*. The well system characterizes the areas that are relatively close to pans, with the saltier soils perhaps precluding widespread bush encroachment.

The areas north of Mopipi out as far as the MPNP boundary are dominated by wells. In good rainfall years, and in the past due to the annual flooding of the Boteti, these areas become inaccessible due to the dominance of pan soils and the rapid juxtaposition of distributary channels, pan complexes with slightly raised areas of savanna on calcrete soils. The heavy late rains and flooding in the 2005/06 season, and resultant mosquitoes, had driven people to relocate their kraals closer to Mopipi,

rather than in the more distant grazing areas. The latter are scenic wilderness areas, under-utilised by domestic stock, probably because of the shortage of potable water.

The bare pan surfaces have no forage value with the immediate surrounding grasslands offering a relatively high carrying capacity of five to eight ha/LSU, and the remaining land within the MCT falling within 13-16 ha/LSU (Field, 1978). The higher stocking rate recorded around the pans relates to the abundance of the palatable and nutritious grass, *Cynodon dactylon*. As a result of sustained heavy grazing by domestic stock, extensive areas such as Lake Xau, are today dominated by the grass, *Odyssea paucinervis*, that is of less value to cattle. Blair Rains and McKay (1968) recommended a domestic stocking rate of 1 to 10 or 1 to 12 hectares, for the areas around the pans, after a suitable period of de-stocking and resting. As they emphasised, mineral deficiencies in the pasture are likely to be a serious constraint for domestic stock.

The dependence of livestock grazing upon water points means that the usual situation of heavy stocking around wells and boreholes occurs. Given the proximity of water points (2 to 4 km apart), grazing reserves are unlikely to exist. The only 'grazing reserve' exists south of the electrified fence around the MPNP, which is distant from the nearest livestock wells and inaccessible to migrant and resident ungulates in the MPNP. Forage in this area is likely to remain underutilised and may even pose a fire hazard to the newly erected fence.

Domestic stock is allowed to graze the crop residues of the molapo and dry land areas, with the newly fenced grazing area at Mokoboxane incorporating an extensive area of former grazing land, as yet uncultivated. The fences around the extensive molapo fields around Mopipi are less secure from domestic stock, but characterized by more fertile soils than the newly fenced and as yet uncleared areas at Mokoboxane. Consequently, a greater focus on dry land production within the molapo fields, secure from domestic stock by improved fencing, is likely to improve subsistence crop yields, especially if greater use of the crop residues can be made by domestic stock.

2.3.2 Wildlife

Livestock development of the area has affected wildlife resources, particularly through a succession of fences that restricts wildlife migration: the Setata fence in 1979; the Mokoboxane fence in 1998/99; fencing of the northern and eastern boundary of the CKGR in 1998, and the erection of an electrified predator proof fence along the western and southern boundaries of the MPNP (2002-2005). The MCT area has virtually no mobility of both livestock and game. The wild ungulates that remained in the area have probably been hunted out. Details of the decline in species in the Makgadikgadi area are presented in appendix 5.

The CWARP report identified a biomass of 6,000 kg/km² for the Makgadikgadi population of zebra and wildebeest, which is equivalent to a stocking rate of about eight ha/LSU (DHV, 1980). The availability of surface water all year round which resulted from the seasonal migration, from the Boteti (dry season range) and pools (wet season range), was identified as providing a boost to grazing animals. Today, there is virtually no wildlife left in the area. Reasons for the wildlife decline include:

- Increased settlement and livestock keeping along the Boteti, relating primarily to loss of dry season grazing reserves on both sides of the river, which are in relative proximity to water that is available in pools in the Boteti riverbed.

- Culminating in the erection of a predator proof fence around the western and southern boundary of MPNP;
- Settlement and livestock keeping at Rakops and the loss of Kedia as a Wildlife Management Area, due to livestock encroachment;
- The loss of Lake Xau as a potential dry season water source by the construction of a dam at Mopipi, and reduced flows along the Boteti River, leading to the drying up of Mopipi dam;
- Closure of the wildlife migration route from the northern Kalahari to the Boteti by the fencing of the eastern boundary of the Central Kalahari Game Reserve (CKGR).
- Erection of cordon fences for veterinary disease control.

In the 1980s drought, those wildebeest that negotiated the veterinary cordon fences and made it to Mopipi Dam, then faced competition with livestock and people for both water and, more critically, the scarce available grazing around water (Parry, 1987a; Williamson and Mbano, 1988). Mortalities resulted from the need to make a round trip of up to 100km in order to attain the essential, but isolated, resources of water, shade and grazing. The latter had been seriously depleted by heavy livestock grazing in the Mopipi/ Lake Xau area. These stressful conditions coupled with harassment from Mopipi residents caused heavy additional mortality (Williamson and Williamson, 1984, 1985a).

The future of wildlife resources in the area is uncertain. The decline may be very difficult to reverse. Re-connecting the CKGR and the Boteti area would offer hope for the return of some wildlife resources. Such a connection would re-establish the link between the Kalahari and Makgadikgadi systems, enabling a wilderness tourism route from the Kgalagadi Transfrontier Park to Chobe National Park and transfrontier conservation area.

2.4 Environmental concerns and opportunities

The consultancy builds on earlier IVP and community activities. A brief summary is presented in this section. The community identified a wide range of environmental concerns, mitigation measures and opportunities (Ministry of Agriculture, 2004a and b) and Community Action Plans were prepared (Khwarae, 2004 a and b). A summary of the main concerns and opportunities is presented below.

Natural concerns

- Drought. Low and unreliable rainfall in the area has resulted in recurrent droughts over the years. Large numbers of livestock have died and this has left people poorer and contributed to land degradation;
- Drying up of surface water sources (Mopipi dam and Boteti River), leading to greater dependency on ground water.
- Salty water. The limited water resources are often saline, reducing their usefulness;
- Decline in useful trees and vegetation and an increase in unwanted tree species. Recurrent droughts and tree cutting have reduced vegetation cover and left most parts of the area bare and susceptible to erosion. Unwanted species have increased (e.g. *senamelagae* and *sekaname*), affecting livestock during droughts;
- Strong dusty winds. Because of a reduction in vegetation coverage and loose sandy soils, whirlwinds gather a lot of dust. This contributes significantly to erosion and has led to migration from Mopipi to Mokoboxane village, which was initially a landsarea.

Human-caused concerns

- Overstocking due to high stocking numbers and dominance of livestock production;
- Shortage of grazing space. Fences have reduced the grazing lands significantly and contributed to overstocking and land degradation.
- Veld fires. Veld fires destroy vegetation and everything else they find on their destruction path;
- Depletion of wildlife resources due to fences, shortage of water, uncontrolled hunting, etc.
- Bare salt pans; as mentioned earlier, the reduced vegetation cover has resulted in bare land.
- Inadequate distance between boreholes. In the Mopipi area though, spacing between boreholes is often less than 2km and rarely more than 4km. This may lead to low recharge, and rangeland degradation through overlapping piosphere zones;
- Land degradation. Land degradation was inferred from the presence of 1. localised permanent damage to vegetation around villages and along river; 2. increased wind erosion and dust storms; 3. die-back of riverine forest, assumed due to lowering of water table and salinisation due to unsustainable water extraction.
- Decline in arable production. Low and unreliable rainfall and low soil fertility have contributed to low yields, but crop production is still regarded as a major economic activity.

During discussions with the Mopipi/Mokoboxane communities, several solutions to these concerns were suggested, which need to be considered during this study. Table 2.1 shows some of the solutions the communities put forward to their problems.

Table 2.1: Environmental problems and possible solutions as perceived by the community

No	Environmental problem	Recommended solutions
1	Lack of grazing	Development of communal ranches; adhere to correct stocking rates; Educate farmers on livestock production
2	Veld fires	Conservation education; frequent clearance of fire breaks
3	Strong winds	Tree and grass planting
4	Clustered boreholes	▪ Establish farmers syndicates; develop communal ranches
5	Decline of wildlife species	Wildlife conservation education; game farming projects; community should be encouraged to partake in raffles
6	Bare salt pans	▪ Soil surveying for pasture and tree planting; fence bare salt pans
7	Land degradation	▪ Fence areas for use during drought; limit livestock numbers
8	Shortage of water	Water conservation education
9	Decline in trees and vegetation	Tree planting, use of coal, revive taboos such as certain trees were not cut at certain times of the year
10	Decline in arable farming	Train and educate farmers on dry land farming; fencing off of arable fields

Source: Ministry of Agriculture, 2004 a and b.

The community attributes the decline in veld products to droughts and therefore assumes that veld products will return with good rains.

Chapter three

Socio-economic resources and livelihoods

This chapter discusses the characteristics of the area's population (3.1), their livelihoods (3.2), infrastructure (3.3) and major institutions (3.4).

3.1 The population

The population of the area was estimated to be 6 963 in 2001 (Population Census, CSO, 2002). Around two-thirds of the people live in the villages of Mopipi and Mokoboxane (3 066 and 1 290 people respectively). The remainder lives in localities, mostly associated with Mopipi. In 2001, the largest of these localities were Morula (169 people), Gubuga (155), Metsimasweu (154), Maphanyane (151) and Xutshaga (112) with all other localities having less than 100 inhabitants; most are people living at the lands (e.g. Morula and Maphanyane).

Mopipi is the oldest village, probably established around 1800. In contrast, Mokoboxane is 'young' and only emerged as a village in the 1980s; previously it was a lands and cattle-post area. The population of Mokoboxane grows fast, in part due to people moving from Mopipi to Mokoboxane to escape dust storms. In 1981, the population of Mopipi and Mokoboxane were 1 540 and 180 respectively.

The population density is around 3.5 person/km², which is slightly above the national average of 3.1 (2001).

More than half of the population has attended primary or secondary school. The youth tend to be better educated than the elderly, as they had better educational opportunities (e.g. junior secondary school in Mopipi).

In terms of gender, females constitute the majority accounting for 59.3% of the village population. The gender imbalance is probably due to migration of the men in search of employment.

The population is relatively young. More than half of the population is aged less than twenty years. Around a quarter is in their twenties and less than a quarter is forty years and older (CSO, 2002). Many people are too young to work, and at the same time there is a huge need for employment creation to reduce youth migration to urban areas.

In terms of spoken languages, Setswana is most common, spoken by 60 to 70% of the population. Kalanga is spoken by a third of the Mopipi population (15.5% of the Mokoboxane population) and Herero is spoken by 9.4% in Mokoboxane. Other languages such as Sesarwa are spoken by a few people (see also appendix 1).

3.2 Livelihoods

In the pursuit of livelihood security, people tend to use a variety of livelihood sources (Ellis, 2000). In Botswana, formal employment and government support have become major sources of livelihoods (BIDPA, 2001; CAR, 2003). Few rural households solely depend on agriculture and gathering. This situation also prevails in the MCT area. Constraints such as low rainfall, droughts, salty water and poor soils limit agricultural productivity, hence people engage in multiple activities to reduce livelihood risks.

Assuming an average household size of five and an even distribution of cash employment, the majority of households have access to cash income from employment; 56% in Mopipi and more than 80% in Mokoboxane. Government support (orphans, destitutes, pensions, and drought relief) probably reaches a similar percentage of households. Despite the importance of formal employment, employment opportunities are limited and mostly restricted to the nearby mines and government. Debswana is the largest employer for the people from this area (Khwarae, 2004).

Participation in agriculture is lower (arable production) or at similar levels. Sixty to seventy percent of the households keep livestock (mostly cattle, goats or donkeys) and around half of the households engage in arable production (Table 3.1). The focus group discussions (FGD) showed that dry land arable farmers have very little or no harvest at all during years of poor rainfall; molapo fields have a much higher productivity.

Table 3.1: Agricultural involvement of the local population

	Mopipi		Mokoboxane	
	Numbers	As %	Number	As %
Total population	3066		1290	-
Male	1232		540	
Female	1834		750	
Households	665		272	-
Households owning livestock				
Cattle	470	70.7	155	57.0
Goats	455	68.4	154	56.6
Sheep	160	24.1	20	7.4
Households who planted the previous year	392	59.0	129	47.4
Households with access to land for ploughing				
Own the land	350	52.6	100	36.8
Have access	159	23.9	54	19.9

Sources: Population Census report and files

Virtually all households gather veld products, including wood for cooking, heating and lighting, berries and vegetable for food, building material (e.g. thatching grass) and medicines. According to the Population Census 2001, fifty to sixty percent of the houses still have thatched roofs while three quarters or more depend on wood for cooking and heating.

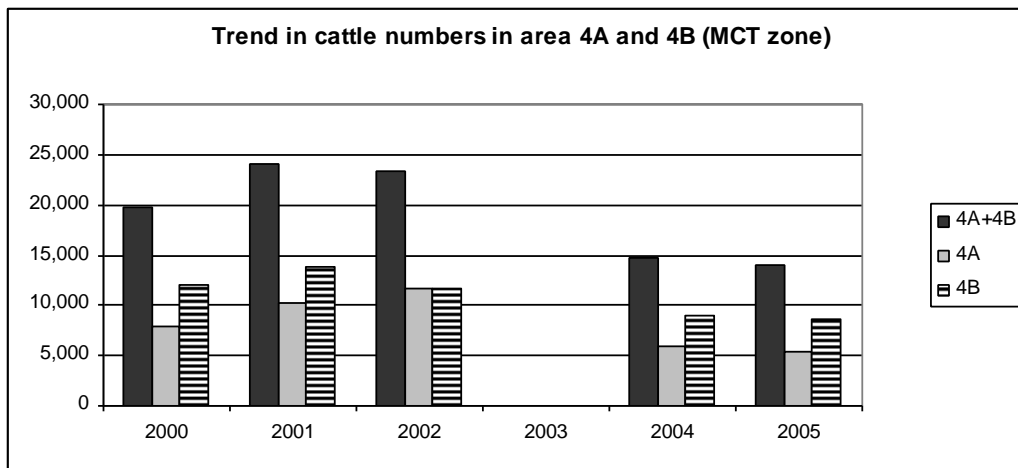
Livestock production and arable farming are the most important rangeland-based activities (Table 3.2). According to veterinary data, there are at least 14 000 cattle and some 5 000 goats in the area. This would represent a stocking rate of around 17.5 ha/livestock unit. Figure 3.1 shows the number of livestock for the period 2000-2005 (the figures are provided in Appendix 1). It appears that livestock numbers are not increasing, and possibly decreasing. Some caution is required as veterinary livestock data are often incomplete and show considerable fluctuations between years, as farmers may not bring all cattle every year.

Table 3.2: Ranking of rangeland-based livelihood sources (1 is most important; 5 least important)

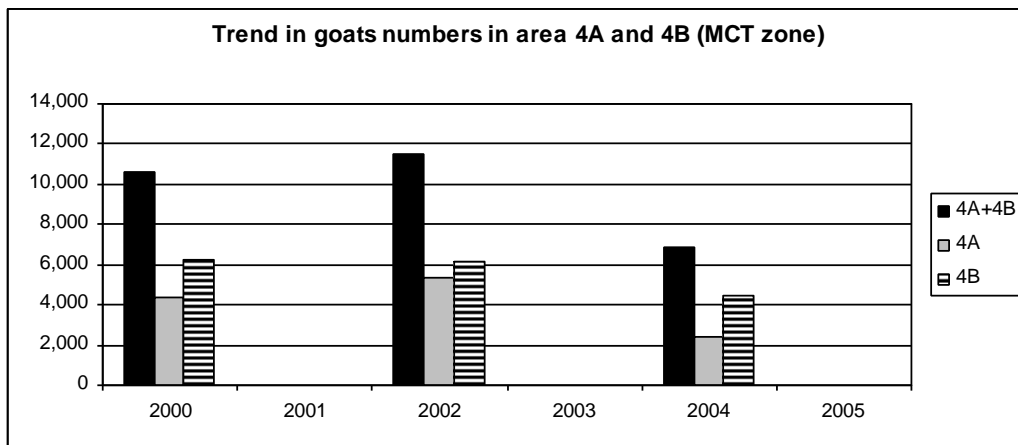
Rank	Mopipi			Mokoboxane	
	Female	Male	Youth	Female	Male
1	Livestock	Livestock	Crops	Crops	Livestock
2	Crops	Crops	Livestock	Livestock	Crops
3	Basketry	Donkeys-horses	Sale of milk	Veld products	Traditional beer
4	Sale of grass	Small stock	Herding	Sale of poles	Water sales
5	Pottery	Firewood + poles	Sale of beer, baskets and wood craft	Sale of firewood	Firewood sales

Sources: Khwarae, 2004a and b.

Figure 3.1: Trend in livestock numbers in MCT area (2000-2005)



Note: insufficient data for 2003.



Note: insufficient data for 2001 and 2003; no data for 2005.

Source: DAHP data (veterinary data).

Other natural-resources based activities such as gathering basketry and pottery support agriculture (Khwarae, 2004). Wildlife resources have decreased and their

livelihood importance has become minimal. During the team visits, not a single wild antelope was seen.

In summary, people engage in the following livelihood activities:

- Rangeland based: livestock production, crop production, gathering and sometimes selling of veld products; legal hunting has virtually stopped;
- Non-rangeland based: formal employment, government support, small businesses and piece jobs.

Livelihoods are regularly affected by events beyond people's control. The major events are:

- Endemic droughts, affecting livestock and arable production and requiring coping strategies;
- The drying up of the Boteti River, reducing the number of livelihood sources and affecting molapo farming and livestock;
- HIV/AIDS, adversely affecting productivity and putting household budgets under pressure;
- Veterinary fencing, restricting livestock movement and marketing opportunities.

3.3 Infrastructure

Mopipi and Mokoboxane are linked to Orapa and Letlhakane by a tarred road which extends to Francistown and Serowe. The new tarred road also links the area to Rakops and Ngamiland. This road offers an alternative route for tourists from Gaborone and South Africa to Maun and Ngamiland. There are many tracks in the area, which access other places like Makgadikgadi Pans National Park (MPNP) and Gweta and the Central Kalahari Game Reserve (CKGR). However, some of the tracks (e.g. in MPNP) are impassable during and after heavy rains.

Most essential public infrastructure is in place (Table 3.3). However, private sector facilities and infrastructure is minimal, and villagers rely on places such as Letlhakane for supplies. The villages are electrified and have water reticulation systems. However, water is occasionally problematic. Villages have phone land lines and access to the two mobile networks.

The MCT area falls into two veterinary zones. The villages lie in the so-called red zone (4A) to the west of the cordon fence, where animals are vaccinated and cannot be sold to the EU. Animals have to be quarantined for twenty one days before they can be sold to BMC for sale in South Africa. This is a cost and risk to livestock owners. The cattle post area east of the cordon fence lies in the buffer zone (4B), where animals are not vaccinated but need to be quarantined before they can be sold to BMC (on government approved and sealed trucks) . The animals from the two zones cannot be mixed or sold at the same time. BMC has different periods for selling for the two areas. In case of an outbreak of FMD from the area or anywhere else in the country, animal and their by-products movement is frozen until the DAHP has done its investigations and deems it safe to move animals.

The Department of Animal health and Production will stop vaccination in the 4A area, which would improve access to the BMC market after several years. The major facilities in the area are summarised in Table 3.3

Table 3.3: Existing facilities in the area

	Mopipi	Mokoboxane
Traditional facilities	kgotla	Kgotla
Education	Junior secondary school, 2 primary schools	Primary school
Health	clinic	clinic
Agriculture	DAHP office, Department of Crop Production office	
Type of shops	Coop, general dealers, tuck shops, bakery, hardware	General dealer, tuck shops
Banking facilities	none	none
Agricultural supplies	none	none
Livestock marketing	cooperative	
Social and Community Development (S&CD)	Office in Mopipi covering other places like Xhumu, Toromoja and surrounding cattle-posts	Office in Mokoboxane , also covers Kedia and surrounding cattle-posts
Tribal Administration	Local police office	Local police office
Development committees	Mopipi VDC	Mokoboxane VDC
Youth groups	Mopipi Youth group	
Water reticulation	Piped water	Piped water
Communication and information	Telephone, cellular phone network, Radio Botswana, BTV	cellular phone network, Radio Botswana, BTV
Postal services	Post office	none
Transport facilities	Buses, tarred road	Buses, tarred road
Power	Electricity	Electricity
Others.....	Youth hall, Bays club, tannery, liquor restaurant	liquor restaurant

Source: Population Census 2001; fieldwork.

The Department of Crop Production (DCP) administers the Arable Land Development Programme (ALDEP), which offers grants and loans to individual arable farmers, and provides seeds to farmers when it is time to plough. The DCP also advises farmers on how to improve their production. In an interview with one of the village arable farmers, he mentioned that normally they face a problem of pests like *setotojane*. The DCP advised farmers to make fallows around the ploughed area so these pests would not reach the crops; this worked quite well.

The work of the DAHP is also appreciated by the local livestock farmers. The animals are vaccinated for foot and mouth disease (FMD) in the 4A area. In addition, animal are inserted with a bolus for identification and traceability. The cattle-posts farmers FGD mentioned that they have been able to buy good bulls and also done some artificial insemination with the help from this department.

Mopipi has a cooperative, but it was reported during the FGD that this facility has not been performing well for some time. Some of the farmers were unaware of its existence. The reasons given were that it is poorly managed and hence the farmers have lost faith in it. It was reported that in the past there were cases which animals were injured or lost on their way to BMC and the owners were not compensated. Consequently, farmers decided to arrange their own transport to BMC.

During the FGD with the extension team, it was mentioned that there is lack of coordination between the various extension groups. They called for coordinated effort and consultations.

3.4 Institutions

The institutions that operate in the MCT area are listed in Table 3.4 many are locally based, but others are based in Rakops, Letlhakane, Serowe or Gaborone. These are: DAHP, crop production, Tribal Administration, Social welfare and community development, health (clinics), primary and secondary education, VDCs.

Table 3.4: Administrative and extension support institutions

	Types/ Names	Development responsibilities	NRM responsibilities
Mopipi	Tribal Administration (headman) DAHP office Department of Crop Production office	Disseminate development information to community, advices and settles disputes, lead in community development initiatives. Vaccination campaigns, bolus injections, issuing of permits, education of farmers, veterinary checks at fences/FMD control, processing of support applications by farmers (SLOCA-LWDP) Processing of support applications by farmers, crop advice, and provision of support (e.g. seeds during droughts).	Conservation of thatching grass; rules on when to harvest
Mokoboxane	Tribal Administration (headman)	Disseminate development information to community, advices and settles disputes, lead in community development initiatives	Conservation of thatching grass; rules on when to harvest
Letlhakane	Sub-Land Board Sub-District Council Sub-District DLUPU	Allocation of land, boreholes, land use plans	Borehole rights
Rakops	Sub-Land Board	Allocation of arable land	Arable land and residential plots
Serowe	Main Land Board Main DLUPU Central District Council (CDC)	Delegate to sub district; allocation of land; boreholes, arable fields, residential, land use plans	Land, water
National			

Sources: Population Census and FGD.

The MCT falls under the main Ngwato Land Board with the headquarters of the district being in Serowe. MCT further falls under two sub-land boards of Letlhakane and Rakops. The western part of Mopipi is under the authority of Rakops Sub-Land Board while the rest of the area is under Letlhakane Land Board. The Letlhakane Land Board allocates boreholes in the area.

According to the FGDs, the community had a meeting at the *kgotla* which among other things discussed the issue of thatch grass harvesting. It was agreed that thatch grass should be left to dry and drop seeds to the ground before it is cut. If one is caught harvesting wet grass s/he is reported to the *kgotla* and may be made to pay for it. This is an important role of the *kgotla* with the community at large in conservation of thatch grass.

The Tribal administration also plays an important role in combating stock theft. All animals that are to be sold or moved have to go through the *kgotla* for clearance and approval of ownership.

Chapter four Resource use practices

4.1 Introduction

This chapter documents the use and management practices of resource users. The main resources, their status and causes of change in their availability, as identified in focus group discussions (FGD), are presented in Table 4.1. The status of most resource, in particular agricultural resources, is considered to be low. Firewood and mophane are still considered adequate. It is striking that rainfall failure is considered to be a main determinant of change of almost all resources. In other words, human activities are a secondary determinant of resource conditions.

Table 4.1: The major resources of the area

Resource	Resource status	Causes of change in availability
Arable land	Low, but depend on rainfall	Lack rainfall, poor soils, crop damage by livestock, pests
Water	Low, but depend on rainfall	Salinity, low rainfall, high temperatures, drying of Boteti river, increase in human population
Grazing/browsing	Low, but depend on rainfall	Low rainfall, overstocking, veld fires
Veld products	Low, but depend on rainfall	Lack of rainfall, unwise use (e.g. early harvesting), veld fires
Firewood	Enough to plenty	Over harvesting, veld fires
Mophane worms	Plenty, but depend on rainfall	Lack of rainfall, unwise harvesting

Source; Khwarae, 2004, FGD

Table 4.2 assesses the strengths and weaknesses of each activity, as emerging from the FGD. It appears that the MCT area has strengths in its varied, abundant and cheap water sources, several scenic spots, fertile river beds and its location close to Orapa and along a tourist route. Weaknesses include poor soils, wind erosion, absence of valuable veld products and wildlife and livestock marketing constraints.

Table 4.2: Strengths, weaknesses and conflicts by activity

Activity	Strengths	Weaknesses	Conflicts
Cattle post livestock areas	Good and easy grazing, easy breeding, good management and control, easier disease control, better, easy to move cattle, formation of groups	Labour shortage, livestock theft and predation, mosquitoes, far from homestead, wind erosion, overgrazing during droughts	Livestock movements With gatherers of veld products
Village livestock areas	Animals within reach; use of cow dung, easy care; no payment for grazing	Poor range conditions, bush encroachment and low productivity, livestock damage; many diseases and waste eaten (e.g. plastics)	With arable farmers, plot owners, traffic, cattle post owners.
Arable production	Fertile molapo fields (maize) Sandy soils suitable for beans and melons	Rainfall, pests, salty soils, crop damage by cattle and wind erosion.	Crop damage by livestock (70% of arable farmers) "Outsiders' have acquired molapo fields, without using it.
Veld product collection	Mostly subsistence use; most resources still available	No significant volumes of special, high value veld products, wildlife has virtually disappeared, large distance to markets	Cattle post livestock farmers deny some access to veld products
Tourism	Pans Archaeological spots Proximity to Orapa Located along major route to Maun	Very little wildlife No infrastructure-facilities	Use of pans may conflict with livestock

Source: FGD.

4.2 Livestock farming

Livestock farming is the most important resource-based economic activity in the area. There are two types of livestock farmers: those operating at the cattle post and those operating around the village.

4.2.1 Cattle-post livestock farming

According to the FGD, there are about sixty five farmers of this type in the area. These are mainly elderly men, who can afford to hire herd men. They have an average of forty to fifty cattle, fifty goats and two to five horses, and are mostly medium-sized livestock farmers. A significant number of farmers from this area have their cattle post beyond the MCT area in places like Tsienyane, Xhago and Beetshoroga. The cattle-post area starts ten km from the villages and most cattle posts are located north of Lake Xau, around Rysana pan, and (north-) east of Mopipi. The distance between cattle-posts is two to four km.

Management practices

The cattle-post livestock production system is semi commercial. More cattle are sold than in the village area livestock farming. Cattle are sold to cover the running costs, mostly watering and labour costs. During droughts, some farmers provide supplementary feeding to their livestock, especially bulls.

Cattle move around the cattle posts and water points. Water is considered to be the main constraint. During drought animals are moved to less affected areas, normally towards Lake Xau. Movement is mainly determined by the availability of water. Other constraints are the lack of market as the area lies in a veterinary buffer zone and thus animals have to be quarantined for twenty one days to sell to BMC. The water is also salty and not optimal for livestock.

Cattle post areas have the advantage that there are no conflicts between livestock and arable farming as cattle-posts are far from the fields. Cattle posts farmers have rights for the use of water in their boreholes, but not to other resources like veld products around the area. Sometimes, conflicts occur when people collect veld products around cattle-posts areas. Some cattle-posts owners deny veld products collectors access to these resources.

Water resources

According to the farmers, wells are most common (over seventy) followed by boreholes (ten to twenty), pans (ten) and dams (two). As wells are cheaper than boreholes, this makes the cattle post area more affordable than many other parts of rural Botswana. As elsewhere in rural Botswana, farmers use surface water sources when they hold water and move to wells and boreholes when the pans dry up (so-called fallback strategy, Bailey, 1980). Farmers move to groundwater somewhere during the dry season, the timing depending on the rainfall of the previous rainy season. Some surface water sources are salty and less suitable for livestock. Access to groundwater is therefore a necessity. The average depth of water strike in this area is six to ten meters for wells and twenty to forty meters for boreholes. The distance between water points is two to four km, less than the norm of six to eight km. Therefore, the Land Board no longer allocates boreholes in the area (the Land Board is not involved in wells).

Those who do not own a well or borehole may hire water for their animals. The charges are one beast per annum for a cattle herd and one goat for a herd of goats of less than twenty (two goats for a larger herd).

Grazing resources

Farmers argue that grazing conditions largely depend on rainfall. The best grazing/browsing area is around Lake Xau and north west of Mopipi. These areas have palatable (sweet) grass species like *morobanare*, *rathathi* and *namela* and good browse such as *moholodi* and *moretlwa*. The Lake Xau area is also used by village area livestock farmers.

Bush encroachment is not yet considered to be serious. However, some undesirable species are invading and affect livestock more especially during dry seasons (e.g. *senamelagae* and *sekaname*; Khwarae, 2004).

Cattle post owners do not actively manage grazing resources. However, they have the means to control livestock numbers and water points as the LB no longer allocates boreholes and cattle post owners have to grant permission for the construction of additional wells.

4.2.2 Village area livestock farming

According to the focus group discussion, the village livestock area extends to about 10km from the villages. A typical farmer in this area would have an average of 15-35 cattle, 15 goats and 6-10 donkeys. The farmers are mostly women, who cannot afford to keep their livestock at the cattle posts and do not have herd men.

Management practices

Livestock production in the village area is mainly for subsistence purposes; animals are only sold to pay for school fees or used as bride price, for milking, draught power. Inputs and production costs are low, certainly compared to cattle posts. There is no supplementary feeding, and herding and kraaling are only done during ploughing season. Goats are kraaled daily; cattle are only kraaled during the ploughing season and when animals are milked. Farmers consider grazing the most important natural constraint (other than rainfall).

Small farmers keep their livestock around the villages, as they cannot afford to hire labour and it is easier to monitor the animals. Other advantages include access to extension services and benefits from milk and transport.

Village area livestock farmers face several conflicts such as crop damage, damage to property and risks of road accidents. The new drift fence aims to reduce the livestock crop conflict. During periods of heavy rains cattle-posts farmers move their livestock into to area to escape from mosquitoes. This aggravates the pressure on the village grazing areas.

Water resources

Unlike most village areas in Botswana, the village grazing areas in the MCT area have a variety of mostly freely accessible water points available: twenty to sixty wells (private) and ten freely accessible pans. As Mokoxane is a former cattle post/lands area, four livestock boreholes are used by farmers (same charges as in the cattle post areas). Most farmers in the area water their animals from natural sources like pans during rainy season and when they dry up wells are used.

Grazing resources

Farmers prefer to keep their animals in the direction of Lake Xau because of better grazing species and conditions. The best grazing areas are on the western side of Mopipi about 8km away. The grazing area which is already small has been further

reduced by drift fences and settlements. During droughts animals are moved further towards Lake Xau into the cattle-posts area.

Bush encroachment is common in village grazing areas, especially on the area around Mopipi dam. The farmers view it not merely negative as bushes provide good browsing for goats.

Photo 1: Local bush encroachment



4.3 Arable farming

Arable farming is the second most important resource-based activity in this area. Most of the arable farmers are elderly people, and their number is decreasing; youth perceive the sector as too risky with low returns and hard work. Arable farming is all dry land farming after the drying up of the Boteti River. Fields in the river bed are still called molapo (flood recession) farms, but in fact it is dry land farming on fertile river soils.

Management practices

Crop production is done for subsistence purposes. In Botswana, only 10% of the arable farmers produce a surplus, and the situation is expected to be worse in the area due to poor soils². Fields are relatively small, and only part of it is cleared and ploughed. Fields are usually fenced. The Machana cultivated area is currently being protected by a drift fence around the entire area. Donkeys are mostly used for ploughing but some farmers use tractors. Seeds of different crops are mixed and

² NAMPAAD promote large scale dry land farming, but excludes the western sandveld due to its poor arable potential.

broadcasted. Weeding is done once or twice. Farmers do not use fertilisers or pesticides. Knives are used for harvesting; cattle eat crop residues after the harvest.

Farming of river bed fields yields much higher yields, but the available area is small and already claimed. Therefore, there is no new 'molapo' land available. Molapo fields are on average two to three hectares and most of it is cultivated on an average rainfall year.

The Rakops Sub-Land Board allocates dry land fields and apparently also molapo fields. The latter is recognition of the drying up of the river as Land Boards normally do not allocate land in river beds.

The yields in the area are low due to poor soils, low rains, poor crop husbandry and crop damage by livestock. In 2002, the average area planted per ploughing household is 1.7 ha in Letlhakane agricultural sub region and the yields for sorghum per planted hectare were 25kg, far below the national average of 89kg/ha. Crops that need less water tend to do well on the sandy dryland fields (e.g. water melons and beans).

The drying up of the river has adversely affected arable production³. According to the FGD with crop farmers, the yields of 'molapo maize' are today at least four times higher than that of dry lands fields. Crops like maize, sweet reeds, pumpkins, etc, do well due to better soils and moisture, which tends to last longer than in the dry land fields.

Land resources

The dry land fields are on sandy soils, and have a low productivity. Only a small portion is annually used. The risk of fertility loss is therefore relatively low. The critical issue is to use the available arable zone better and to utilise molapo fields optimally.

Water resources

Arable production depends entirely on rainfall. Rainfall variability and recurrent droughts are therefore the largest constraints for arable farmers.

4.4 Veld products collection

According to the focus group discussion, all households and mostly elderly are engaged in collection of one or more veld products for food, building, medicines and cooking/ heating (wood). The most important veld products are (in declining importance): 1. firewood; 2. mophane worms; 3. wild foods; 4. thatching grass and 5. medicinal plants. Veld products are collected for subsistence purposes, but some like mophane worms are sold. There is virtually open access to veld products, i.e. anybody can harvest veld products. While veld products are currently not depleted, lack of management poses the risks of their depletion in future, for example when commercial use increases.

Residents argue that the availability of veld products primarily depends on rainfall and not on harvesting. Veld fires also destroy veld products. During the FGD only wild foods and some medicinal plants were considered to be in decline. No decrease was observed for other products.

³ During the time when the river was still flowing, floods would rise in May/June and recess in November/December thus farmers would start planting into the moist soil. Yields of 300-350 kg/ha of maize were realised using traditional methods of intercropping with melons and pumpkins (Maas, 1995).

Firewood is collected and used on daily basis. It is widely available even though people have to travel larger distances. Normally, only dead trees and dry wood are cut and carried home by donkey carts, bakkies or head loads. *Mophane* is the most preferred species, followed by *motsiara*.

The area has green and multi-coloured mophane worms. They are only harvested when they are fully grown and about to enter the next stage of pupae. Some of it is left to go underground as pupae so that it could complete its life cycle and be available for next season. Mophane worms are gathered twice a year from December to February and from April to May.

Wild foods (e.g. *mogwana*) are harvested at different times of the year depending on when they ripen. They are normally collected in bags and carried home on head loads. Only edible parts are harvested, and plants/ trees are not seriously disturbed.

Regarding medicinal plants, only leaves, small branches and/or roots are harvested. Normally, plants and trees are not heavily disturbed to ensure their survival.

Thatching grass (mostly *tshikitshane*) is normally harvested by sickle in winter when it is dry and has seeds. When dry, the seeds fall to the ground and will germinate during the next rainy season. Some people cut it when it is still wet and other uproot grass, but these practices are discouraged by the community.

Some medicinal plants like *mokgalo* have taboos for harvesting. They can only be harvested at certain times and only during emergencies. Small roots are normally dug and cut, then the ground is covered to avoid drying up of other roots. Enough for usage is harvested.

People feel that a few of the veld products are in the decline and are collected further away from the village than before. Reasons given were the poor harvesting methods and the increased usage by the increasing population. An example of poor harvesting methods given was the cutting of thatch grass when it's still wet and not ripe.

While veld products are largely unmanaged, traditional measures existed to ensure their regeneration, including:

- Taboos on the use of valuable trees such as *motlopi*, *mopipi*, *mothapo* for firewood;
- Ban on harvesting of wet thatching grass.

Conflicts

The most notable conflict, as discussed earlier is between collectors and cattle-post farmers. The cattle-post farmers deny collectors access to their area and may take away whatever has been harvested without their consent. Harvesting of thatching grass does not lead to conflicts with livestock owners as it is harvested when it is dry and it is less palatable to livestock.

It was also mentioned during the FGD that people from other areas like Rakops, Xhumo, etc collect some veld products like mophane worms and firewood from their area. This was said to have led to the decline in availability and increased distance to the area where firewood is being collected.

4.5 Tourism and wildlife

According to the FGD with local extension workers, this area has little wildlife left after the drying up of the Boteti River and fencing of the MPNP. The area has some pans and archaeological spots, which can attract weekend and transit tourists. This potential is currently not used. With improved tourism facilities, transit tourists from South Africa to Ngamiland and weekend tourists from Orapa and other parts of Botswana could spend some time in the area. This would create employment and market for locally produced products.

There are some constraints for tourism in the area though. There is lack of basic tourism facilities, lack of tree cover which makes the area prone to devil winds, and also that the area is generally less developed. Moreover, during rains access to the pans is difficult.

To increase tourism in the area, some ideas were put forward. It was suggested that MCT should construct some rest camps for transit tourists, ask for permission from Debswana to take tourists to Orapa Game Park (OGP) for game viewing, developing and running of the Bays club by the MCT, etc.

Photo 2: The Bays club at Mopipi dam



Chapter five Current land uses and key spatial features

5.1 Introduction

The proposed project area under the MCT consists of extensive rural areas that are mostly devoted to village-based and cattle-post based livestock grazing. Locally, other land-uses are important, including specifically settlement and infrastructure, arable farming, veld-product harvesting (including wildlife) and tourism activities. Other important land-use issues to consider include archaeological and historical sites and ecologically sensitive sites/areas.

The land-use situation in the area must be considered in the broader context of surrounding areas. Significant in this respect are the protected areas to the north (Makgadikgadi Pans National Park) and to the south-west (Central Kalahari Game Reserve) as well as the fenced Orapa mine-lease area to the east. To the west of the Mokopi area toward Xhumo and Rakops land-use is comparable to land-use around Mopipi and Mokoboxane.

Figure 5.1 shows the regional setting of the Mokopi area in northern Botswana, while Figure 5.2 shows the (immediate) surrounding land-use context. The overall land use situation in the Mokopi project area is summarised in Table 5.1. Individual land-uses are discussed in more detail in paragraphs below.

Table 5.1: Land-use categories of the MCT area.

Land-use Category	Size in km ²	Percent of total area
Settlement	20	Around 1
Infrastructure	20	Around 1
Cultivation	35-40	Around 2
Livestock grazing	1900+	Around 95
village area based	635 (+/-)	Around 30-35
cattle post based	1265 (+/-)	Around 60-65
Veldproducts	Most of the MCT area	Close to 100%
TOTAL	About 2 000	

5.2 Settlement

As indicated earlier, the area has two major settlements Mopipi and Mokoboxane. In addition, there are several locations associated mostly with Mopipi.

Mopipi village covers about twelve km², largely devoted to residential plots for the 665 households in the village and numerous tracks between plots. Substantial plots are occupied by educational, sports and health facilities and by shops, bars, petrol stations and similar commercial activities and currently by (temporary) camps for road construction workers working on the new Mopipi-Rakops road.

Mokoboxane village covers about five km², mostly consisting of residential plots for the 272 households of the village as well as tracks between plots. There are also plots occupied by small-scale commercial activities.

All other settlements are much smaller in size and population. Figure 5.3 shows the approximate distribution of settlement in the area, demonstrating that small localities

exist scattered throughout the entire area. Most of these are cattle posts and lands areas. They are all small entities in terms of land-use, except where (relatively small) areas of cultivation are attached to such localities.

5.3 Infrastructure

Generally, infrastructure occupies limited areas of land. However, the location and nature of infrastructural facilities offer crucial support to other land-use arrangements (e.g. access to markets). In the Mokopi area, significant infrastructural components relate to roads, fences, boreholes and (water) pipelines. Power and telephone lines (and transmitters) are usually located along roads or otherwise have limited specific land requirements.

Roads

The main Orapa/Letlhakane to Rakops road traverses the Mokopi area over a distance of approximately 67 kilometers. The section from Mopipi to Rakops is currently undergoing reconstruction and re-alignment (see Figure 5.4). Assuming that a strip of about 200 meters along the road becomes unavailable for other land-uses, a total of 13.5 km² of land is taken up by the road. Two fairly major gravel roads connect Mopipi and Mokoboxane to Kedia. In addition, there are a large number of minor roads (tracks) in all parts of the area.

Fences

The Mokoboxane veterinary fence cuts through the eastern portion of the MCT area from the Boteti River in the north to the Setata fence in the south, over a distance of about 50 kilometers. The Setata fence forms the southern boundary of the MCT area from the Setata quarantine camp in the south-east over a distance of about 42 kilometers. Veterinary fences have a profound impact on land-use, particularly with respect to livestock grazing and wildlife movements. The latter is relevant with respect to the new electrified Makgadikgadi National Park fence, which prohibits any wildlife movements into the Mokopi area.

Boreholes

Boreholes are utilised both for livestock watering and village water supplies. Major well fields exist particularly near Mokoboxane from where pipelines run to both Orapa and Mopipi along the main road.

The overall picture of infrastructure is shown in Figure 5.4. As a general estimate, it can be assumed that infrastructure, mostly in the form of roads and fences, in the Mokopi area occupies about one percent of the MCT area (Table 5.1).

5.4 Arable farming

The drying up of the Boteti River has resulted in genuine flood recession farming (molapo farming) being no longer practised. However, the recent and former valleys of the Boteti River where molapo farming used to be practised have fertile soils and good moisture availability and potential yields are therefore significantly higher than on sandy upland soils. The main area where a modified form of molapo farming is practiced is located about 8-10 kilometers west of Mopipi near Phorokwe, extending over not less than 5-6 km² in total. Yields can be very good on these (former) molapo fields, especially when mixed crops (maize, beans and melons) are planted. This traditional practice is, however, currently less used in favour of mono cropping.

Dry-land farming is practiced elsewhere on sandy soils:

- In a large area (Machana) of not less than 14-16 km² north and north-east of Mokoboxane. A major portion of this “farm-block” is fenced with the remainder undergoing fencing. Currently only small portions are cultivated, mostly with maize and melons. Yields are very low due to poor, sandy and locally salty dry-land soils and poor management;
- In another fairly large area (Morula) of approximately 14 km² about 6 kilometers south of Mopipi dam near Morula;
- At scattered fields at localities, mostly cattle-posts.

In all, out of the total MCT area, about 35 km² or almost two percent is devoted or reserved for cultivation. This implies that about 0.5 hectares of crop land is available per person. This is a significant resource for food security that requires attention in terms of improving yields and more effective land use.

5.5 Livestock grazing

Ninety to ninety five percent of the area is devoted to livestock grazing (with opportunities for gathering). There are no fenced livestock farms in the area. The main livestock grazing zones are:

- Village-based, mostly small-scale livestock farmers without individual water supply options; and
- Cattle-post based, often larger-scale livestock farmers with usually privately controlled water supplies.

The area has favourable water supply conditions despite the drying up of the river and Mopipi dam. Firstly, numerous large and small pans hold water for variable periods of the year. For example, Ntsokotse/Rysana pan held water in July 2006 after good rains and the water is not saline. In addition, there are other, smaller, water-holes north east of Mokoboxane, which hold water for considerable periods of time. Obviously, the water holding of these pans depends on rainfall conditions. Secondly, much of the area, particularly in the river valleys, is underlain by shallow fresh groundwater that can be accessed through hand-dug wells. Other portions of the area contain good groundwater resources accessible through boreholes, although in some locations only saline water can be found. Figure 5.6 shows the water resources (at the back of this report), in terms of pans and boreholes/wells for the area. These are crucial resources for the livestock sector. The Focus Groups Discussions (FGD) revealed that boreholes are two to four kilometers away from each other. This implies that the risk of rangeland degradation is high, especially during drought years and that Land Boards have ceased to allocate more boreholes.

While village based livestock farming is centred around Mopipi, Mokoboxane and a number of other, smaller settlements, cattle-post based livestock farming is centred on the scattered cattle-posts, distributed throughout the area as shown in Figure 5.7 and along the Boteti river channel. Assuming that village based livestock farming is concentrated in a radius of about ten km around Mopipi and Mokoboxane, approximately one third of the total project area is under village based livestock farming and the remainder under cattle-post based farming.

Grazing lands are separated by the Mokoboxane veterinary cordon fence that crosses the region. Farmers west of the fence face market access restrictions.

Photo 3: Dryland crop farming inside the drift fence area



Photo 4: A well for livestock watering



During field visits in June and July 2006, little evidence of over-grazing was encountered on account of a good previous rainy season. East of the Mokoboxane fence and in the areas along the Boteti River channel north of Mopipi grazing looked good. There obviously exists good livestock potential in the region, depending on the variable conditions of rainfall and drought. Appropriate management of both water and vegetation resources in line with suggestions contained in the Livestock Sector Review report, may enhance the production potential of the local livestock sector. Overstocking and over-utilisation of water resources are some of the potential problems facing livestock farmers.

5.6 Use of veld-products and wildlife

A wide range of products are harvested from rangelands. These include:

- Poles and thatching grass for house building and fencing;
- Wild foods and fruits (e.g. mophane and moretlwa);
- Fuel wood;
- Medicinal plants; as well as
- Clay and gravel and sand at several small quarries.

Generally, veld products are collected throughout communal rangelands. Fuel wood, food and berries are collected close to the villages. Building material is collected further away from villages in the cattle post areas. For example, thatching grass is harvested between Phatshwanyane and Magotho cattle posts. Some of it is sold commercially. Other products include materials for basket weaving and for pottery. Most of the vegetation products need to be gathered at considerable distance (over 10 km) from the villages as there is competition with livestock grazing where there are many livestock. Some cattle posts owners reportedly deny others access to veld products in 'their' area.

The MCT covers Controlled Hunting Area (CHA) CT19 and part of CT8. The area is located along an old wildlife migratory route between the Makgadikgadi Pans grasslands and the Central Kalahari. This changed dramatically as a result of the drying of Lake Xau (Dow), fencing and encroachment of people and their cattle. There is now very little wildlife left in the area. Small game reportedly causes damage to crops during the growing season. In the Ntsokotse/Rysana pan area, reportedly, steenbok and kudu can be found but numbers tend to be low. It is unlikely that wildlife numbers will increase in future as wildlife migration has stopped.

5.7 Special sites

The area has some archaeological sites and some ecologically sensitive areas, which need to be managed with care.

Generally, the Boteti region is abound with archaeological and historic sites. But most lie outside the MCT area. The most significant site inside the MCT area is the Xanxaga site with fossil footprints, which is fenced as an official Museum site. Figure 5.8 at the back of this report shows the main archaeological/historical sites in and near the Mokopi area.

It is assumed that all river valleys and pans are ecologically sensitive. Ntsokotse/Rysana pan is also officially recognised as an important birding area, especially for water birds. These areas may be threatened because of increased human pressure (e.g. arable, livestock and tourism).

Photo 5: Animal footprints in rocks



Chapter six Opportunities and limitations set by existing land use and development plans

The major development planned in the area adjacent to the MCT that could profoundly impact upon the existing land use practices and the pressure that is put on natural resources by people is the fencing of the Boteti Area 4B under the National Policy on Agricultural Development.

The proposed ranches lie between the two veterinary cordon fences – the Setata in the south and south-east and Mokoboxane to the north-west. To the north the boundary of the ranch block is the Mopipi – Orapa road, while to the west it is the CKGR. Mokoboxane is three kilometers away from the proposed ranch block, Mopipi (10kms) and Orapa (10kms) (Marata, 2000). The latter study reported 62 water points, with a total of fifty developed at the time of the survey in late 1998. Only thirty one water points had drinkable water with the remaining 19 abandoned as a result of high salinity levels (Marata, 2000).

The Ranch Feasibility study reported 8 470 cattle, 544 sheep, 4 861 goats, 175 horses and 311 donkeys. It recommended that the minimum economic farm size of 6 x 6 kms, each sustained by 154 LSU (260 cattle) 'or more' (Marata, 2000). The latter report enumerated 225 Remote Area Dwellers (RADS) by visiting the boreholes within the area, with 52 people employed on the cattle posts. A major concern of the RADS with the proposed fencing project was that they would be deprived of the right to collect veld products in the area due to the fact that they would be denied access into private land (Marata, 2000).

This concern is elaborated in NRP (2006) with Marata (2000) pointing out that the establishment of the Hima Game ranch (28 090 ha) will be explicitly for the RADS, although it is currently devoid of water points. The Hima Ranch is also separated from Kedia by the Setata veterinary cordon fence, suggesting that access to veld products within the proposed Ranch area may be problematic.

The major concern with the Area 4B ranch block is the displacement of veld product harvesting pressure and also domestic stock grazing pressure into the MCT area, due to the reduced options in Area 4B as a result of its fencing and effective privatization. In terms of veld products it would be a direct increase in pressure by people from outside (e.g. Kedia) harvesting within the MCT, while increased grazing pressure is likely to be more indirect through watering arrangements made within the MCT by people from outside. Both will place the finite and limited natural resource base of the MCT under increased pressure and so compromise the improved livelihood and diversification options proposed within the land use management plan. In this respect it is doubtful whether the proposed Game Ranch at Hima or the proposed water development in the communal grazing (NRP, 2006) areas can compensate for the fenced livestock ranches, not least because of the fundamental problem of the lack of suitable water. The experience of the Game Harvesting Project at Kedia and other game ranches in the country would also suggest that the proposed economic returns from Hima Game Ranch (NRP, 2006) are wishful thinking.

Chapter seven

Review of resource management and development policies and legislation

Legislation and policies provide the institutional framework for natural resource management. This includes identifying the opportunities and constraints for community-based rangeland resources management. Below, the main laws and policies governing resource management are summarised in section 7.1 and 7.2. The key questions for the MCT are:

- Which laws and policies (instruments, rights and support opportunities) can be used by the MCT to conserve resources and increase the local benefits?
- Which limitations exist in current legislation and policies, to which the MCT activities have to comply?

It is important that the MCT anticipates future plans for the Makgadikgadi Pan area. Of particular importance to the MCT is the integrated management plan for the Makgadikgadi wetlands that will be prepared under the auspices of the Department of Environmental Affairs. This will be an effort similar to the Okavango Development Management Plan. The Tourism Development Framework (2001) is also important to the diversification efforts of the MCT (see chapters 8-11).

7.1 Legislation

Statutory legislation is mostly sectoral, dealing with individual sectors such as livestock and arable production or wildlife and tourism. In addition, customary laws and practices have traditionally regulated rangeland resource management and still play a role in current management (e.g. overseers). Legislation, policies and customary law provide opportunities for communities to manage and conserve their resources. There are also discernible constraints in the legislation, policies and customary law.

Constitution of Botswana

The Constitution of Botswana is relevant in the protection of community areas and recourses; its section 8(5) provides for the conservation of natural resources. The clause deals with protection from compulsory acquisition of property or interest in or rights over property. However, it authorises the state to compulsorily acquire property if it necessary for soil conservation or the conservation of other natural resources or work relating to agricultural development or improvement. This means that where the government considers that privately owned property or land is required for the conservation of natural resources, it can acquire it. This is relevant for the MCT because it gives them the opportunity to acquire compulsorily acquired land or property and use it for developmental purposes.

Therefore, the Constitution may be a useful tool for communities in Mopipi/Mokoboxane area in the management and conservation of resources in their area. It is the starting point for an examination of the legislative framework on the management of community resources.

Tribal Land Act (Cap. 32:02)

The Act aims at establishing the Land Boards (LBs) vest the management of Tribal Land in the LBs and defines the powers and duties of such boards. It provides the Land Board in each tribal area with specific powers over land within its jurisdiction for purposes of promoting the economic and social development of the people. The LBs

have the powers to grant rights to use any land; cancel the grant of rights to use any land including the grant made prior to the coming in operation of the Act; hear appeals from subordinate land authority; and impose restrictions on the use of tribal land (s. 13). The LBs are responsible for the allocation of tribal land and ensure that land is used for the intended purposes.

In order to acquire resource rights over land whether arable or grazing etc, the MCT would have to apply for licenses or permit authorizing them to use land and resources on the land. The licenses or permits would provide conditions under which the land and resources should be used such as prohibition against transferring resource rights without the LBs permission or change of use.

The Establishment of Subordinate Land Board Order, 1973 provides for Subordinate Land Boards (SLB). Mopipi falls under Rakops SLB, and although it is not indicated, presumably Mokobaxane falls under the same SLB. The Rakops SLB allocates communal land in the areas. It also exercises jurisdiction over the area and communal resources in the areas. The major constraint is that the Act is not clear on how to deal with the allocation of land and distribution of resources that are shared by neighbouring areas and how to deal with conflicts in those areas. For allocation of boreholes, applications are made to the subordinate land board for Mopipi area and allocation is done by the main Ngwato Land Board.

The Agricultural Resources Conservation Act, Cap 35:06

This Act controls and conserves agricultural resources⁴ in Botswana. The Act establishes the Agricultural Resources Board (ARB) as the institution charged with the implementation of its provisions. The ARB also advises the responsible Minister on the nature of legislation necessary to secure or promote the proper conservation, use and improvement of agricultural resources. The ARB has the power to control the exploitation and utilisation of rangeland resources by:

- Issuing licenses or permits authorising individuals or groups to collect community resources;
- Issuing conservation orders and regulations and stock orders for degraded areas. Conservation orders are orders to the owner or occupier of land to undertake measures for the conservation of agricultural resources; conservation regulations are regulations that control land-use practices. Stock orders prescribe the maximum number and class of stock that may be kept or watered (see Agricultural Resources Conservation Act: section 16 (1) (a) and (b)).

The Act has several constraints. For land, it is largely corrective rather than preventive and pro-active. Actions can be taken when the land is degraded, but no tools are provided to prevent land degradation from occurring. The Act defines agricultural resources in a broad sense only. Usually, agricultural resources are equated with veld products, but this is in fact uncertain. Some veld products may be capture under the Forest Act (see below) or under both Acts. It would be clearer for the MCT if the Act expressly state that it covers all communal rangeland resources. Finally, since its enactment in 1974, no conservation or stock order has ever been issued. Despite these limitations, The MCT could use the Act to request stock orders, and conservation orders or regulations.

⁴ In terms of the Act, agricultural resources include animals, birds, plants, waters, soils, vegetation and vegetation products, fish, insects and such other similar thing that the Minister may declare to be an agricultural resource.

The Wildlife Conservation and National Parks Act No. 28/1992

This Act is designed to protect and conserve the country's wildlife resources. The Act's main objective is to conserve, manage and protect wildlife resources. The Act establishes land zones with different degrees of wildlife protection:

- protected areas for wildlife conservation (National Parks and Game Reserves) where hunting is prohibited;
- Wildlife conservation and utilisation areas such as Wildlife Management Areas (WMA), where wildlife utilization takes priority over other forms of land use;
- Controlled Hunting Areas (CHA), in which hunting is regulated in most parts of the country.

The MCT area falls in CHA CT8 and CT19, but has minimal hunting quota due to the demise of wildlife resources. The MPNP is located to the north of the MCT area, offering opportunities for photographic safaris and use of community use zones. The OGP is located to the east, and offers tourism opportunities.

Tourism Act No. 22/1992

This Act aims at regulating tourism in Botswana. The Act provides for tourism concession areas (TCAs) wherein exclusive tourism rights are acquired by firms or communities. Most of the TCAs are located in Ngamiland and Chobe, but TCAs can be developed around the Makgadikgadi pans. If communities are granted such rights, they may sub-let (part of) these rights or develop a joint venture with a tourism firm.

Waste Management Act, 1998

This Act aims at regulating and managing disposal of waste in the country. It indirectly relates to communal areas in the MCT area because waste disposal can also be deposited in these areas. The Act prohibits uncontrolled waste disposal, and provides for waste removal at the costs of the polluter. It is, obviously, difficult to identify and charge the polluters.

Water Act, 1968

While the Tribal Land Act provides that Land Boards allocate borehole drilling rights, water abstraction rights need to be obtained from the Water Apportionment Board under the Water Act. This Act regulates the granting of water development and user rights in the country. It imposes conditions under which water rights can be granted to occupiers of land and various right limitations. The Water Apportionment Board (WAB) is responsible for the granting of water rights. Such water rights normally have a ceiling for water abstraction, depending on the use, and are conditional. For example, they may be reduced during droughts. Rights are normally granted to individuals or companies, but there is no reason why the MCT cannot apply for water rights.

While borehole owners normally apply for abstraction rights from the WAB, it is doubted whether owners of wells do so. This leaves their rights unprotected.

A revised Water Act (1991) has not been enacted. The Act does not have explicit references to community water rights and responsibilities. However, there appears to be no prohibition for granting water rights to communities in community-managed areas.

The Forest Act

Botswana's efforts to protect and conserve the few forests and forest produce in the country are found in the Forest Act. The Act defines a forest produce to include trees, timber, brushwood, firewood, plants, grass, reeds, fruits, seeds, leaves, honey,

wax, fungi and such other things as the Minister may by notice in the gazette declare to be a forest produce. It further protects forest reserves. This is any area declared by the President to be a forest reserve. All currently declared forest reserves are located in northern Botswana and state-owned.

Importantly, most of these forests, forest produce and forest reserves although being state-owned are community rangeland resources found in most community rangeland areas and certainly MCT area is no exception. Individuals and communities can obtain licenses or permits from government to harvest resources located therein such as veld products and other forest produce. The Act can therefore be used to protect and conserve these resources. The problem with this Act is that it is only confined to forest reserves and leaves wood resources outside the reserves to the mercy of the users. Moreover, there may be overlap with agricultural resources.

Town and Country Planning Act

The Act aims to make provision for the orderly and progressive development of land in both urban and rural areas; and to preserve and improve amenities thereof; for the grant to permission to develop land; and for other powers of control over land. One way of achieving these aims is through subdivision or demarcation of land to be used for residence, construction or agriculture. Part 1 of the Act provides for the control of land development by designating specific uses of land for agriculture, wildlife, forestry, mining, water resources and other purposes. The Second Schedule to the Act indicates that the Development Plan may make provision for the use of land for communal purposes. This means that the Act can be used for demarcation or zoning for land as communal rangeland areas.

Customary /Traditional Law

Apart from legislation, customary law also offers opportunities for the communities in the Mopipi/Mokobaxane area to manage and conserve their resources. Under customary law, the chief had the power to allocate land to members of the tribe. Every household in the tribe was allocated and designated land to use for grazing, hunting, arable and residential purposes. Apart from residential areas, grazing, hunting, arable land was used by the entire community. The community had user rights on this land. There were also rules on the management and conservation resources regulated mainly by taboos and totems prohibiting use and destruction of certain types of trees etc. However, its constraints are that customary law is difficult to enforce because of its unwritten nature and is not suitable for modern management practices. Also, communal rangeland areas have all but shrunk. Further, the responsibility of their management has been taken over by the Land Boards thus minimising the chiefs' role in the management of customary land. However, the chiefs and village headmen still have influence in the sense that they are responsible for signing application forms for allocation of tribal land although they are not involved in land allocation.

7.2 Policies

Botswana has several policies that are relevant to the MCT's operations, covering specific resources (e.g. rangelands and water), rural development and communities. Some are cross cutting such as the draft CBNRM policy and the community-based rural development strategy.

7.2.1 Community- focused policies

The 1997 Community-Based Strategy for Rural Development Strategy

The Community-Based Rural Development Strategy aims are to stimulate community-based rural development and to promote sustainable natural resource use. The policy is still in its pilot phase even though the policy was launched in 1997. The strategy is that communities would become primarily responsible for rural development, while government assuming the role of facilitator. The strategy envisages devolution of development responsibilities to local communities; preparation of community action plans and priorities; community liaison officers in district councils; and assistance to communities by development workers, reform of extension services and NGO involvement.

The IVP project is in line with this strategy and some of its activities can be viewed as implementation of the strategy (e.g. formation of the MCT, community action plans, preparation of land use and resource management plans).

The Strategy can be used to strengthen the policy base of the MCT operations and to strengthen the integration of conservation and development efforts.

The 2003 draft CBNRM Policy

This policy aims to provide a stimulating environment for the growing number of CBNRM projects, most of which deal with wildlife resources. It also aims to establish common property regimes for biological resources that are now threatened by open access and ineffective management. Moreover, the policy aims to link resource conservation and rural development by strengthening local resource management and by increasing local benefits.

The CBNRM policy is of critical importance to MCT area such as wildlife and tourism CB woodlands, fishery zones. Veld products fall under the Agricultural Resources Conservation Act. At the same time, the policy mentions that this Act will be reviewed. The Policy proposes the establishment of a CBNRM co-ordinating unit and encourages joint ventures between communities and the private sector. However, the policy does not deal with community rangeland resources. It also does not refer to agricultural resources or deal with land and water rights. It therefore cannot ensure an integrated resource management approach, as land and water are vital. Finally, the policy mostly refers to existing support of service providers. Efficient, community based service provision requires more than a coordinating unit. There is therefore the need for a review of the support landscape and infrastructure, and reform it to make it more community-friendly.

The CBNRM policy is of critical importance to MCT. It brings together existing instruments and measures, and contains few new elements. It focuses on wildlife and tourism (including the Parks and People strategy), and mention Community-Based woodlands and fishery zones. In addition, communities can be granted user rights of certain veldproducts under the Agricultural Resources Conservation Act. The main tools for community management are CBO leases for CHAs (wildlife and tourism); community resource-use zones (forests and fisheries); and Parks and People strategy (e.g. community zones inside Parks and support for communities living in the vicinity of Parks).

7.2.2 Development and sectoral policies

The 2002 Revised National Policy for Rural Development (RNPRD)

The primary aim of the Rural Development policy is to enhance the quality of life of all people who live in Botswana's rural areas, and to widen their choices. The specific policy objectives are to reduce poverty, provide opportunities for income generation and economic activities, create employment and enhance popular participation in development planning and implementation processes as a basis for broad-based, balance and sustainable development. Its planned activities include support for Community-Based projects, special support for women within CBNRM projects.

The specific policy objectives are to provide opportunities for income generation and economic activities, reduce poverty, create employment and enhance popular participation in development planning and implementation processes as a basis for balance and sustainable development.

It provides for support for Community Based projects and special support for women within CBNRM projects. Its programme activities that are relevant for this study are:

- Livelihood diversification through veld products and wildlife;
- Preparation of comprehensive integrated district land and water management plans;
- Providing essential social safety networks and poverty reduction;
- Stronger and clearer property rights; and
- Cost-effective restoration of degraded rangeland resources and regeneration of veld products.

The policy offers important opportunities for MCT. The Rural Development policy could support Community Based-projects which are closely linked to its implementation. The policy has the potential to link environmental policies with rural development agricultural policies. It can therefore be a useful tool for the management of community in the MCT area.

The 2003 Poverty Reduction Strategy

The stated overall aim of the Strategy is to develop opportunities to sustain livelihoods by employment creation through economic diversification and evenly spread development. It offers more opportunities for the communities to manage and conserve resources. It provides for the tackling of poverty by a combination of sound macro-economic policies, district development planning based on natural resources and comparative advantages, provision of a safety net for those who cannot take economic opportunities themselves and enhancing access to social services and investments by the poor.

The Poverty Reduction strategy seeks to promote natural resource management by the community, encouragement of genuine community participation, strengthen human capabilities and CBNRM capacity of Districts and extension services.

It should be noted that although the Poverty Reduction Strategy does not add much to existing programmes and policies, it offers more opportunities for the MCT projects in that it can strengthen the capacity of service providers, including extension services.

The Tribal Grazing Land Policy (1975)

The objectives of this policy were to increase income of large and small cattle owners, to increase productivity and to improve range management. It also aimed at

safeguarding the interest of small cattle owners and non-livestock owners. Large herds would move out of communal areas into ranches, creating more space for small herds. Ranch owners would receive exclusive land rights for 50 years with limited transferability and pay an annual land rental (now at P 0.70/ha having been P 0.04 for a long time). Groups of small cattle owners would receive priority during ranch allocations. Reserves would be set-aside for future cattle owners. The size of the communal grazing areas would be based on the needs of the local population, and the left over would be destined for commercial ranches. In communal areas, Land Boards would control cattle numbers, and could set a ceiling for the number of livestock to be held per person. Land Boards could also specify the number of land holdings and the total area held by one individual. Water points would not be individually owned. In commercial areas, displaced cattle owners would be compensated and reserves would serve the future interest of the poor and be available for non-livestock uses.

TGLP had a good balance between commercial and subsistence areas and interests and contained useful instruments in land use planning, granting of exclusive rights to ranches and LB-control over grazing conditions and livestock number in communal areas. Monitoring of the policy's impact on land distribution, natural resources and rural incomes was planned.

The TGLP was exclusively focused on ranches and commercial livestock production, and hence lost its original balanced approach. The policy became synonymous with fencing and ranches. The policy was implemented through a series of Livestock Development Programmes.

Since its implementation there is no evidence that livestock productivity has increased. Instead, stocking rates in communal areas have not improved, as few large herds actually moved out and cattle of displaced cattle owners were moved back into communal areas.

The constraints of the policy rest on the fact that it permits dual grazing rights. While communal farmers no longer had access to ranches, ranch owners continued to have rights to communal rangelands, hence discouraging communal farmers to manage rangelands sustainably. Private ranches could be used as reserve for dry season and drought periods. Further, several assumptions proved to be wrong, such as the notion that there were no large empty tracks of land for commercial ranches; water was available in areas designated for commercial ranches; fencing is the key constraint to improving livestock productivity, and therefore ranching would automatically double productivity. After more than roughly 25 years, there is no conclusive empirical evidence that TGLP ranches are more productive than communal areas. Also, ranching may not be the best management model for semi arid rangelands such as the Mopipi/Mokobaxane area. It certainly requires other type of management than the unfenced livestock production model. As the carrying capacity fluctuates enormously with rainfall variations, livestock mobility is essential in livestock management. Fenced ranches restrict mobility and hence require different and adjusted management practices than the traditional ones.

National Policy on Agricultural Development (NPAD 1991)

Agricultural stagnation gave rise to a sectoral assessment, and subsequently to the NPAD. The performance of the livestock sector was considered to be poor with a low off-take and a stagnant animal weight. The policy's objective was to increase production without or with minimal adverse environmental consequences. Employment and income creation, agricultural diversification and resource conservation were some of the specific objectives.

For the livestock sector, the following measures were mentioned: breeding with AI, veterinary services, increased milk production and tsetse eradication. The policy mentions many measures for rangelands, including subsidies of fodder and animal feed. In addition, fencing of certain areas would be allowed, and exclusive rights would be granted to individuals, groups or communities. Borehole owners would automatically be granted exclusive land right, hence transforming de-facto private land use to de-jure private land. Ranches would be allocated after land use plans had been prepared and were approved by Land Boards. Then the Ministry of Agriculture would demarcate ranches and the LBs would start the allocation process. The policy does not mention criteria and guidelines for the selection of suitable areas and for ranch allocation. In practice, buffer zones of at least 20 km around villages are distinguished, where ranches cannot be allocated. Communities would qualify for a wide range of subsidies and support measures.

The fencing component is a continuation of the TGLP ranching component. Unlike TGLP however, the NPAD does not see a future for communal areas management, as it is judged unable to increase productivity and improve resource management, and it is unsuitable to control and eradicate livestock diseases. Community livestock efforts should therefore be restricted to ranches through community owned ranches.

The NPAD is important for MCT for at least two reasons. Firstly, ranches in grazing areas are the trust of the livestock efforts, even without reviewing the performance and impacts of the existing TGLP ranches. Secondly, the policy contains the clearest condemnation of the Ministry of the communal management system. Therefore, subsequent livestock efforts are fully geared towards ranching, even though a growing amount of literature casts doubts about the feasibility of ranching in semi-arid rangelands such as the Moipi/Mokobaxane area.

Citizen Entrepreneurial Development Agency

CEDA is another programme that can offer opportunities for communities in Mopipi/Mokobaxane area. CEDA provides a holistic approach to the development and promotion of viable sustainable citizen-owned enterprises. This is done through the provision of financial assistance in the form of loans at subsidised interest rates, and back-up business training and mentoring services to enhance the sustainability of these enterprises.

Arable Land Development Programme (ALDEP)

ALDEP started in 1982 after a pilot study had identified major arable constraints of farmers and possible support measures. It was the first programme to support arable farming. Its objectives were to raise agricultural productivity and cultivated area; increase self-sufficiency in food production of poor people; and increase fodder production for draught power animals. It was divided into phases: Phase One (1993-96) and Phase Two (1996 onwards). Although it still has backlog of approved applications due to financial constraints, ALDEP can provide financial opportunities to small subsistence farmers in communal areas once the backlog is cleared.

The Programme Support for Livestock Owners in Communal Areas (SLOCA)

SLOCA is a government livestock support scheme that dates back to 1970s. It was conceived within the context of the TGLP. It was intended to reduce overgrazing and develop a sustainable livestock industry with an increased output and productivity. Under it, big communal farmers were encouraged to move to leasehold ranches thus reducing stocking rates in the remaining communal areas. It was used to support the development of livestock infrastructure by providing financial support for livestock departments within the Ministry of Agriculture and for farmers. Although it has been suspended due to implementation gaps and problems such as delay in the release of

government funds which ultimately resulted in no new funds from government, once it is re-instated it can potentially provide financial support to improve the livestock industry.

Livestock Water Development programme (LWDP)

LWDP is another government support programmes for livestock. It offers financial support for borehole drilling or equipping to syndicates and individuals. It also offers support for a wide range of management practices, including fencing, water points and firebreaks.

Tourism development Framework 2001

This framework aims to stimulate tourism in other areas than the Okavango and the Chobe. The Pans are considered as one of the five areas with a tourism potential. They are more subtle and less mainstream than many other areas in Africa and thus, appeal to the more discerning, better informed, often more experienced and therefore more critical wildlife tourist. However, the Pans can never compete with Moremi or Chobe for numbers and diversity of wildlife. The Pans must be integrated with other destinations and offer adventure such as ballooning, sand yachting as well as more passive pursuits such as bird watching, night drives and walking safaris. Zoning of activities is critical. The true potential of the area can only be realised through community involvement in resource management. It will be vital to introduce a series of policies to sustain and reinforce the community and economy of this area.

The framework notes that in order to realise the potential, wildlife movement is important and fencing should be kept to a minimum and complemented with wildlife corridors. There are two key wildlife corridors: the area from MPNP to the south west provides a corridor between the Boteti River - the area (Bushman Pits/Kanyu) is essential to the functioning of the Pans as a viable protected area offering the only proven water and grazing resources that can replace the Boteti River in the dry season; and the area from MPNP to the east needs consolidation of communities if the benefits of tourism are to be maximised – the area is hampered by tribal land surrounding Gweta village, State land north and south of Gweta occupied by livestock owners, and west of Gweta leased to BLDC ranch.

The survival of the Pans therefore depends more than anything else on the attitude of local people. Batswana have had to bear considerable costs and derive little benefits and are not really consulted on local decisions that affect their lives. Livestock can be managed along with wildlife and has long been a tradition in Africa and elsewhere. Community development will therefore play a major role in the future tourism planning and management of the area.

The aim will be to integrate planning for tourism with resource management and local aspirations. A Biosphere Reserve, covering the entire Makgadikgadi basin, is the long-term goal. The framework identified six possible projects:

- Integrated management plan for the Pans;
- Development of tourism centres at Gweta and Rakops (secondary);
- Site development zones with a range of accommodation to satisfy different markets (overseas, regional and domestic). One is planned near Nxai Pan National Park and three sites on the north and western boundaries of the MPNP;
- The Kalahari Wilderness Trail. The trail will start at Gweta Tourism Centre and follow a route through the MPNP down towards Rakops continuing into the CKGR. In the future, the Trail may be extended northwards, through NPNP and eventually connecting with Chobe National Park.

- Establishment of five ecological Corridors

The preparatory work for the Integrated Management Plan for the Makgadikgadi Pans has been done and the actual plan preparation is expected to start in the near future. It is unclear which tourism projects will be carried out in the near future. However, the framework shows that the area has a tourism potential, which should be exploited by the MCT.

Youth projects

There are also government strategies for the improvement of the plight of youth. These have resulted in the adoption of the National Action Plan of Youth (1998-2003) which seeks to address youth empowerment and training, youth education and employment opportunities. In this regard, the Botswana National Youth Council (BNYC) provides financial and training support to the youth. It also has schemes to engage youth in agricultural projects and provides funds for those projects.

7.3 Opportunities and limitations for MTC

The CBNRM policy is not yet finalised, and therefore the MCT (and other CBOs) operates to some extent in an institutional vacuum. There is need to monitor the finalisation of the CBNRM policy and to utilize the opportunities it will offer to the MCT.

Most agricultural policies are not geared towards supporting CBOs but do not exclude the possibility to do so. The same holds for other laws and policies (e.g. water Act). Agricultural policies tend to be geared towards smaller groups within communities such as livestock syndicates and agricultural management associations. The challenge for MCT would be to access agricultural support and benefits from support programmes such as SLOCA, LWDP, ALDEP etc.

There is institutional confusion and seemingly overlap between different types of resources such as agricultural resources, veld products, forest resources and soon community management resources. It is essential for the MCT to recognise the differences and access the rights to the desired resources under the various laws and policies. There is no clarity on the exact nature of rights and responsibilities of communities over resources (conflicts and overlap). Further, issues of conflict resolution and regulations governing operation of communities are not addressed.

Due to the fragmented nature of laws and policies, there is confusion about resource access and rights. For example, cattle post owners around boreholes have de-facto exclusive access to grazing resources, but do others have access to veld products in the same areas? In principle, others have access but in practice it may cause confusion and conflicts. Similar conflicts may arise between tourism operations in TCA and other land uses. If MCT acquires resource rights in the area, does that cover all resources, and how is the co-existence of private and community resources managed?

The legislative and policy opportunities and constraints for community-based rangeland management are summarised (Table 7.1).

Table 7.1: Opportunities and constraints for community based rangeland management

	Opportunity	Limitations
Resources		
Rangelands	Conservation order Conservation regulation	No definition of rangeland resources
Water resources	Application for borehole drilling rights from LB; area is already full Application for water abstraction rights from WAB (e.g. from pans and wells)	Act focused on boreholes, but less clarity about wells and surface water sources. No explicit reference to community water rights
Veld products	Harvesting rights Declaration of forest reserve	Scope of legislation limited No explicit reference to community harvesting rights
Wildlife resources	Resource monitoring	
Sectors		
Livestock production	Livestock ceilings Stock order Financial support through SLOCA, IVP etc. Group or community livestock ranches	Mostly focused on privatisation and ranching
Arable production	Financial support through ALDEP, IVP etc.	Support programmes are country-wide, and not geared towards sand veld.
Tourism	Exclusive tourism rights through TCA Linking up with the tourism development framework	Currently mostly in Ngamiland and Chobe.
Wildlife utilisation	Community hunting rights (very small at present) Financial support from community support funds Community zone in MNP Game ranching	
Development	Liaison with CBRDS; utilization of support opportunities through RDCD-MFDP Financial support through CEDA, Youth programmes Support through labour-based drought relied projects	Community-based resource conservation and rural development are not integrated.
Sustainable development	Planned integrated management plan for the Makgadikgadi wetlands	Preparatory work done. Plan preparation is expected to start before or during NDP10 and DDP7.

Chapter eight Resource management and livelihood options

8.1 Introduction

According to its Constitution, the MCT activities should aim to conserve natural resources, create local employment and fairly distribute resource benefits, which are expected to increase due to the MCT operations. This represents a local sustainable development agenda, leading to a better local environment and improved livelihoods.

This chapter examines the major options for livelihood improvements and environmental management that have been identified during the study. These have been discussed and prioritised with the MCT and in kgotla meetings in September, 2006. The MCT Board gives priority to the following types of projects:

- Projects that benefit the environment *and* generate local revenues. Purely environment *or* purely economic projects receive lower priority;
- Projects with limited capital and recurrent costs expenditures are given priority given the fact that the MCT is new and has limited resources. For the same reasons, projects that are likely to receive external financial support are also prioritised;

While the agricultural sector has increasingly dominated the rural economy over the last decades, the proposed activities aim to establish a more diverse rural economy based on the area's comparative advantages. This is in line with Vision 2016 and NDP9.

The proposed activities may be classified under four headings:

- *Economic diversification*, mostly through tourism development;
- *Resource use intensification*, mostly in the agricultural sector, leading to higher productivity of existing natural resources;
- Resource expansion through access to part of CT 10 after its conversion from State land into Tribal Land, game acquisition, and access to Orapa Game Park (OGP) and the Makgadikgadi Pan National Park (MPNP);
- Resource rehabilitation and management through control of bush encroachment and establishment of an effective community-based village rangeland system.

The feasibility of the opportunities is principally determined by market size and access (local and external markets) and by local natural resources (and those in surrounding). In addition, the community should have the capability to successfully operate the activities or form a joint venture.

The *strengths and opportunities* of the MCT area include the following:

- Formal employment opportunities in the diamond mines and public sector;
- Proximity to the markets of Orapa and Letlhakane;
- Proximity to CKGR, MNP and Orapa Game Reserve;
- Transit route to and from Maun to southeastern Botswana and South Africa;
- Some fertile river beds for dry-molapo farming;
- Birdlife during the wet season when pans hold water;
- Several attractive pans and sites with animal foot prints;

- Better future access to livestock markets as the vaccinations in the 4A veterinary area are stopped⁵. Cattle could therefore be sold to the EU and other global markets after all vaccination traces have disappeared from animals in the area.

The *weaknesses and threats* of the area include:

- Past resource losses, which are difficult to reverse, i.e. drying up of Boteti River and decline in wildlife migration;
- Located in veterinary red zone and buffer zone.
- Saline and sandy soils are marginal for rain fed crop production;
- Wind erosion and dust storms;
- Low and erratic rainfall and high temperatures; and
- Long distance to markets in eastern Botswana and South Africa.

The area and its surroundings do not pose a single, big option for development, but instead many modest opportunities. Put together and successfully implemented, these could improve local livelihoods and improve resource management. Below, the most important options are reviewed.

8.2 Tourism development

Tourism development is seen as the best option to diversify the local economy. Tourism activities would be based on three market segments:

- Weekend recreation from Orapa, Letlhakane and possibly other parts of eastern Botswana;
- Stop-over tourists from South Africa and Botswana on their way to or from Maun-Ngamiland;
- 'Ad-on' tourism to activities in the MPNP and other parts of the Makgadikgadi Pans.

Several tourism activities can be developed.

First, attempts could be made to acquire the Bays Club and the dam area in Mopipi and to up-grade its facilities. More attractions would be developed in and around the Mopipi dam area. This activity would be targeted towards weekend, stop-over and ad-on tourism. Proposed measures would be:

- Negotiate acquisition of Bays Club and the land of Mopipi dam from Debswana;
- Renovation of Bay Club facilities for tourism (chalets and campsite);
- Development of day and weekend recreational facilities, including a fenced section with small game, quad bike trails, donkey and horse ride.
- Possibilities for the introduction of a small wet part of the dam need further investigation. It may be possible to combine this with environmental education, tourist attraction and possibly fishing project; and
- Development as environmental education centre, a diamond mining museum, a conference facility and a cultural village.

⁵ The eastern part is likely to benefit first (livestock and cloven hoof animals). The western side is expected to benefit later once no animal shows traces of the FMD vaccine anymore (pers. comm. Dr.N. Mapitse, DAHP).

Secondly, overnight stay facilities can be developed at one or two pans with a picnic spot and camp site with modest facilities. One pan could be developed for tranquil recreation with low or no noise and few interventions. The other pan could be used for quad biking and horse rides.

Thirdly, the MCT could offer nature walks and cultural activities like traditional dance, food, etc. for both the Mopipi dam and pan area. The quad bike trails can be developed to access sites with animal footprints. To avoid environmental damage, the routes to the pans and other scenic sites like the animal foot prints should be carefully selected and MCT guides would need to be present.

Fourthly, the MCT could negotiate for a community zone inside the MNP and for the right to take tourists to Orapa Game Park (OGP). Both options require agreements with external institutions (DWNP and Debswana respectively), but would enhance the attraction of the area for tourists. At present, no provision for community zones is made in the MPNP management plan. Mine security concerns could make access to OGP difficult. The MCT is currently discussing this and other forms of support with Debswana.

Fifthly, the MCT could establish a game farm in the northern part of the area, just south of the MNP and partly inside CT 10. Game farming is not an easy or highly profitable proposition. Positive aspects are that the wilderness nature of the area south of the MNP fence and its strategic location along routes that access the protected opens up the possibility of photographic safaris, wilderness based tourism and game farming. However, game farming requires significant investments (P 2-3 million), particularly for fencing and stocking. Possibly game could be donated from the OGP, and locating it next to the MPNP fence would reduce the fencing cost. This would reduce the capital costs. A further drawback is that revenues from game farms are time lagged, especially for trophy hunting. The MCT should therefore consider a joint venture partner if it is to pursue the option of game farming.

8.3 Livestock and range resource management

The MCT prioritised improvements in livestock production and range management because of the fact that most people have livestock and therefore improvements would make a significant impact on livelihoods. Another reason is that market access will improve in future, and therefore the MCT would help farmers prepare for that situation. It appears that livestock numbers are hovering around the capacity of the area, and therefore improvement in livestock production has to be achieved through intensification. The following options are considered.

Firstly, the MCT would establish a community-based rangeland management system in the village grazing areas. It was found that the owners of boreholes and cattle posts are not keen to involve the MCT in rangeland management in 'their' areas, hence the restriction to village rangelands. Much of the MCT efforts towards resource management should be pro-active, and aim to re establish prudent resource management in communal areas. In consultation with the users, the MCT needs to establish a common property range resource management system that ensures sustainable resource use, and increases the local resource benefits. This requires the following:

- Establish membership;
- Establish grazing and stocking capacity;

- Establish maxima for livestock numbers for the wet and dry season, and set ceilings for individual livestock ownerships;
- Provision of a network of evenly spread water points (either boreholes or temporary, movable water points);
- Design of a sustainable rotational grazing schemes with joint herd management or individual herding requirements;
- Establish a range resource monitoring system through rangeland overseers;
- Consideration of fair grazing and water fees.

Secondly, a cattle holding ground could be established inside the drift fence area to fatten cattle and prepare them for BMC. This project should only be carried out when the quarantine requirements have been dropped (otherwise, the benefits of weight gains will be negated by weight losses in the quarantine camp). Currently, the animals are held in quarantine for twenty-one days and by the time they reach BMC they have lost some weight and thus loss of value. The holding ground could be made as a fattening place so the animals could gain more weight before they are sent for slaughtering. Draught animals would also be given priority within the holding grounds during the dry season to improve their condition in readiness for ploughing. Water could be provided as well in tanks or through an existing borehole. The costs in utilising the holding grounds would have to cover the costs of water supply and herding and so would be borne by existing livestock owners. However, they would also receive the benefits in terms of improved carcass quality and range condition following the rest pastures would receive when the herds are moved out to the holding grounds. Extra funds could be spent on supplementary feeding. Another option would be to make more use of fodder and other livestock inputs (e.g. salt licks).

Thirdly, bush encroachment could be controlled by mechanical means. The option would be to establish a bush control unit with a bush cutter and a few workers. Initially, the unit could focus on the village rangelands where bush encroachment is most visible. The MCT has therefore the opportunity to control bushes before the carrying capacity is greatly affected. Experiences from Namibia show that natural and mechanical control methods are most suitable, and that bush control could double the carrying capacity. Moreover, fuel wood and/or charcoal could be useful byproducts. The main problem is the costs of at least P 1000/ha (including labour). Donation of a bush cutter and inclusion of bush control as a component of labour-intensive work schemes would reduce the costs. It is an option to assemble one or two bush control units, each with a cutter and five people that control bushes in the village grazing areas. Two such units would be able to cover some 500 ha per annum. Cattle post farmers could 'hire' the units to control problem bushes in their area. If that happens, the units could become sustainable

Intensification requires changes in management strategies and practices, and is usually difficult to achieve. The Ministry of Agriculture already has a wide range of support programmes. The MCT could assist in discussion about the need for livestock management improvements and possible forms of assistance for farmers.

8.3 Crop and fodder production

The area earmarked for crop production is generally under-utilised. The best option is to ensure full utilisation of molapo fields because of the higher soil fertility. This requires a shift in focus from the dry land areas to molapo fields. Full utilisation needs to be combined with proper crop management practices such as row planting and regular weeding. Additional use of fertiliser, improved fencing and improved

transportation to and from the fields may further improve farming conditions, although cost implications need to be weighed against crop production gains. The reduction of crop damage should be a priority for all arable land given the high incidence of crop damage. This needs to be done by fencing of individual fields and/or drift fences. It is wise for the community to exploit the different suitability of molapo and dry land farming in terms of crop choice etc. Discussions showed that people already do so, and this practice of arable specialisation based on soils should be continued. The MCT could establish fodder plots to provide fodder reserves for the dry season or drought periods. Alternatively fodder could be used for livestock fattening. Some arable farmers already grow fodder at a small scale. This could be linked to the idea of fattening livestock for BMC.

Unfortunately, the new road cuts across the fertile molapo fields, reducing their availability.

8.5 Use and management of veld products

Most veld products are still sufficiently available, but resource conflicts emerge in cattle post areas and commercial use of veld products could become a future concern. It is therefore important that the MCT monitors the situation, particularly emerging commercial use, and reduces the conflicts between gatherers and borehole owners.

The main option is to establish an effective management system for veld products. The youth advocated for a community-based management for veld products. Thus, MCT would have the rights to control harvesting of veld products, including monitoring to avoid depletion or decline. This would help reduce pressure and protect those that are in danger of getting finished. This would also help solve the conflicts between veld products collectors and cattle-post owners. The MCT would grant permission to collectors and could charge fees for commercial use. The system should be kept simple at first and would evolve with mounting pressure on veld products.

The potential for processing of veld products is considered to be very limited due to limited veld products availability and distance to markets. For example, mophane worms could be canned or processed into stock feed. However, north-eastern Botswana has more mophane worms and is closer to the South African market in South Africa.

8.6 Other options

The MCT could consider ostrich farming, but the viability of ostrich farming in the area seems doubtful. A viable commercial ostrich farm requires significant investments (P 0.5 to 1.5 million) and skilled management. Fodder and transport costs are the most important production costs, and both are likely to be higher than in eastern Botswana. The water quality could be an additional constraint. Therefore, this activity is currently not recommended.

MCT could also engage in conservation education, for example linked to the conference and educational centre. With the assistance from NGOs like KCS and Somarelang Tikologo, the community could be educated on the importance of resource conservation and use. In case of veld fires, the importance of frequent clearance of fire breaks could be stressed to the community.

The community can also engage in growing of trees in nurseries. Indigenous trees could be grown and sold locally and in Orapa and Letlhakane. Indigenous trees could also be given to the community to plant in and around the village to reduce the effects of the devil winds. This activity could be done by the MCT, but may also be done by an individual or in backyards.

Clay soils can be used for pottery making. However, the clay soils in the area are very salty due to lack of rainfall to wash away the salt, affecting the strengths of the products. Other diversification options that emerged include: selling of donkey meat if the abattoir will materialise and cat fishing in small ponds. The latter would require a back up supply of groundwater.

8.7 Synthesis and review of the options

A wide range of options for economic diversification, resource intensification, resources expansion and resource rehabilitation was considered. After careful review, the following clusters of options were discussed in further detail with the MCT community:

1. *Cluster of tourism projects*, leading to economic diversification. This is associated with several projects:

1.1 Acquisition and development of the Mopipi dam area.

Activities would include: Revive old structures around Bays Club for environmental education and a historic review of diamond mining in the area, improvements of the Bay Club, develop dry dam activities: quad bikes, donkey-horse rides and small game area; bush walks, cultural activities and possibly small wet area; panting of trees to reduce and capture dust; reduce bush encroachment; re-vegetation with exotic grass species; trips to OGP, CKGR etc..

Community benefits: job creation, resource rehabilitation, bush control, dust reduction.

1.2 Development of pan(s) for wilderness overnight stays.

Activities: Development of campsite with simple basic services

Bush walks and cultural activities (also linked with sites of foot prints); rips to OGR.

Benefits: job and income creation, conservation of the pans as wilderness areas

1.3 Application for community zone in MNP

Activities: Acquire community zone in MNP; develop utilization and conservation plan for area.

Benefits: jobs, income and additional resource access

1.4 Negotiate access to OGP and mine.

Activities: Wildlife as a complement to other tourist attractions; demonstrate diamond mining process and benefits.

Benefits: extra income and jobs from tourism

1.5 Game farm or combined unfenced livestock game utilisation

Activities: Complement for tourism and tourism diversification (fenced or unfenced)

Benefits: employment, income and some meat.

2 *Livestock related projects*

2.1 MCT management of village livestock areas

Activities: Design of acceptable NRM system with: agree on membership; assess max. livestock numbers (normal-wet and dry); stock ceilings for individuals (normal-wet-dry); establish RR monitoring procedures-system; introduce grazing fees; temporary additional water points and grazing reserves-rotational grazing (winter and summer areas)?; joint herd management; establishment of one bush control unit with five people; Consider forage provision; firebreaks.

Benefits: Rehabilitated, more productive village grazing areas, some jobs and more income

2.2 Control of bushes in village livestock areas.

Activities: Establishment of one bush control unit with five people
Benefits: resource rehabilitation, employment, firewood or charcoal

2.3 Cattle holding ground.

Activity: Establishment of cattle holding ground in enclosure (e.g. within the drift fence)

Benefits: Collective improvement of cattle conditions, better returns and improved market access; job creation

3 *Arable and fodder production*

3.1 Better utilisation of dry molapo farming area

Activities: 1. Encouraging and monitoring of use of molapo fields; 2. Encouraging those who will not use field to 'rent it out', for example to the MCT, or recapture by Land Board; 3. Ensuring that all suitable molapo fields are allocated (if there is land left, some to the MCT); 4. Use of fertiliser or cattle manure to maintain soil fertility; 5. Improve practices and crop choice to achieve higher yields.

Benefits: Increased food production (mostly subsistence) and some income generation

3.2 Fodder production

Activity: Establishment of fodder area within dryland farming zone

Benefit: Livestock productivity increase; coping with droughts, de-pressurising rangelands

4 *Other activities*

4.1 Common property management of veld products

Activity: Establishment of a community-based veld products management system for mopane, fuel wood and other valuable resources, including: Monitoring of main veld products; establishment of sustainable harvesting practices; monitoring of harvesting and education; controlled harvest in cattle post livestock areas; permits for commercial harvesting of veldproducts in MCT area.

Benefits: reduced conflicts, resource conservation and rehabilitation, subsistence and cash benefits

4.2 Acquisition of water points

Activities: Identify possible water points; Apply for rights transfer OR develop additional water points; design and collect user charges

Benefits: support for other activities.

4.3 Tree nursery

Activity: Establishment of nursery with indigenous species; experiments with veld products (e.g. mokola palm)

Benefits: Environmental rehabilitation and food security; dust control and possibly cash income

Reviewing the options, tourism development will probably generate the largest extra economic benefits to the villages, as it is currently virtually absent. Their development, however, requires that benefits will accrue to the communities and that environmental education and improved resource management is integrated in tourism activities. Otherwise, tourism development becomes a mere economic activity with little social and environmental benefits. We recommend that Options 1 and 2 be prioritised while negotiations with Debswana and DWNP should be initiated as soon as possible to see which extra opportunities can be derived from Orapa and MNP (options 3 and 4). Given the investment and skills requirements and the need for more land, the development of the game farm is recommended as a joint venture and for the medium to long term.

On the livestock side, the establishment of a community-based village grazing area management scheme scores high on economic, social and environmental grounds, and should therefore be given priority. In the process, the MCT could inform farmers about improved livestock production systems and government support programmes.

The cattle pen and fodder production options are important for the longer term after an effective grazing management system has been established and access to export markets has been secured.

From the other options, establishment of a simple veld products monitoring and management system would have social, economic and environmental benefits, and therefore be a priority. If successful, it would prevent the depletion of veld products that has occurred in other communal areas, and it would give the MCT control over commercial gathering before it becomes a major issue. The results of the above analysis are summarised in Table 8.1.

Table 8.1: Summary of livelihood and improved resource management options and priorities.

	Short term (1-3 years)	Medium to long term (4-10 years)
Tourism development	Bay Club acquisition and rehabilitation Acquisition and development of Mopipi dam area Low service level pan development Requesting access to OGP Requesting a community zone in the MPNP and part of CT 10	Game ranch development Develop community zone in MNP
Livestock development	Establishment of a CB- village grazing management scheme Awareness raising and information sharing about improved livestock management practices and government support	Fodder production, fodder reserves and livestock fattening Cattle holding ground
Arable production	Protection of molapo areas from further encroachment of settlements and infrastructure Pilot project with Sanitas ploughing method in 2006/07	Promote full use of molapo areas Establishment of fodder scheme with water
Gathering of veldproducts	CB- veld product management scheme	Tree nursery (indigenous species)

The MCT may further consider the introduction of a micro-lending scheme to stimulate small-scale economic activities of community members, for example projects associated with MCT activities. The MCT would administer the scheme and be responsible for repayment and allocation of small loans. Micro lending is offered by several CBOs in the country (e.g. Kgetsi ya Tsie and BORAVAST). Defaulting on repayments is a common problem that needs to be controlled and minimised.

Chapter nine Land use plan

9.1 Introduction

This chapter discusses the land use implications of the proposed options discussed in chapter eight. It reviews the MCT boundaries (9.2), the broad land use options (9.3) and proposed land use zoning (9.4).

9.2 Proposed boundaries of the MCT area

Boundary recognition is an essential first step for community resource management, and is more easily achieved for cohesive groups. The boundaries of the MCT were established while actively driving through the area and during extensive discussions with the community members during the FGD. The boundaries further took into account earlier IVP literature for the area. The MCT area is approximately 2 000 km², consisting mostly of rangelands used for grazing. Land use in the area is summarised in Table 5.1. During meetings in September, it was agreed that the MCT would have further discussions about the boundaries with the villages of Kedia and Xhumo. No problems were expected with Kedia, but some argued that Xhumo residents may have some activities inside the proposed MCT boundaries.

There can be little doubt that incorporation of part of the State Land (CT 10) into the MCT would increase options and help overcome some potential conflicts over the natural resource base following the fencing of the Area 4B ranches.

As indicated in chapter 2, the resource base has been eroded through loss of significant wildlife resources and the drying up of the Boteti River. This has reduced the contribution from wildlife, fishing and molapo farming to local livelihoods. Several pans and sites (e.g. footprints) as well as the location between the CKGR and the MNP remain the main natural advantages. Proximity to Orapa and Letlhakane and the location along a tourist route to Maun are economic advantages of the area.

As a result of the above, livelihood sources have shifted to an almost total dependency upon formal employment, livestock and subsistence crop sector. Much of the rangelands are dominated by privately owned cattle posts, where the role of the MCT is very limited. The MCT could, however, become meaningfully involved in management of the village grazing areas, better exploitation of the opportunities for dry molapo farming, and management of veld products, including the reduction in conflicts between gatherers and cattle post owners. The greatest potential for diversification into wildlife/tourism ventures surrounds the former State land area (CT/10) that occurs south of the MPNP electrified fence and to the north of the MCT. It will allegedly pass to the MCT's control although there is the difficult issue of illegally drilled cattle post boreholes in the area to deal with.

The poor quality of the mopane dominated veld, salty groundwater and severe constraints upon livestock movements due to disease control restrictions, mean that there is very little that can be done with the small amount of grazing land that has not been utilised and is still available to the community. The most pressing issue of equity and social justice concerning the distribution and ownership of essential resources in the livestock sector (boreholes, ranches and stock) are politically unpalatable, as are the effective imposition of conservative stocking rate strategies that could lead to range rehabilitation. The entire area is almost totally devoid of large

wild ungulates with hunting pressure likely to mean that those areas where the groundwater is too salty will remain as 'empty savanna'.

The MCT has some veld products with a commercial potential such as mophane and hoodia, but the resources are very limited, and the distance to markets large. Therefore, the potential of the area for commercial exploitation of veld products is considered to be very limited.

9.3 Land use options

On the basis of land-use information collected during fieldwork and discussions with residents, it is suggested that future land-use zoning as much as possible follows current land-use practices, but with the intention of improving land-use efficiency where feasible.

Major land-use zones in the area include:

- Settlements and infrastructure;
- Cultivated areas (dryland and molapo);
- Livestock grazing areas (village-based and cattle-post based);
- Area for harvesting of veldproducts
- Archeological and tourism sites (pans, sites with animal footprints)
- Others: game ranch and cattle holding ground

Small but significant portions of land are devoted to settlement and infrastructure, while some special sites of archaeological and tourism-potential significance were identified. A potential area for game-ranching was also identified near the Boteti Delta in what is currently state land with the possibility that it will be handed over to the community in the near future.

Settlement and infrastructure

The existing major settlements of Mopipi and Mokoboxane need to reserve some space for future expansion. The internal arrangement in terms of residential plot alignment can be further improved. This also applies to internal roads and tracks in Mopipi, which take up a fair bit of space and may need re-alignment in view of the new road to Rakops that is aligned differently from the old road. The old road within the village, now severely potholed, could be rehabilitated. Areas devoted to recreational use (e.g. soccer fields) may need to be confirmed.

Possible forms of livestock development

Fenced ranches are not considered feasible in the area. Instead, increased cooperation of neighbouring cattle posts/ water points through shared herding is an appealing option. The latter could also be linked to the development of holding grounds.

Village based livestock grazing is found along the main tarred road between Mokoboxane and Mopipi and stretching some ten kilometers beyond the road is devoted to communal livestock grazing. Enhanced management of grazing resources with the possible addition of supplementary feeding through fodder production could enhance livestock productivity.

The remainder of the area is devoted to cattle post based livestock grazing, centred on wells and boreholes scattered throughout the area. This covers mostly the area east of the Mokoboxane fence and the area north of Mopipi along the Boteti floodplains toward the north-east as well as the Boteti river valley toward Xhumo. As

these cattle-post areas are also important to residents for veld-product collection, the management of access is important (see other section).

Within both the cattle post system, but more especially the village-based system it is possible to maintain or increase mobility of the livestock herds and so incorporate periods of rest into otherwise heavily grazed areas, so as to facilitate range rehabilitation.

Given the proximity of water points, further groundwater supplies cannot be expected in the MCT. Drying up or salinisation of existing supplies is more likely given trends over the last two decades. This would require increased flexibility in terms of herd movement and watering requirements.

Two possible locations for the cattle holding grounds have been identified: inside the drift fence or in the existing State land area (CT/10), where the pressure from domestic stock is limited to a few (illegal) cattle posts and the MPNP boundary fence has removed the potential grazing from wild ungulates. There are other opportunities to use temporary water sources within the MCT but they are limited due to the more widespread use of the grazing resource by domestic stock and perhaps of less value to the MCT when it is effectively private cattle post owners who benefit rather than the communal stock farmer.

The former State land CT/10 offers considerable promise for such a purpose provided the issues surrounding the existing cattle posts can be resolved. The areas either side of the MPNP fence and between the electrified fence and the cattle fence will need to be cleared in order to prevent a fire hazard to the fences, and the fodder so generated could be used to supplement that in the nearby holding grounds. A network of firebreaks, along existing tracks and cut lines should actively be cleared in order to protect the grazing reserve (cattle holding) areas. The MPNP, with its depleted herds of wild ungulates (so allowing the grass biomass to build up), must be regarded as a major source of veld fires in the future. The cattle would also not need to be kraaled at night because of the absence of predators in the area due to the electrified predator proof fence. It must be emphasised that the holding grounds are temporary and under no circumstances should they develop into permanent supplies, as this would defeat the object of the exercise.

Extensive game ranching and restricted livestock production

The former State land area, south of MPNP, has potential for extensive game ranching and limited grazing by domestic stock. The electrified fence of the MPNP to the North, and the Mokoboxane veterinary disease control fence to the East mean that fencing requirements are limited to the west and south (i.e. north of Mopipi). Fencing is likely to be essential if introduced animals are to be prevented from leaving the area and getting poached out. The State land area is shown on Figure 5.2 but needs to be handed over to the community first.

Linkage with Orapa Game Park, for restocking purposes, and potentially Hima Game Ranch are also appealing. However, without suitable water supplies the latter seems unlikely to succeed, and even with water the NRP (2006) estimate of a start up cost of P2 million for the game ranch appears unattainable.

Cultivation

Three major cultivation blocks were identified. The extensive molapo fields contain the best soils in the MCT area and offer some potential for improved production via the increased use of livestock manure/fertilizers and the planting of a greater diversity of crops. The improvement of some of the fences to prevent stock incursion

would also be beneficial, and may include consolidating the molapo fields with a (drift) fence that could mitigate crop damage and enhance production for subsistence purposes.

The newly fenced dry land farming site at Mokoboxane should not be cleared entirely for arable production but should rather also form a grazing reserve area to be used in the dry season and during droughts. It should also constitute one of the first sites chosen for labour based bush clearing as the benefits of doing so will go directly to the community. As the area is already fenced (in spite of relatively poor soils) it offers potential opportunities for alternative forms of crop cultivation or horticulture, including cultivation of beans, fodder production or a nursery for indigenous trees. Other sections could be devoted to traditional crops of maize or sorghum.

Tourism

The MCT area stands to benefit from a number of diverse tourist/visitor groups if it can position itself strategically with respect to their needs. They include overseas tourists, local tourist groups and visitors from the mines at Orapa and Letlhakane. The latter, as well as some of the self drive South African tourists, may well be attracted to the Mopipi Bays Club by the opportunity to ride 4x4 quad bikes on a specially zoned area of the pan. Quad bike, horseback and foot trails can also be developed, provided that they are zoned carefully in order to avoid conflict with each other and existing land uses.

The development of an extensive game ranch area (within the current State land) offering consumptive and photographic safaris would also be a welcome development that would diversify tourism and livelihood opportunities within the MCT.

Two ancient 'footprint' sites also hold some potential as tourism sites, although some are unprotected and have already faced the loss of some of the key resources (i.e. visitors have removed some of the footprints). Except for specialist tourist/archaeological groups these sites are unlikely to constitute a tourist attraction on their own, but could form part of a medium to long term plan to develop tourism routes within the MCT area.

Figure 9.1 shows the four sites with the largest tourism potential: Mopipi Dam/Bays Club, Leupane Pan, Churube Pan and Rysana/Ntokotse Pan (with nearby fossilised animal footprints). Small areas of land may be reserved at those locations for potential future tourism sites.

9.4 Land use zoning

The above discussion of livelihood and land use options would lead to the following land use map with clear zones for:

- Livestock grazing areas: cattle post areas and village grazing areas;
- Arable zones: dry molapo farming and dryland farming;
- Tourism spots (e.g. pans and foot prints)
- Areas for gathering of veldproducts: entire MTC area.
- Potential game ranching area

The proposed land use map is presented in Figure 9.1 at the back of this report.

As already indicated, it is recommended that any land-use zoning follows existing practice where possible. This means, for example that areas used for arable farming (as shown in Figure 9.1 at the back) are best confirmed for such purpose. It is, however, useful to consolidate such land use and make it contiguous into one coherent area devoted to (in this case) arable farming. This would facilitate fencing and might be helpful in efforts to provide services such as transport and water to farmers. This applies particularly to the molapo farming area west of Mopipi, which is the most productive crop area. However, with respect to the fenced arable lands near Mokoboxane, given the relatively poor soils and large fenced area, consideration needs be given to devoting part of the area to alternative uses such as livestock holding, fodder production or tree nursery.

The area available for village based livestock rearing is located west of the Mokoboxane fence along the main road to Mopipi (and at lower intensity further toward Xhumo) stretching about 10 kilometers either side of the road and covering about 490 square km. This area is fenced along the eastern margin and partly along the southern margin. This area is also locally used by residents for veld product gathering and has reached capacity, allowing no further expansion, although improved village-based grazing land management might permit limited productivity enhancement as discussed elsewhere in this report.

Cattle-post based livestock farming is the main land-use for most of the remainder of the region, covering about 1400 square km. The area east of the Mokoboxane fence is almost exclusively devoted to cattle-post livestock farming, although veld-product gathering also occurs. North-west of Mopipi, along the Boteti valley, village-based livestock farming gradually gives way to cattle-post based livestock farming. This is a potential situation for future conflicts; the MCT may play a role in mediating conflict resolution in areas where village and cattle-post based livestock farming overlap.

At selected specific locations as indicated in Figure 9.1 potential exists for tourism related activities. Even if such activities are not to be implemented within the next few years, it may still be useful to pro-actively reserve them for tourism purposes by signposting or fencing these fairly small locations.

North of the MCT area in CT10 a fairly large zone of between 350 and 400 square km is tentatively reserved as a potential area for game ranching or equivalent activity (shown marginally in Figure 9.1). In this area, also, in the vicinity of the Boteti River delta is another potential tourism activity site. However, this whole area is currently not (yet) under the jurisdiction of the MCT trust and any further planning or land-use zoning for this area needs to await government permission for the use of this land by the community.

Residential areas, particularly the villages but also smaller informal settlements may benefit from improved plot allocation procedures that avoid excessive scattering of residential plots, especially along roads (as has started to occur west of Mokoboxane) as this infringes upon grazing lands and increases the expense of service provision.

Surface water points (such as those west of Rysana pan) and hand-dug wells may need protection by fencing to avoid trampling by livestock and to enhance the usefulness of the sources.

Chapter ten

Range resource management plan

10.1 Introduction

This chapter deals with the management of local natural resources. The demise of wildlife resources and the drying up of the Boteti River have increased the dependency on agriculture. This is unlikely to change in the near future, even though tourism activities will contribute to diversification of the local economy.

Higher living standards and improvements in resource management can be achieved by prudent and sustainable use of natural local resources use and the establishment of an effective resource management system for communal resources to avoid the problems of open access and resource depletion. This means that resource use and management need to have the following general guiding principles:

- Ensure that renewable resources (grass, plants and soils) are used at or below their regeneration level to maintain their production potential;
- Ensure that all resources are effectively managed, either by government or the community. Current resources at risk from open access are communal grazing and veld products;
- Ensure that access to communal resources is fair and that communal natural resources are used optimally and their benefits are fairly distributed;

A combination of raising resource productivity (e.g. through fodder and cattle pens) and diversification (e.g. tourism) appears to be most realistic, and is expected to bring modest benefits. On the longer term, wildlife utilisation may offer additional benefits in association with tourism, but this will depend on strategic choices by the communities, as there is a trade-off with livestock production.

10.2 Tourism projects

10.2.1 Rehabilitation and further development of Mopipi Dam area

The rehabilitation and development of the Mopipi dam area, focusing upon the Mopipi Bays Club, offers the most promising short-term option for economic diversification. There is also considerable potential to rehabilitate the vegetation of the area, so as to reduce the dust hazard and improve the aesthetics of the area.

The planned rehabilitation of Mopipi Dam by Orapa Mine should be done with minimal disturbance to the existing vegetation and soil. Indeed, the recommendation from this study is for the former yacht club and embankments to be retained, so they can be utilised as a campsite for tourists and linked to an 'environmental change' tourist information (and diamond mining) component. In this respect recent photos of the Lake when it was full in the 1970s should be built into a 'small museum' (a simple rondavel) that could also serve as a display and selling point for local crafts and produce. Another roundavel could host a display on the history of diamond mining in the area, and associated environmental management practices.

It is important for the MCT to find out which rehabilitation measures will be carried out in the area by Debswana. There is some concern on the part of the Consultant's that restoration of the area to its previous condition (by removing dam walls and embankments that were emplaced in the 1970s) could be counter-productive in terms of the future use of the area for tourism.

The embankments used to create a 'harbour' for the yachts are well-vegetated today and provide an excellent view of Mopipi Pan and its often spectacular sunsets. Campsites and braai facilities can be placed strategically upon them, so extending the number of guests that can be accommodated at any one time. However, the perimeter fence around the Mopipi Bays Club that is in places incomplete should be moved outwards into the Pan so as to protect the proposed campsite from the intrusion of domestic stock⁶. The presence of donkeys, cattle and goats within the immediate environs of the Mopipi Bays Club is clearly incompatible with tourism, such that their populations need to be excluded from this small area by a secure and well maintained perimeter fence (1.2m high).

Natural resource management tasks

1. Secure MCT ownership of the Mopipi Bays Club and exclusive user rights over the dam area;
2. Raise funds for rehabilitation and improvement of structures (i.e. accommodation, ablutions, swimming pool, power and water supply, perimeter fencing, shaded rest areas and rondavels to serve as a small museum/local craft centre).
3. Enter into a Joint Venture Agreement with an established tourism operator (or Debswana), provided tangible benefits for the MCT are included.
4. Zone the area for the development of a quad bike/motorbike route, education centre, mine museum, etc..
5. Establish strategic links with existing operations (e.g. tourism operators that pass through the area, Orapa Mine and Orapa Game Park, Hima Game Ranch amongst others).
6. Link the development of the Mopipi Bays Club with wilderness campsite provision at satellite camps (i.e. the nearby Pans).
7. Promote the revitalised Mopipi Bays Club via a web site and targeted marketing.
8. Ensure effective operation and management of the Mopipi Bays Club by following well established guidelines for the Tourism sector (see Appendix 6).

Ecological restoration is slow. It needs knowledge, planning, persistence, and social justice in the distribution of resources (Milton *et al*, 2005). Consequently, it makes sense for the MCT to start with relatively small areas that it can easily control (i.e. that are already fenced and can exclude livestock) and so demonstrate the benefits of rehabilitation measures. It will then be easier to expand the projects into more extensive areas of rangeland within the MCT.

10.2.2 Wilderness campsites on pans

The development of some of the pan sites for tourism purposes must be regarded as a short term opportunity for those sites that are close to Mopipi Bays Club and medium – longer term for some of the more distant sites. Designation of the area as a tourism concession would resolve many of the legal issues (see regulations chapter) and protect the user rights of the MCT. The archaeological (footprints and Stone tools etc) and birdlife resource of the Pans will be a major attraction to a select group of visitors, who are also prime candidates for wilderness/minimal infrastructure type locations. The archaeological sites are known to the MCT which should approach Birdlife Botswana in order to establish the most suitable locations for bird watching and the best seasons, as the Pans are important for flamingos and blue cranes are known to nest in the area (Scott Wilson, 2002).

Early Stone Age tools – hand axes, bifacially flaked, pear shaped and pointed stone tools are likely to occur along the old shorelines of Palaeo Lake Makgadikgadi and to

⁶ Fencing the interior pan edge at the base of the embankments and extending it across the entrance' to the former harbour would be optimal.

be buried in the sediments of the pans (Scott Wilson, 2002). The latter study reports that numerous Late Stone Age (c.20,000 BP to present), microlithic tools (less than 25mm in length) occur around the fringe of the Makgadikgadi pans.

The exclusion of livestock from such Pans is unrealistic in light of the water and access to surrounding forage they provide to livestock owners, although the use of limited fencing could be used to protect certain key sites and viewing points. The latter may include bird hides, while some of the archaeological sites need to be fenced to protect them from theft by people and destruction by trampling by animals and vehicles.

Infrastructure should be minimal but would comprise a pit latrine, water for showers and a bucket shower and screen shelter, braai and clearly marked camping area. Firewood would be provided by the MCT in order to avoid destruction of the vegetation around the sites. Guided walks and cultural activities could also be built into tourism calendar, with zoning necessary to avoid conflicts with the archaeological and birding aspects of visitors stay. A booking system could be operated and access controlled via the veterinary personnel at the veterinary cordon fences – strategic signposting would be necessary.

Natural resource management tasks:

1. Request that the MCT becomes a tourist concession or secure tourism use of the area through Regulations.
2. Identify wilderness campsites, and those related to visits to the unique archaeology and birdlife (the advice of Birdlife Botswana in the precise location and design of these sites should be sought).
3. The basic facilities provided at these sites should be unobtrusive, simple and low cost and should not result in domestic stock being attracted to the area – water tanks should be partially filled only when there are visitors and should be securely fenced.
4. The unique archaeological resources on some of the Pans need to be protected by fencing via liaison with the National Museum.
5. The possibility of developing windsailing and quad biking within certain areas of the more suitable Pans should also be investigated (the management plan for the Gaing-O Community Trust has suggested such activities, Scott Wilson, 2002).
6. All visitors should fill in a visitor's book and be encouraged to provide feedback.

10.2.3 Extensive wildlife utilisation and fenced game ranch

The area has currently few wildlife resources and the MCT has limited experience and inadequate financial resources to start game farm. However, the wildlife utilisation options need to be considered on the medium to long-term as part of a further diversification strategy. It would be dependent on the success of tourism in the area, as it could further enhance the tourism potential.

The wildlife option would be based on game farming and access to nearby Parks such as the MPNP (including a community zone), the CKGR and the OGP. Reasons for planning it for the long term include:

- Current veterinary regulations restrict the type of outputs of the game ranch (e.g. selling of live animals and products). The relaxation of veterinary regime will also benefit game ranching;
- Game ranching requires five to ten thousand hectares, part of which has to be in CT 10. The allocation of CT 10 to communities will take time;

- Capital investments are relatively high (P 2-3 million) and returns time lagged and modest. The investments are beyond the current means of the MCT.
- The MCT needs to acquire the required skills and/or negotiate a joint venture with a game rancher.

Springbok has been identified as the most suitable wildlife species for the area. Springbok is endemic in southern Africa and delivers the finest wildlife meat of all the Southern African antelopes; the springbok (*Antidorcas marsupialis*) is well suited to semi-intensive production (Conroy, 2005). The latter is also due to the excellent productivity and the large numbers of animals that can be kept within a 1.2 m high fenced unit. Moreover, springbok can be produced in combination with domestic livestock as a viable mixed animal enterprise.

The springbok is a true mixed feeder whose year round diet generally includes leaves and other parts of grasses, forbs, dwarf shrubs, ordinary shrubs and fine-leaved as well as broadleaved trees. Noteworthy plants eaten are some known to be poisonous to livestock, e.g. *Geigeria africana*, *Nerine sp.*, *Scilla sp.* and *Solanum sp.* (DHV, 1980). The latter study showed a springbok preference for burnt areas, depressions (pans and fossil river valleys) with short growing and relatively nutritious species like *Cynodon dactylon*, *Enneapogon desvauxii*, *Eragrostis bicolor*, *E.echinochloidea*, *Sporobolus spp.*, *Urochloa mossambicensis etc.* Springbok will also eat the dry fallen leaves of Mopane (DHV, 1980; see also appendix 4).

Technically simple proposals to exploit the game resource, that did not require large capital inputs, were put forward by DHV (1980) and could be adapted to suit the prevailing situation in MCT (CT/10). The various forms of game use they considered were: meat production, hide production for leather, fur production, trophy production, game domestication and export of live animals. Meat production for human consumption as a commercial enterprise was not recommended due to the technical problems associated with bringing to market a highly perishable commodity from a remote area. Indeed, domestic demand would be met by individual hunting. The location of the MCT within the veterinary surveillance zone also precludes this form of utilisation.

Box 10.1: Possible village wildlife utilisation project

A number of Local Professional Hunters register themselves in a village. A co-operative is registered and someone engaged by the hunters to run it. The co-operative negotiates a supply contract with a buyer in return for financial assistance with start-up expenses. The hunters collect animals licensed in the name of the co-operative and also by assignment from individuals who for one reason or another cannot hunt it themselves. This latter function of the Local Professional Hunter is the only practical way of ensuring that more people make better use of their individual game entitlements.

Three factors help to make the possibility of cropping for hides attractive in the long term: firstly, the operational simplicity; secondly, the promising future for leather. The dependence of synthetic leather substitutes on oil for their manufacture, which is already enjoying an increased demand....Thirdly, an abundant supply of meat is made available as a by-product which, though of limited potential as human food, strongly influences the basis of the second form of game use proposal: fur production."

Source: DHV, 1980, p.42.

The extensive game ranch idea is inextricably linked to the fate of CT/10. In reality land use within the ungazetted WMA area (CT/10) has already changed from CBNRM to cattle rearing (Scott Wilson, 2002). The latter study reports that springbok have not been sighted during aerial DWNP aerial surveys in the southwestern MPNP since 1996; this may be due to the succession of good rainfall years, that has made such movement unnecessary (Scott Wilson, 2002). Much of what MPNP has to offer (vast open wilderness areas, salt flats and cultural richness) are available in CT/10

(Scott Wilson, 2002). The re-introduction of wildlife via the proposed extensive game ranch would provide a further boost to the tourism potential of the area.

The extensive game ranch should be regarded as a medium – long term option with essential pre-requisites to its formation, the identification of a suitable area within CT/10, support for the idea amongst livestock owners within the area and the broader community and the recruitment of a manager with the necessary skills to carry the proposal forward. The main objective of the MCT in the short term could be to ensure that this option is not foreclosed entirely by further livestock expansion in CT/10.

Natural resource management tasks

- MCT to identify an area for extensive game production within CT/10 that is largely devoid of water points or is 'under' grazed or unutilised by domestic stock.
- MCT to identify a suitable 'game manager' or joint venture partner to (co-)implement the project.
- MCT to ensure the extensive game ranch is perimeter fenced (at least 1.2m high).
- MCT to establish clear guidelines concerning the use and management of the existing livestock water points within the extensive game ranch (i.e. stocking rates and movements);
- Purchase of material for water provision;
- The acquisition of springbok from Orapa Game Park and/or Hima Ranch, as well as elsewhere in the region should be assured before the project starts up.
- Additional wildlife (e.g. gemsbok) to be considered provided the springbok populations do well.
- Maximise returns through all or any of the following (i) trophy hunting (ii) meat sales (iii) biltong (iv) hides (v) wilderness and photographic tourism.
- MCT to identify sources of external funds in order to secure the required management expertise, infrastructure and animals and to ensure training of MCT personnel.
- Management linkages with the proposed Hima Game Ranch and Orapa Game Park to be actively encouraged.
- The extensive game ranch along the Southern section (CT/10) should be formally linked to community use zones (i.e. use by the MCT) within the southern zone of MPNP.

The land use proposal developed above centre on the planned use of game, which in the case of springbok will not require the exclusion of domestic stock. However, the stocking rate of the latter must clearly be controlled as there is no future for the proposed game ranch if the proceeds are used merely to build up livestock herds.

Linkages with Orapa Game Park and the management expertise that resides there will be essential to the proposed extensive game ranch and will also provide a boost to the development of other tourism based activities within the MCT. The designation of community use zones on the western side of the MPNP is primarily targeted at the collection of veld products and fuel wood by the local communities, with no such zones existing inside the southern boundary. If livestock holdings can be contained in CT10 and wilderness tourism promoted then community use rights in southern MPNP could become important and could usefully be secured by the MCT via discussions with the DWNP.

Natural resource management tasks

- Management linkages with the proposed Hima Game Ranch and Orapa Game Park to be actively encouraged.
- The extensive Game ranch along the Southern section (CT/10) should be formally linked to community use zones (i.e. use by the MCT) within the southern zone of MPNP.

10.3 Livestock and range resources management

Options to improve general livestock and range condition are limited by the lack of water availability and low productivity of the available rangelands. Improvements can be made however through a number of related projects, which if targeted at those with smaller herds in the communal areas could greatly alleviate pressure in the village based areas and poverty. The latter, could actually be accentuated if the below schemes become the preserve of the larger herd owners such that the MCT will have to face many thorny issues concerning access to and benefit from the projects detailed below.

10.3.1 Village-area grazing scheme

The village area grazing scheme seeks to establish community-based resource management in an era where resources are not managed. It seeks to control and alleviate stocking pressure on the village based grazing areas, so improving range condition and animal productivity. In this respect there are strong linkages between the various options proposed below, all of which can contribute to the reduction of overall stocking rates on the Commons and the improvement of animal and range condition.

Three-day watering cycles made possible through the collective and more intensive herding of stock, enabling more distant pastures to be reached has potential to improve animal and range condition in poor to average rainfall years. It could easily be linked to the provision of more temporary water points, including wells that could be dug by the MCT. For such a scheme to work effectively there must be a sufficient level of interest in improved range management and sufficient incentives for small herd owners to accept it.

These facilities should be linked to both fodder banks (below) and temporary water points (above) with the primary objective of improving animal condition prior to slaughter. Decisions concerning the placement and management of the temporary water points should form part of the MCT Rangeland Management Regulations. Ideally they should be targeted at the poorest members of the community that the MCT serves, rather than those community members who already have comparatively considerable wealth by virtue of the water points and livestock they already own and/or have access too. These however are matters for the MCT resolve with the broader community and should not be imposed from outside.

The livestock distribution figures from the DWNP aerial census south of the Makgadikgadi fence suggest that there is some potential to increase the grazing range of livestock by the provision of temporary watering points. Kraals would not be necessary as the risk from predators has been removed by the Makgadikgadi fence.

Natural resource management tasks

- Identification of grazing areas:
 - a. MCT to identify areas devoid of water points that are 'under' grazed or unutilised by domestic stock.
 - b. Identification of optimal grazing areas and herders to be tasked with livestock management.
 - c. Dry season utilisation of the abovementioned grazing reserves.
- Development of guidelines concerning the use and management of grazing resources and temporary water points;
- Organise interested livestock owners into collective herding cooperatives.
- Water infrastructure: Identify wells/boreholes that can be used on a temporary basis.

- Ensure that the temporary removal of herds from village based areas does indeed reduce overall stocking rates – rather than result in the simple substitution of herds from different livestock owners.
- Monitor the impact of the scheme on the village based areas via a system of photo point monitoring – whereby photos are taken from a fixed point on an annual basis using a digital camera.

It must be emphasised that the primary objective of the temporary water point project is to 'rest' more intensively grazed areas around existing water points by enabling the utilisation of under grazed or unutilized pastures or grazing reserves. The intention is *not* to increase the overall stocking rate in the area. If this is the outcome the MCT should discontinue the project.

There is also a potential social justice and equity component to the temporary water point project although this should be decided by the MCT and the communities they represent. In this respect both the environmental and equity benefits are likely to be maximised when the temporary water point project is linked to an extensive game ranch, rather than domestic stock – where the inequalities in wealth are already pronounced.

10.3.2 Cattle holding pens and water distribution

Permanent cattle holding pens tend to suffer the same fate as veterinary quarantine camps whereby the grazing becomes depleted and animal and range condition deteriorates rapidly. Animals thus leave the facility to be sold in a poorer condition than when they entered.

A more temporary arrangement of cattle holding pens that utilise the temporary water points/ collective herding scheme (above) and a system of fodder banks (below) could help overcome the problems faced by more permanent facilities. Participation by the community in such a scheme should be motivated by the possibility of improving animal condition prior to sale rather than securing additional grazing or an additional source of water. As such the MCT needs to build in guarantees that the cattle coming out of the holding pens will be sold rather than put back on the commonage. Sweet (1986) notes that when they came out of a similar scheme the 'fat' cattle lost+ more weight than their leaner contemporaries in the commons – leading to reluctance of members to pay for participation.

Natural resource management tasks

- Identify areas that can be used to as 'holding pens' to fatten cattle prior to slaughter at different times of the year (e.g. dry season underutilized pastures and fodder banks).
- Effectively operate and manage the cattle holding pens to improve animal and range productivity.
- Monitor range condition in the various cattle holding pen areas via simple monitoring systems (photo point).

10.3.3 Control of bush encroachment

Bush clearing has the dual purpose of improving both rangeland condition and the aesthetics of an area. The latter is particularly important in terms of access to and the emplacement of tourist facilities around some of the key wilderness sites. It is doubtful whether bush clearing is economically viable throughout the MCT area. A spatially targeted approach may be optimal in the short term that uses the clearance of woody biomass to improve the aesthetics of tourist areas and provide fuel wood for campsites and needy households (e.g. pensioners and disabled persons).

Moreover, bush clearing could become integral part of labour intensive drought relief projects in the area. If the activity becomes more viable in future it could be expanded to the affected cattle post areas and linked to a broader range rehabilitation programme within the MCT.

Natural resource management tasks

- Identify areas around, and on the way to, the wilderness campsites and attractions that need to be bush cleared.
- Form bush clearing units to undertake the work (e.g. as part of drought relief programme).
- Seek training opportunities with farm where bush control training is offered (through Dr. Habarad);
- Use the fuel wood so generated for visitors at Mopipi Bays Club and/or the wilderness campsites.
- Place the cleared thorn bushes over the bare soil to affect the rehabilitation of the range and reduce soil erosion.
- Monitor range condition in the various cattle holding pen areas via simple monitoring systems (fixed photo point).

10.4 Crop production and fodder

10.4.1 Dry molapo farming and crop production

The superior soil quality of the molapo areas and the relative concentration of rainfall onto them, means that 'dry molapo farming' still offers better returns than traditional dry land agriculture. It is therefore unfortunate that the new Rakops – Mopipi road cuts through some of the molapo fields and reduces the productive potential of the area.

Natural resource management tasks

- Ensure protection of the molapo areas from further infrastructure development (in line with the National Settlement Policy).
- Rationalise the existing allocation of molapo fields and re-allocate un/under-utilised molapos every season – via an agreed system of planting and sharing.
- Trials on molapo fields for fodder production (see below).
- Trial with water efficient dryland farming techniques with IVP support (e.g strip ploughing pioneered by Sanitas)
- Encourage collaboration between molapo producers to increase the benefits of resource sharing, especially during planting and harvesting periods.

10.4.2 Fodder

Fodder banks – grasses, trees and shrubs

Fodder banks are used in grazing systems to boost animal production by the production of green feed and high quality fodder during tropical dry seasons and droughts. As the main constraints to plant and animal production in sub-Saharan Africa are nutrient shortages and water, legumes can play various roles in improving the soil nutrient status, which in turn can positively influence the water constraint. Herbaceous legumes like *Stylosanthes spp.* are notable. Significantly, fodder banks must be managed throughout the year to ensure that they enter the dry season in suitable condition. If they are left ungrazed during the growing season the legume component will be suppressed and the bank will degenerate to old grass.

The fruits of wild trees are also grazed or licked off the ground by livestock, and the *Acacias* of the African savannas are important in this respect. Some pods are harvested for use as concentrate feeds, either from protected and managed wild

trees (e.g., *Acacia albida* in the Sahelian zone), or cultivated, like the carob (*Ceratonia siliqua*) in the Mediterranean region, and algaroba (*Prosopis juliflora*) in southern America (Suttie, 2000). Some farmers do collect the pods of *Acacia erioloba* in the dry season (personal observation).

A list of the main fodder trees and shrubs used in arid and semi-arid Africa (Dicko and Sikena, 1992) is provided in Appendix 2. As they point out it is important to be realistic and to learn from past experience and match intervention packages to farmers' needs and circumstances (Dicko and Sikena, 1992). The extensive newly fenced lands area at Mokoboxane offers considerable potential to experiment with fodder crops on a medium to long term basis – due to the protection from browsing, while financial assistance packages for tree planting and seedling provision may be tapped into by the MCT.

Natural resource management tasks

- Identify areas within the newly fenced arable lands at Mokoboxane and unused molapo fields that can be used for fodder production;
- Secure financial assistance for seedling purchase and planting;
- Trial different grasses and trees within each of the areas using fertilised (N, P, K) and 'natural sites';
- Trial the use of indigenous and *Vetiver* grasses on both fenced and unfenced (e.g. roadside corridors and bare ground within Mopipi) plots;
- Experiment with the use of a limited watering regime – that utilizes the capped boreholes within the lands area, provided the TDS is not too high (resulting in soil salinisation).
- Ensure the Mokola Palm is both protected in its natural habitat and forms a strategic part of tree planting programmes.

Standing hay

Reserving some areas of pasture during the period of growth for later use is an ancient and widespread practice in temperate and semi-arid grazing systems. Its effectiveness depends largely on the quality of the stand-over feed. In the better-watered tropical grasslands, however, the quality of the senescent, dried-off grass is so low and its palatability so poor that it does not even provide a maintenance ration; then the old vegetation may be burnt off to encourage a small but nourishing re-growth.

Collection of poor natural grass is associated with acute shortage of dry matter and where the cultivation of good hay is not easy. It is evident along some of the main roads in Botswana with private individuals taking the initiative to pick up the grass cut by roadside clearing crews and feed it to their stock. However, along the roadside corridors in much of the MCT the grass biomass is too low and patchy, as a result of the calcrete/salty soils, to make such operations viable. However, a corridor either side of and between the Makgadikgadi electrified fence will have to be cleared to avoid the fence being destroyed by bush fire, with it possible to link the availability of this forage to the use of mobile temporary water points (as detailed above). The dry season clearance of firebreaks and ranch fence boundaries also generates dry matter, particularly in a good rainfall year, and so offers some dry matter potential.

Growing hay on saline soils is possible with Rhodes grass (*Chloris gayana*), *Panicum coloratum* and *P. coloratum* var. *makarikariensis*, *Diplachne fusca*, *Melilotus indica* and *Sesbania sesban* all suitable for hay production, as are bulrush millet and sorghum. *Sesbania sesban* is used for reclamation of saline land and as forage, especially for goats, but is usually browsed directly rather than being dried (Suttie, 2000).

Natural resource management tasks

- MCT to establish whether the clearance of dry matter from firebreaks (including those along the new electrified Makgadikgadi fence) can be used to generate hay for livestock.
- MCT to liaise with DWNP and Ministry of Agriculture to ensure that hay collection accompanies the clearance of any dry matter along roads, cut lines and fences.
- MCT to experiment with the production of hay within the fodder banks (Mokoboxane lands area and unused molapo fields).

10.5 Veld products

10.5.1 Establishment of a community-based veld products management system

There is a dearth of information concerning the abundance and distribution of veld products in Botswana. As for the monitoring of the general vegetation it is important to distinguish between long-term and seasonal changes in the distribution and abundance of veld products (Perkins, 1999). Amount, timing and spacing of rainfall are often just several of a whole myriad of factors that can conspire against a crop. Short term fluctuations in the nature of the veld product resource base can therefore be pronounced.

Community-based natural resource management plans and monitoring systems have been developed in the communal lands and protected areas of Namibia (Stuart-Hill and Tagg, 2005). Known as the "Event Book" and "Incident Book" Systems they are now being adopted by other countries in southern Africa, including Botswana, Mozambique and Zambia. The relevant components of these systems, including that for veld products could usefully be adopted by the MCT.

Natural resource management tasks

- Monitor the condition of the vegetation, major veld products (fuel wood, mopane and Grewia berries) using the Event Book System approach.
- Ensure subsistence access to veld products throughout the MCT.
- Acquire harvesting rights for the main veld products within the MCT and introduce charges for commercial use of veld products within the MCT.
- Ensure effective mediation of conflict resolution between affected parties (e.g. gatherers and cattle posts owners).

10.6 Other options

10.6.1 Tree nursery

There are tree improvement programmes that were initiated by either government or non-governmental organisations such as Forestry Association of Botswana (FAB), Veld Products Research and Thusano Lefatsheng. The government and FAB have always concentrated on exotic tree species elimination and provenance trials of tree species such as *Eucalyptus* (gum trees), *Leuceana leucocephala* and *Atriplex nummularia* (old man's salt bush). Veld Products Research continues to carry out tree improvement work on indigenous fruit trees such as *Sclerocarya birrea subsp. caffra* (Morula), *Strychnos cocculoides* (Monkey orange), *Azanza garckeana* (Snot apple) and *Vangueria infausta* (wild medlar) (Minkie, 2004).

There are fifty two woodlots in the country, with a total area of about two hundred and twenty one hectares. The most prevalent tree species in the woodlots are *Casuarina*

cunninghamiana (Beefwood); *Eucalyptus camaldulensis* (River red gum); *E grandis* (Rose gum) and *E. tereticornis* (Forest red gum). In most cases the species were planted in unsuitable sites resulting in low productivity, with their planned amelioration of fuel wood and pole shortages unfulfilled (Minkie, 2004).

In Mopipi, *Hyphaene petersianna* (Mokola palm) is used in weaving baskets and appears to be declining within the MCT area. In this respect the MCT should ensure both the sustainable management of natural trees and that communities are encouraged to plant their own palm – within areas protected from grazing.

There is an annual ‘National Tree Planting Day’ (NTPD) that is commemorated every last Saturday of November. The former President of the Republic of Botswana Sir Ketumile Masire inaugurated this event in 1985. Although the NTPD is effective in the raising of public awareness and appreciation of the value of trees in our lives the programme is also far from fulfilling its ultimate objective. It could usefully be used by the MCT to boost rehabilitation efforts.

10.6.2 Bee keeping

The Government of Botswana through the Ministry of Agriculture considers the Beekeeping Industry as one of the alternative enterprises that can diversify the economy in rural areas. Beekeeping can be started using little capital and simple technologies that require semi-skilled labour and other minimal factors of production. Consequently, it has been promoted by Government for more than 20 years. Unfortunately, drought spells and difficulties in securing the required expertise in rural areas have meant that the sector has not performed as well as expected.

10.6.3 General resource rehabilitation measures

Rehabilitation of the MCT will be a long term and multi-faceted project. In the long term it may well lead to the re-instatement of viable wildlife populations within the region, but the area is currently overwhelmingly influenced by the Mainstream Government Policies that promote beef production for export markets and subsistence crops production. Ironically the former is not possible within the MCT due to its disease surveillance status, while the loss of molapo farming has dealt a severe blow to the crop sector. As such the MCT is caught between two main Government policies from which it is unable to benefit directly, but also prevent the development of a wildlife/tourism alternative.

10.6.4 Mopipi village and roadside rehabilitation

Pans are a major source of dust and Mopipi dam and the surrounding areas are no exception. In the mid-late dry season it is not uncommon to have driven around with your headlights on as the dust lifts off the bare ground surfaces into the atmosphere. It creates an unpleasant habitat, with asthmatics suffering disproportionately as well as other community members that are likely to suffer a number of dust related ailments.

Observations during fieldwork for the MCT suggest that a considerable improvement could be made in Mopipi village by a sustained programme of grass and tree planting in strategic areas. Dust generation off the pan is a natural hazard and will remain an integral part of life at Mopipi. The village is however located upwind of the Pan such that it is dust generation within Mopipi Village itself that creates the problem.

The new Mopipi – Rakops has also been constructed in such a manner as to accentuate the dust hazard. This is surprising as the 2005 EIA Act and its requirement for an Environmental Management Plan (EMP) should have prevented, or at least minimized many of the impacts that are today all too readily observed and likely to remain a permanent hazard. The latter relates to the extensive clearance of areas adjacent to the new road for drainage, the provision of an alternative route for vehicles while the tar road was being built, and the numerous often quite shallow scrapings that have been excavated in the quest for road building material. This is both unfortunate and unnecessary, such that the resultant dust hazard needs to be mitigated by a concerted tree and grass planting programme in the 2006-2007 wet season.

The need for the planned Mopipi Dam Rehabilitation Project that is planned by Orapa Mine, to avoid creating a further dust hazard by grading or bulldozing areas of land must also be emphasized. As emphasised above any removal of vegetation cover would be a negative development for the area.

Recommended species for rehabilitation trials

Grasses	Trees
<i>Vetiveria zizanioides</i> , <i>Cynodon dactylon</i> , <i>Chloris Guyana</i> , <i>Tricholaena monachne</i> , <i>Digitaria eriantha</i> , <i>Eragrostis superba</i> , <i>Eragrostis curvula</i> , and <i>Trachypogon</i> species	<i>Acacia nilotica</i> , <i>Acacia karroo</i> , <i>Acacia rehmanniana</i> , <i>mundulea sericea</i> , <i>Combretum imberbe</i> , <i>Acacia amythetophylla</i> , <i>A. erioloba</i> , <i>A. galpinii</i> , <i>A. gerrardii</i> , <i>A. rehmanniana</i> , <i>A. sieberiana</i> , <i>A. tortilis</i> , <i>Dichrostachys cinerea</i> , <i>Leucaena leucocephala</i> , <i>Sesbaia sesban</i>

Note that this list may change according to seed availability although it is strongly recommended that *Vetiveria zizanioides* is the dominant grass used.

Natural resource management tasks

1. To establish a community of self-sustaining, diverse indigenous trees, shrubs and grasses in order to control the dust hazard and improve aesthetics.
2. investigate various practical options for plant establishment, i.e. direct seeding, transplants, soil addition;
3. Based on the results of the trials, formulate a large scale planting action plan for rehabilitation of the broader MCT.
4. Monitor the progress of rehabilitation programmes via simple vegetation measurements (e.g. plant cover and species composition) and a photographic record.
5. Record any problems/setbacks to the rehabilitation (e.g. disturbance by wildlife such as kudu, impala and warthog/ drought) and instigate mitigation measures (e.g. fencing and limited irrigation, respectively).

10.7 Summary

Livestock production and tourism are the emphasis of the resource management plan. However, it is recommended that the MCT should keep its wildlife utilization option open for the future, as this would boost tourism. However, balancing livestock and wildlife involves trade-offs. Ecosystem goods and services are harmed by the loss of biodiversity and impacts that follow livestock expansion, which in turn provides valuable societal benefits which many people are understandably reluctant to forego.

The establishment of an effective community based grazing management system around villages is a priority, but at the same difficult to achieve. It requires hard work and commitment on the part of the MCT as well as a good working relationship with the communities. Rangeland management needs to be considered as a priority.

Chapter eleven

MCT Rangeland Resources Management Regulations

11.1 Introduction

This chapter discusses the regulations deemed necessary for the proper and effective operation of the MCT, covering the options discussed in chapter eight. The regulations are arranged as follows:

- *Section 11.2: Preliminary*
 1. Citation
 2. Interpretation
- *Section 11.3 Tourism projects*
 3. Acquisition and development of Mopipi dam area
 4. Development of Pans for Wilderness Overnight
 5. Community Zone in MNP
 6. Access to Orapa Game Park and Mine
 7. Game Farm or Combined Unfenced Livestock Game Utilisation
 8. Permission to utilise tourism resources
- *Section 11.4 Livestock Related Projects*
 9. MCT management of village livestock areas
 10. Control of bushes
 11. Cattle holding pens
- *Section 11.5 Arable and Fodder Production*
 12. Utilisation of dry Molapo area
 13. Fodder production
 14. Tree nursery
 15. Community rights and protection
- *Section 11.6 (Part V) Veld products*
 16. Common property management of veld products
- *Section 11.7 (Part VI) General Provisions*
 17. Community Rights over Resources
 18. Joint Ventures
 19. Amendments
 20. Enforcement of the Regulations
 21. Adoption of the Regulations

Section 11.8 discusses training needs and possible funding sources.

11.2 Preliminary regulations (Part 1 Preliminary)

1 Citation

These regulations may be cited as MCT Rangeland Management Regulations

2 Interpretation

- (1) In these Regulations, unless otherwise provided, the words and expressions shall have the following meaning;
 - a. Tourism projects – shall mean all projects and activities related to tourism undertaken in the Mopipi Dam area;
 - b. Responsible authority – shall mean the department or institution for the time being having authority over a particular area or project
 - c. Trust – shall mean the Mokopi Conservation Trust (MCT) constituted in terms of the MCT Deed of Trust.

11.3 Regulations for tourism projects (part II)

3 Acquisition and development of Mopipi dam area

- (1) The Trust shall apply to the responsible authority for permission to rehabilitate and develop the Mopipi dam area.
- (2) The rehabilitation and development shall include, inter alia,
 - a) Revival of old structures around Bay Club for environmental education (subject to transfer of ownership to the MCT);
 - b) Up-grading of the Bay Club (subject to transfer of ownership to the MCT);
 - c) Development of dry dam activities such as quad bikes, donkey-horse rides and small game area; bush walks, cultural activities and small wet area;
 - d) Planting of trees to reduce and capture dust;
 - e) Reducing bush encroachment.
- (3) Unless provided otherwise for under any law or the Deed of Trust, the Trust shall have the power to;
 - (a) Negotiate with Debswana for the transfer of ownership of Bay Club and apply for permission from LB;
 - (b) Raise financial resources to develop and rehabilitate the Mopipi dam area
 - (c) Enter into joint ventures to ensure sound management of the area
 - (d) Market tourism activities in the Mopipi dam area
 - (e) Seek technical assistance for the development of the dam area, and;
 - (f) Perform all acts authorised by the Deed of Trust.
- (4)
 - (1) Subject to any other written law and granting of permission by the responsible authority, the Trust shall have exclusive right of use of the Mopipi dam area.
 - (2) This right shall include harvesting, sale and disposal of resources located thereon for the benefit of the entire community in the area.
 - (3) The right to use the Mopipi dam area by the Trust shall not be unnecessarily restricted

4 Development of Pans for Wilderness Overnight Stays

- (1) The Trust shall apply to the responsible authority for permission to develop the pans for wilderness overnight stays.
- (2) The following activities shall be undertaken and developed in the pans;
 - (a) Setting up campsites properly equipped with simple basic services such as water and sanitation;
 - (b) Arranging bush walks and cultural activities in the pans;
 - (c) Improving sites of foot prints, and;
 - (d) Arranging trips to OGR, CKGR and MPNP
- (3) In order to ensure that activities in regulation (1) (a) to (d) are achieved, the Trust shall provide marketing, training in site management skills and raise capital.
- (4) Subject to any other law, the Trust shall have exclusive rights over resources in relation to the pans including the right to exclude any individual from using pan for wilderness overnight stays.

(5) Subject to payment of a fee, an individual or group of individuals may apply for permission from the Trust to utilise the pans for wilderness overnight at designated sites.

(6) The granting of permission in terms of Regulation 4(5) shall be subject to such terms and conditions as the trust may deem necessary.

5 Community Zones in MNP

(1) In order to acquire additional resources for the improvement of livelihoods in the area, the Trust shall apply for permission from the responsible authority to acquire community zones in MNP.

(2) Subject to permission being granted, the Trust shall develop the utilisation and conservation plan (hereinafter conservation plan) for the community zone.

(3) The community zones shall be used for;

- o En route tourism;
- o Weekend tourism;
- o Supply of inputs for economic activities;
- o Subsistence purposes such as thatching grass, and;
- o complementing tourism development

(4) The granting of permission over community zones to the Trust shall have the effect of conferring exclusive right to use resources therein by the trust.

(5) Subject to payment of a fee, an individual or group of individuals may apply for permission from the Trust to utilise the community zones.

(6) The granting of permission in terms of Regulation 5(5) shall be subject to such terms and conditions as the Trust may deem necessary.

6 Access to Orapa Game Park and Mine

(1) The Trust shall request and enter into negotiations with Orapa Mine authorities in order to obtain permission to enable it to gain access to the Orapa Game Park for tourism purposes.

(2) The granting of permission in terms of Regulation 6(1) shall confer authority on the Trust to;

- (a) Organise guided trips to the Orapa Game Park;
- (b) Visit diamond mine, and;
- (c) Perform such activities that are incidental to the granting of the permission.

(3) Access to the Orapa Game Park shall be subject to approval of the Orapa mine authorities and on such terms and conditions as the Orapa mine authorities may deem necessary.

7 Game Farm or combined unfenced livestock/game utilisation

(1) The Trust shall regularly review future wildlife utilisation options, including establishing a game farm, restocking with game, engaging in combined unfenced livestock game utilisation project for purposes of creating employment and income opportunities for the community; and ensuring better use of north-eastern part of the MCT area and suitable state land transferred to the Trust.

(2) In order to make the project viable, the Trust shall initiate financial activities including support from institutions with interest in environmental protection and management.

8 Permission to utilise tourism resources

(1) All application for the use of tourism facilities and harvest of tourism resources in the Mopipi Dam area and pans acquired by the Trust in accordance with these Regulations shall be addressed to the Trust.

(2) Applications shall be made in the form and manner prescribed by the Trust.

(3) The Trust shall have the power to decide on all applications made in terms of Regulation 8(1) and its decision shall be final.

11.4 Regulations for livestock and range resource management projects (part III)

9 Management of village livestock areas

(1) The Trust shall be responsible for the management of village livestock in areas within its jurisdiction.

(2) The Trust shall design acceptable natural resource management systems for livestock in the area.

(3) In designing acceptable natural resource management systems, the Trust shall;

- Do so with the express agreement of the membership of the Trust;
- Assess maximum livestock numbers for the area (normal-wet and dry);
- Establish stock ceilings for individuals (normal-wet-dry);
- Establish Range resources monitoring procedures-system;
- Introduce grazing and water fees;
- Acquire temporary additional water points and grazing reserves
- Encourage rotational grazing (winter and summer areas);
- Encourage Joint herd management;
- Establish one bush control unit with five people,
- Consider forage provision, and;
- Construct firebreaks.

(4) In order to carry out the efficient management of livestock resources in the area, the Trust shall rely on the support of the community and shall, in accordance with these Regulations and the Deed of Trust seek financial support for any institutions or department.

(5) The Trust shall be authorised to seek support from Department of Forestry and Range Resources and Land Board in the execution of its mandate under this Regulation.

(6) Subject to any other law, the Trust shall have exclusive rights over livestock resources in the areas within its jurisdiction including the right to exclude any individual or group of individuals from using livestock areas without its prior authorisation.

(7) Subject to payment of a fee, an individual or group of individuals may apply for permission from the Trust to utilise the livestock resources in areas within its jurisdiction.

(8) The use of livestock resources in accordance with Regulation 9(6) shall have the effect of conferring the right of use only for the stipulated period.

10 Control of bushes in village livestock areas

(1) The Trust shall be responsible for the control of bushes in village livestock areas within its jurisdiction in order to increase productivity of rangelands and supply of fire wood or input for charcoal.

(2) In order to control of bushes in village livestock areas, the Trust shall have the power to seek assistance from the community and raise funds from whatever sources in accordance with the Deed of Trust.

11 Cattle holding pen

(1) The Trust shall have the power to establish of cattle pen in enclosures within the drift fence in livestock areas within its control for purposes of improving cattle conditions, ensuring better returns, creation of jobs for the members of the Trust and the community and improve market access.

(2) In order to ensure that cattle pen are established, land would be set aside for that purpose.

(3) The Trust shall undertake fodder production for feeding livestock in cattle pens and sale to the community with the area of jurisdiction of the Trust and any proceeds realised from the sale of fodder will be utilised for the improvement of fodder production facilities and the community.

(4) The Trust shall make provision for water within livestock areas to used mainly but not exclusively for livestock, fodder production and any activity that shall be undertaken in pens.

(5) In order to ensure that activities and projects regulated by this section are achieved, the Trust shall enter into negotiations with responsible authorities for purposes of controlling diseases in livestock areas and agreeing on quarantine requirements.

(6) Subject to any other law, any fodder and its by-products and water facilities in livestock areas shall be owned by the Trust.

(7) No person shall have access to the pens and any operations thereon without the written permission of the Trust, and any such access to and/or any use of the pen shall subject to the payment of a prescribed fee.

11.5 Regulations for arable and fodder production projects (part V)

12 Utilisation of dry molapo area

(1) The Trust shall apply for permission from responsible authority to utilise Molapo farms for dry land farming in order to increase food production and income generation.

(2) In order to achieve the objective in section 12(1), the trust shall;

- Encourage and monitor the use of molapo fields;
- Encourage those who will not use the field to 'rent it out' or take it back to the Land Board;
- Ensure that all suitable molapo fields are allocated to other users;
- Use of fertilizer or cattle manure to maintain soil fertility in the farms, and;
- Improve practices and crop choice to achieve higher yields.

(3) To ensure that soil in the farms does not lose its fertility, the Trust shall discourage continuous farming and encourage improve farming practices.

(4) The Trust shall have the power to broker land hiring.

(5) The Trust may apply for external support in order to promote dry molapo farming.

13 Fodder production

(1) In order to increase livestock productivity, cope with droughts and depressurise rangelands, the Trust shall establish fodder area within dry land farming zone.

- (2) The Trust may seek support from external sources in order to implement measures in section 13(1) and train personnel.
- (3) Any fodder produced in dry land area shall be the property of the Trust and shall use it in any manner it deems necessary.

11.6 Regulations for use and management of veld products (part V)

14 Common property management of veld products

- (1) The Trust shall establish community-based veld products management system for mopane, fuel wood and other valuable resources, including:
 - (a) Monitoring of main veld products
 - (b) Establishment of sustainable harvesting practices
 - (c) Monitoring of harvesting and education
 - (d) Controlled harvest in cattle post livestock areas
 - (e) Permits for commercial harvesting of veld products in the Trust area.
- (2) The main purpose for establishing establish community-based veld products management system shall be ensure Resource conservation and rehabilitation, subsistence and cash benefits for the Trust and the community.
- (3) For purposes of establishing community-based veld products management system, the Trust shall raise finances and seek cooperation of local population.
- (4) The Trust shall have commercial rights to veld products in the area within its jurisdiction, which rights shall include but not limited to the right to harvest, sell, dispose or alienate such veld products.
- (5) Veld products located within the Trust area shall belong to the Trust and the community and no person shall have access to and use of such veld products without written consent of the Trust provided that where the Trust grants any access to and use of veld products it shall charge a prescribed fee.

11.7 Regulations for other activities

15 Acquisition of water points

- (1) The Trust shall apply to acquire water points from any responsible authority in order to support livestock and other activities.
- (2) In order to achieve the objectives in section 16(1), the Trust shall;
 - (a) Identify possible water points;
 - (b) Apply for rights transfer or;
 - (c) Develop additional water points, and;
 - (d) Design and collect user charges.
- (3) All the water rights in the water points acquired by the trust shall vest in the Trust, and the Trust shall have the power to alienate such rights to third parties subject to such conditions that it may deem necessary including the payment of a prescribed fee.

16 Tree nursery

- (1) The Trust shall establish or encourage the establishment of a nursery with indigenous species and conduct experiments with veld products in order to rehabilitate the environment, ensure food security, control dust and increase cash income.
- (2) The Trust shall secure a piece of land and water for a nursery;
- (3) The Trust may seek support from external sources in order to implement measures in section 14(1) and (2) and train personnel.

(4) Any species and veld products produced in dry land area shall be owned by the Trust and shall it use same in any manner it deems necessary.

17 Other projects and activities

11.8 General Provisions (part VI)

18 Community rights over resources

(1) Without derogation from any rights conferred to and person or persons, natural or juristic given under these regulations or any other law, the community in the area of jurisdiction of the Trust shall have user rights with respect to resources located in the area. These rights shall be respected and protected by law.

19 Joint Ventures

(1) The Trust shall have the power to enter into any joint ventures with other entities or organization to ensue the full realization of the objectives of the Trust.

(2) Any such joint ventures should be concluded in accordance with the Deed of Trust.

20 Amendment of Regulations

(1) The Trust shall have the power to amend these regulations.

(2) Any amendment must be supported by two-third majority of the Trust.

21 Enforcement of regulations

(1) The Trust shall have the powers to enforce these regulations.

22 Adoption of the Regulations

(1) These Regulations shall come into operation following their adoption by the Trust at a meeting specially convened for that purpose.

11.8 Capacity, training needs, finances and funding

The MCT was formally established in December 2005, and is therefore a young institution with a very limited capacity. The Trust does not yet generate its own revenues and has no staff or assets such as an office and transport. It is hoped that the IVP office and vehicle will be transferred to the Trust after the winding up of the project.

The above shows that the MCT Trust and communities will require substantial support and training for the short and medium term. On-site technical advice will be needed for the next five to ten years, either through IVP or through government. The following training needs have been identified:

- Administrative and organisational management and planning (e.g. annual plans and long term plans, and performance monitoring);
- Financial record keeping and financial management and planning;
- Monitoring of range resources and changes therein;
- Wildlife training and tourism development and management;
- Entrepreneurial, business skills and marketing;
- Effective use of extension support;

- Selection of and dealing with joint venture partners

The MCT does not have staff and does not possess assets (e.g. premises, vehicle and savings). It is important that the capacity of the MCT is gradually expanded and strengthened to efficiently implement the suggested projects. It is recommended that the MCT selects priority projects (as indicated in chapter 8) and expands its activities when the capacity is increasing. Methods to increase the MCT capacity include:

- Seeking a joint venture partner (e.g. for tourism projects) or a supporting organisation such as Debswana;
- Active participation of MCT members and possible implementation of projects by MCT members. The MCT needs to consider how it can individuals and local businesses in furthering its plans;
- Learning from other CBOs through the National CBNRM Forum;
- Training and funding.

The MCT does not generate its own revenues. In order to pursue financial sustainability, it is recommended that the MCT only engages in projects with a prospect to cover the recurrent expenditures from revenues generated by the MCT. External financial support should be used to pay for capital expenditures and –when necessary- initial recurrent expenditures. While foreign donors have largely withdrawn from the country, government and other agencies still offer a wide range of financial support opportunities that needs to be fully exploited by the MCT. The most important funding opportunities are presented in Table 11.1.

Table 11.1: Some funding and support opportunities for MCT

Type-area	Support	Source
General		
GEF small grants	Support for small projects, mostly through CBOs administered by UNDP	
US Ambassador's fund	Support for small projects	USAID
Forestry		
Tropical forest conservation Fund (USAID and GoB; 2006)	Starts mid 2007. Grants for training, research, restoration, protection and sustainable use if diverse plant and animal species; support livelihoods of people near forest. Eligible organisations: NGOs and indigenous people's organisations. Priorities to projects run by local NGOs with people., no ceiling for grants (over US\$ 100 000 possible).	USAID
CBO assistance		
Community development Fund	Mostly legal and training support for starting CBOs (set up and first two years.; administered through DWNP-EU project; Underutilised and terminated with the DWNP-EU project	NDP9 p. 320.
Community Conservation Fund	Infrastructure development and some operational costs (only first 5 years); focus on protection/ breeding of endangered species and conservation education; funded through revenues from ivory sales through DWNP; Available to CBO within elephant territories	NDP 9, p.321
Community Trust Fund	Assistance to CBOs; project size up to P 2 million; administered through DWNP	NDP9
Tourism		
Tourism development (EWT 301)	Includes support for walking trails and eco-tourism pilot projects Cap budget P 24.5 million for period 2003-2008.	NDP9
Livestock		
SLOCA	19 million for 1997/2002/03 for livestock development, including SLOCA and LWDP. Also support for AI etc. SLOCA grants for farmers and farmer groups for: water facilities, fodder production, handling facilities and drift fences; also support for community farms (up to 4 per annum); total capital budget P 101.7 million for 2003-2008.	
LWDP	Grants for drilling or equipping of boreholes for livestock.	
Crops		

ALDEP	Individual farmers: support for fencing, equipment, ploughing; capital budget p 29.1 million 2003-2008	NDP9
Droughts		
Drought relief	Labour intensive drought relief projects	
Others		
Private sector- civil society	Kalahari Management Services (KBL), Debswana's Social responsibility Programme and small funds available from embassies	

11.9 Relationship between the MCT Board and communities

The Board has been elected by the communities for a period of two years. According to the constitution, annual general meetings need to be held to ensure that community members are fully informed about the MCT activities, and that Board members are elected when necessary. It is critically important that the communities consider the MCT as 'their own' project, that they give it full support and that they in time benefit from the MCT activities. Therefore, the MCT Board is strongly advised to regularly discuss its activities and plans with the communities and to seek their guidance. Active community participation is a known requirement for the success of community-based natural resource management.

Consultations during the preparation of this plan suggested that the Mokoboxane community is more interested and active in the MCT activities than the Mopipi community. While the attendance of focus group discussions was good, the kgotla meetings to discuss the draft plan did not materialise (Mopipi) or were poorly attended (Mokoboxane). Therefore, the MCT Board needs to intensify its contacts with the communities in order to ensure community ownership of the MCT and full community support.

References

- Anderson, D.M.W., 1985. Gums and resins, and factors influencing their economic development. In: *Plants for Arid Lands*. Eds: G.E. Wickens, J.R. Goodin and D.V. Field. Proceedings of the Kew International Conference on Economic Plants for Arid Lands, Royal Botanic Gardens, Kew, England, 23-27 July 1984, George Allen and Unwin. London.
- Arnold, T.H., M.J. Wells and A.S. Wehmeyer, 1985. Khoisan food plants: taxa with potential for future economic exploitation. In: *Plants for Arid Lands*. Eds: G.E. Wickens, J.R. Goodin and D.V. Field. Proceedings of the Kew International Conference on Economic Plants for Arid Lands, Royal Botanic Gardens, Kew, England, 23-27 July 1984, George Allen and Unwin. London.
- Arntzen, J.W. *et al*, 1994. Desertification and Possible Solutions in the Mid-Boteti River Area. University of Botswana, 1994.
- Barnhoorn, F., Jansen, R., Th. Riezebos, H. and Sterkenburg, J.J., 1994. Sustainable development in Botswana. An Analysis of Resource Management in Three Communal Development Areas. University of Utrecht, The Netherlands.
- Bhalotra, Y.P.R., 1987. *Climate of Botswana - Part II: Elements of Climate*. Department of Meteorological Services. Ministry of Works and Communications. Gaborone.
- Blair Rains, A. and McKay, 1968. The Northern State Lands. *Botswana Land Resources Study*. No.5. D.O.S.Tolworth.
- Bishop, J. and Scoones, I., 1994. *Beer and baskets: The Economics of Women's Livelihoods in Ngamiland, Botswana*. IIED, Research Series, Volume 3 (1). .
- Campbell, A., 1986. The use of wild food plants, and drought in Botswana. *Journal of Arid Enironments*. 11. 81-91
- Cashdan, E., 1977. *Subsistence, Mobility, and territorial Organisation among the //Ganakwe of the north-eastern Central Kalahari Game Reserve, Botswana*. University of New Mexico. Mexico.
- Birnie, P and Alan Boyle, 2002. International Law and the Environment. Oxford University Press, Oxford.
- Central District Council, 2000. Land use plan for Central District- volume 1; The plan.
- Central District Council, 2000., Land use plan for Central District- volume 2; Report of survey.
- Centre for Applied Research, 2004. Review of institutional and legal arrangements for community based management of rangelands in Botswana. Report prepared for IVP of MoA-UNDP.
- Centre for Applied Research, 2006. Final report on The environmental assessment of Botswana's livestock (beef) sector: livestock, wildlife and natural resources management. Report to the MFDP, Government of Botswana.
- Conroy, A.M., 2005. The Springbok. In: Intensive wildlife production in Southern Africa. Eds: Bothma, J.du P. and N.van Rooyen. pp.214 – 226.
- Cunningham, A.B., 1991. Development of a conservation policy on commercially exploited medicinal plants: A case study from Southern Africa. In: The Conservation of Medicinal Plants. Ed: Akerele, O., Heywood, V. and Synge, H. 1991. 337-358.
- Cunningham, A.B. and Milton, S.J. , 1987. Effects of Basket-weaving industry on Makola Palm and Dye Plants in Northwestern Botswana. *Economic Botany*. 41(3), 386-402.
- Dept of Meteorological Services, 2006. Rainfall statistics
- DHV, 1980. *Countrywide Animal and Range Assessment Project*, 7 vols., European Development Fund and Ministry of Commerce and Industry, Gaborone.
- Deimann, S and Dyssle, B. (1995), *Environmental Rights: Law, Litigation and Access to Justice*. Cameron May Ltd, London.

- Dicko, M.S. and Sikena, L.K. (1992) Fodder trees and shrubs in range and farming systems in dry tropical Africa. FAO Animal Production and Health Papers - 102.
- EcoSurv, 1994. EIA for the Rakops – Mopipi Road. Department of Roads. Gaborone
- ERL, 1985 Fuelwood Survey: Botswana. Department of Energy. Gaborone.
- Field, D., 1978. Range Ecology Handbook for Botswana. Ministry of Agriculture. Gaborone
- Indigenous Vegetation Project, 2003. Situational analyses of IVP Botswana project sites
- Indigenous Vegetation Project, 2003. Environmental education strategy for IVP Botswana.
- Indigenous Vegetation Project, 2004. Participatory indicator development: preliminary report
- Indigenous Vegetation Project, 2004. Management of indigenous vegetation for the rehabilitation of degraded rangelands in the arid zone of Africa. Baseline socio-economic data for IVP Botswana sites.
- Indigenous Vegetation Project, 2004. Community Action Plan proposed projects- Boteti.
- Indigenous Vegetation Project, 2004. Baseline socio-economic data for IVP Botswana sites from 2001 census
- Indigenous Vegetation Project, 2005. Report of educational trip by IVP stakeholders to rangeland management initiatives in Namibia
- Khwarae,G.M, 2004a. Mopipi Community Action Plan (final draft). IVP project, Ministry of Agriculture and UNDP.
- Khwarae,G.M, 2004b. Mokoboxane Community Action Plan (final draft). IVP project, Ministry of Agriculture and UNDP.
- LaFranchi, C. (1996) *Small Scale Subsistence use of Natural Resources in Namibian Communal Areas. Estimating the value to livelihood of selected wild foods, medicinals, building and craft materials, and fuelwoods.* WWF (LIFE) Program, Windhoek, Namibia.
- Marata, 2000 Area4B Ranch Survey. Ministry of Agriculture.
- Mark, R and A. Dougill, 2003. Participatory Indicator Development; IVP workshop manual.
- MoA, 2004. Management of indigenous vegetation for the rehabilitation of degraded rangelands in the arid zone of Africa. Mopipi community action plan workshop report.
- MoA, 2004. Management of indigenous vegetation for the rehabilitation of degraded rangelands in the arid zone of Africa. Botswana annual report 2003.
- Ministry of Agriculture and IVP, 2003. 1st draft Khawa community action plan.
- Ministry of Agriculture and IVP 2004. Draft final Mokoboxane community action plan.
- Ministry of Agriculture and IV, 2003. 2nd draft Struizendam community action plan.
- Ministry of Agriculture and IVP, 2003. 2nd draft Vaalhoek community action plan (2003)
- Ministry of Agriculture and IVP, 2002. Inception report.
- Ministry of Agriculture and IVP, 2003. Botswana Annual Report 2003 and 2004.
- Ministry of Agriculture and IVP, 2003. Strategic plan 2002-2007.
- NRP, 2006. Range resources management plan- draft final report. Report prepared for IVP.
- NRP, 2006. Hima ranch and Kedia communal lands Land Use Plan- draft final. Report prepared for IVP.
- Pheto, M.M. (2004) Forestry Statistics. Published by Central Statistics Office, Environment Statistics Unit, Department of Printing and Publishing Services. Gaborone.

- MoA, 2004. Management of indigenous vegetation for the rehabilitation of degraded rangelands in the arid zone of Africa. Mopipi community action plan workshop report.
- MoA, 2004. Management of indigenous vegetation for the rehabilitation of degraded rangelands in the arid zone of Africa. Botswana annual report 2003.
- Parry, D.C., 1987a. Wildebeest (*Connochaetes taurinus*) mortalities at Lake Xau, Botswana. *Botswana Notes and Records*. **19**: 95-101
- Parry, D. 1987b. Zebra die in the Makgadikgadi. *Kalahari Conservation Society Newsletter*. 18: 4.
- Perkins, J.S. 1999. Developing a Methodology for a Community-Based Natural Resource Inventory and Monitoring System. USAID/DWNP. IDraft Final report.
- Pheto, M.M., 2004. Forestry Statistics. Published by Central Statistics Office, Environment Statistics Unit, Department of Printing and Publishing Services. Gaborone.
- Sallu, S., 2004. Fieldwork report phase 1: Biodiversity, degradation and livelihoods: Environmental change in Khawa settlement, south west Kgalagadi district.
- Scott Wilson, 2002. An Environmental Appraisal of the Electrified Fence around Makgadikgadi Pans National Park. For Department of Wildlife and National Parks. Gaborone.
- Sims, 1981. FAO Soil Survey Technical Bulletin. Gaborone. Botswana.
- Stuart-Hill, G., Diggle, R., Munali, B., Tagg, J. and Ward, D., 2000. The Event Book System: a community-based natural resource monitoring system from Namibia. *Biodiversity and Conservation* 14:2611–2631
- Sweet, J. 1986. The Communal Grazing Cell Experience. Ministry of Agriculture. Gaborone.
- Schapera.I. 1955. A handbook on Tswana law and custom. James Currey Limited, Oxford.
- Suttie, J.M., 2000. Hay and Straw Conservation: For small-scale farming and pastoral conditions. FAO Plant Production and Protection Series. .
- Taylor, M. *et al*, 2002. IVP in the context of CBNRM movements in southern Africa; overview paper for project staff and interested stakeholders.
- Tobedza, G, 2003. Proceedings of the first IVP training and awareness raising workshop for Boteti project area
- Tshosa., O.B. , 2005. Environmental Law in Botswana, Kluwer Law International, International Encyclopedia of Laws, edited by Prof. R. Blanpain, Supplement. 56, The Hague, Netherlands.
- Van der Maas H.A, (ed.), E. Kooyman, T. Rampha, and A. de Wit, 1995. North west Boteti baseline survey; socio-economic and bio-physical baseline survey of the communal area between and including the villages of Rakops and Makalamabedi in the Boteti sub-district. University of Utrecht, Netherlands.
- Weare, P.R. and Yalala, A., 1971. Provisional vegetation of Botswana. *Botswana Notes and Records*. **3**. 131-152.
- Williamson, D. and Mbano, B., 1988. Wildebeest mortality during 1983 at Lake Xau, Botswana. *Afr.J.Ecol.* **26**: 341-344.
- Williamson, D. and Williamson, J., 1981. An assessment of fences on the large herbivore biomass in the Kalahari. *Botswana Notes and Records*. **13**. 91-94
- Williamson, D. and Williamson, J., 1985a. Botswana's fences and the depletion of Kalahari wildlife. *Parks*. 10 (2): 5-7.
- Williamson, D. and Williamson, J., 1985b. *Kalahari Ungulate Movement Study*. Frankfurt Zoological Society.

Figure 2.1: Soil types in the area.



**Survey Mokopi
Land-use Plan**

SOILS

CLIENT: Mokopi Trust

Consultant:
Centre for Applied Research




July 2006

 Fields

Soil Type (foreground)

-  Arenosol
-  Cambisol
-  Fluvisol
-  Gelysol
-  Luvisol
-  Regosol
-  Solonchak
-  n/a

Soil Fertility (background)

-  High
-  Moderate High
-  Moderate Low
-  Low

SCALE:  Kilometers

Figure 2.3: Vegetation types in the area

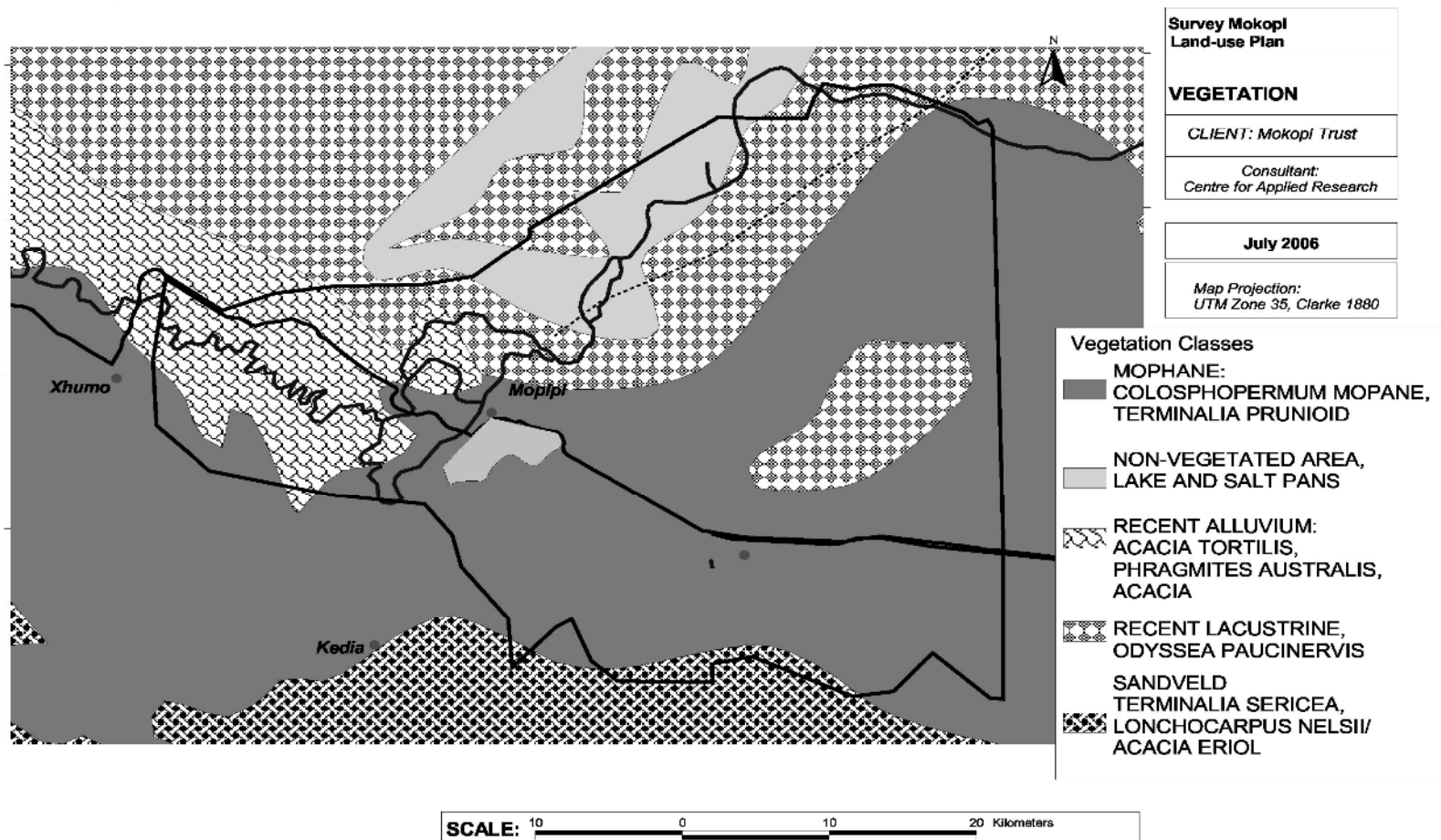


Figure 5.1: Location of MCT area in northern Botswana.

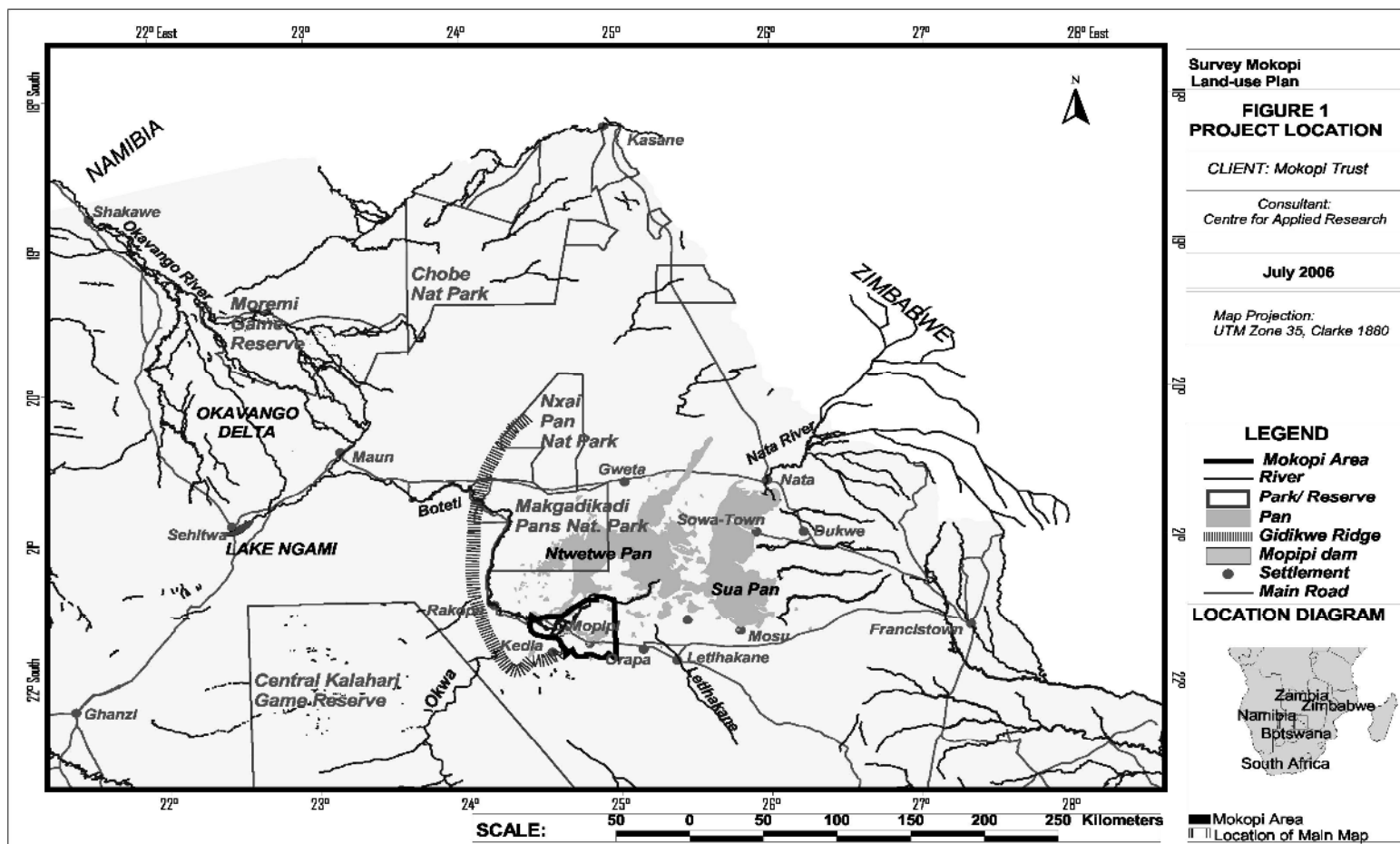


Figure 5.2 Surrounding land-use context for Mokopi project area.

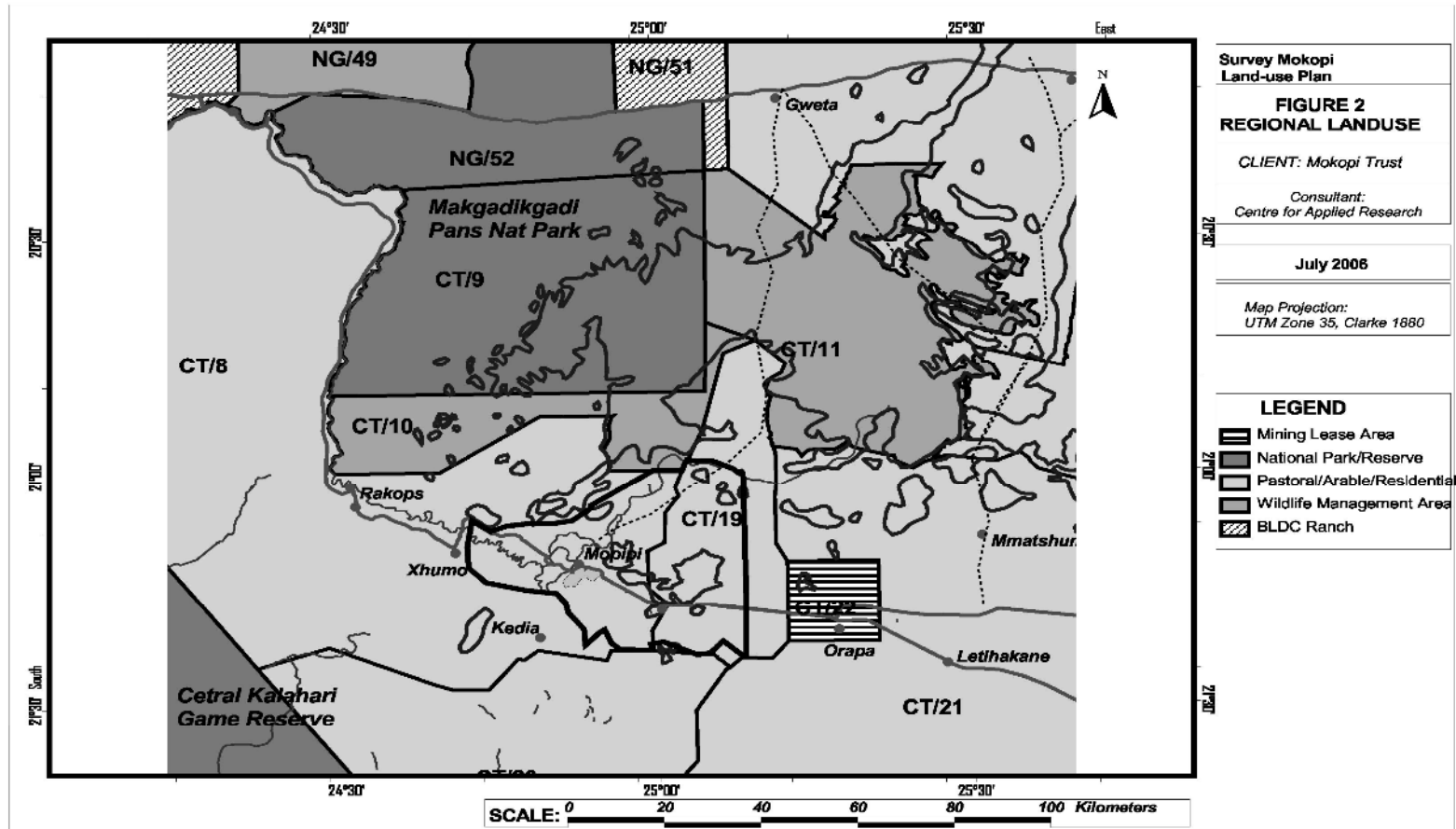


Figure 5.4 Infrastructure in the MCT area (roads and fences).

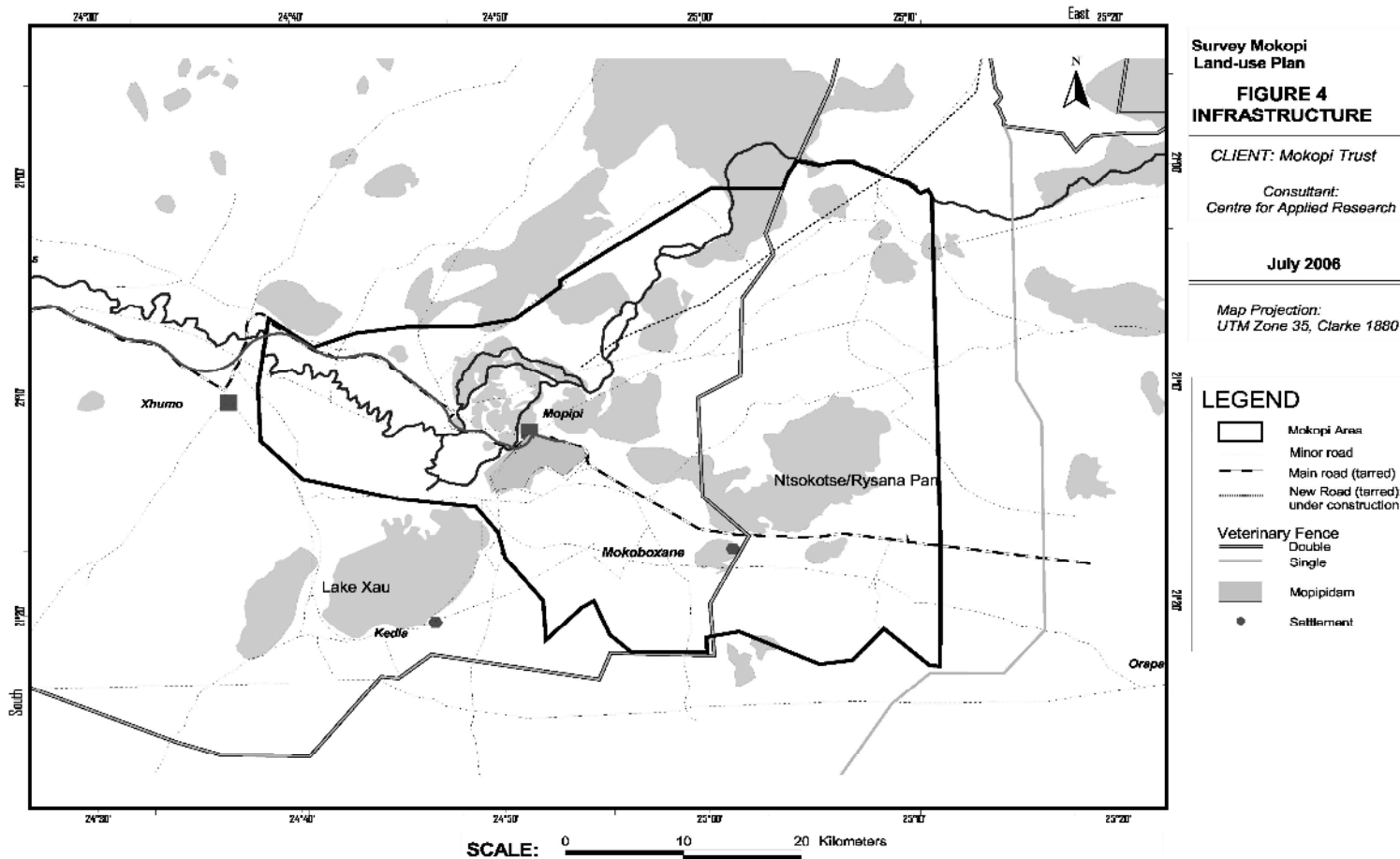


Figure 5.5 Main field areas (molapo and dry-land) in MCT area.

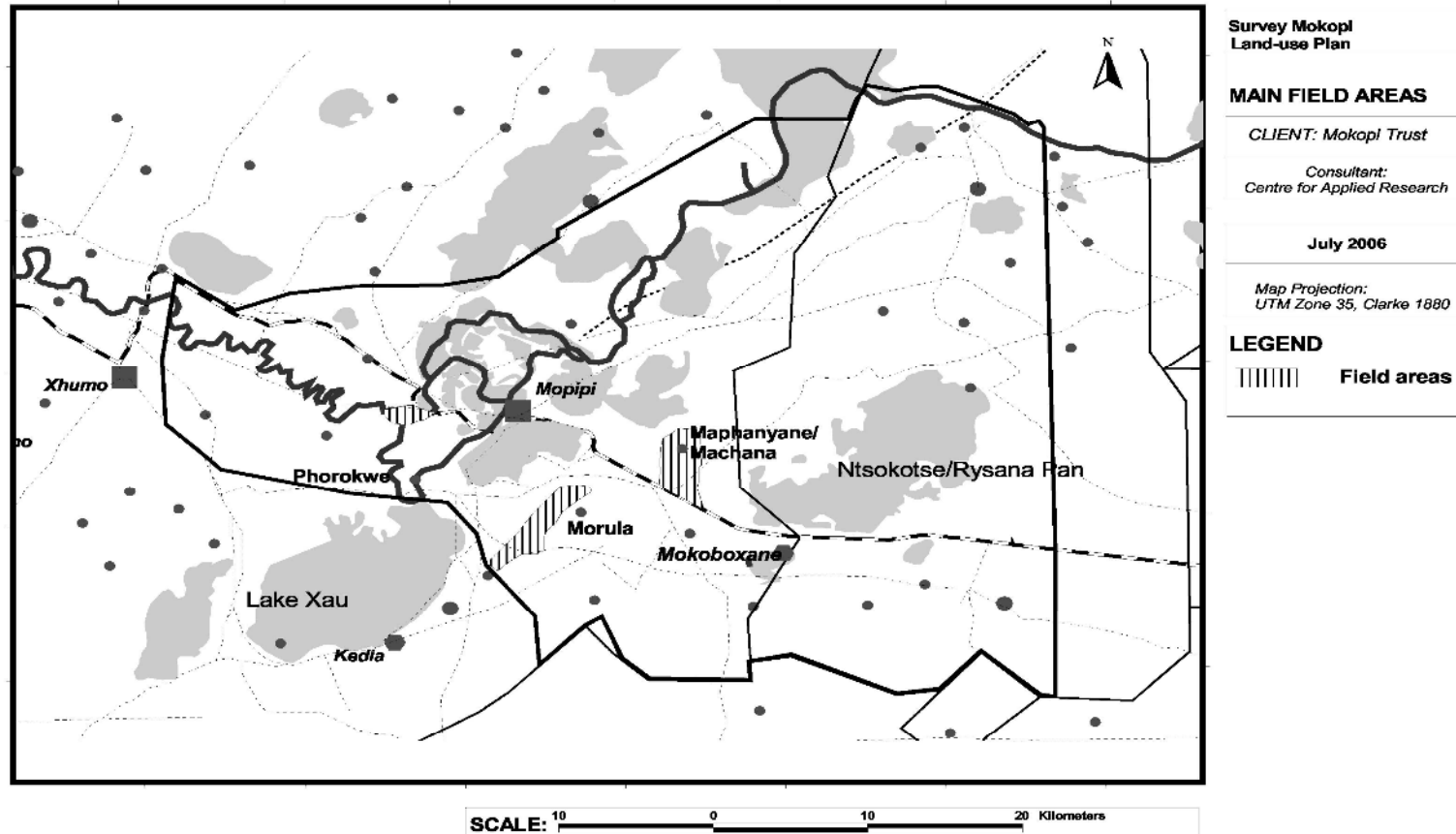


Figure 5.6 Water points across the MCT area.

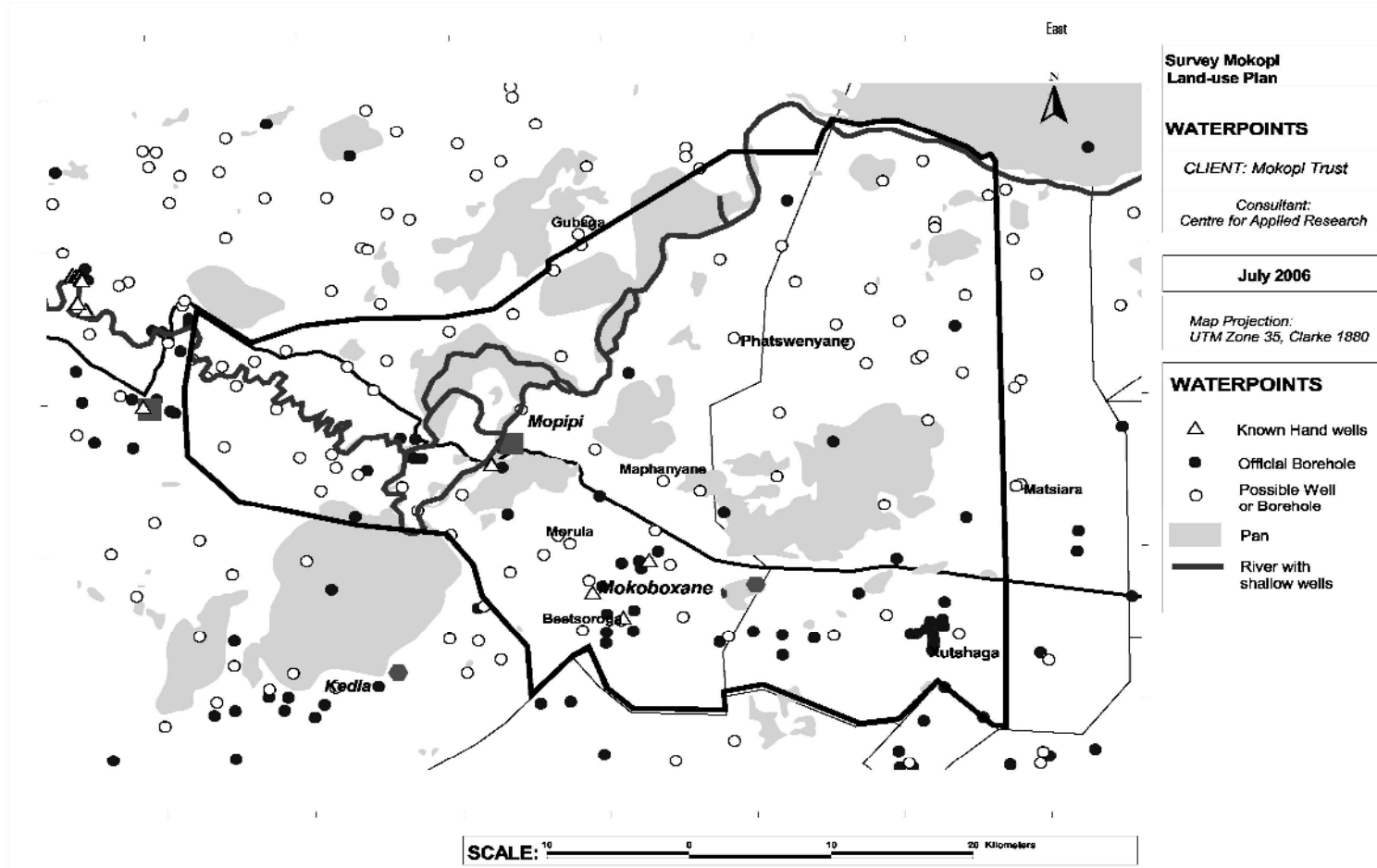


Figure 5.7 Cattle post distribution in the MCT area (approximate)

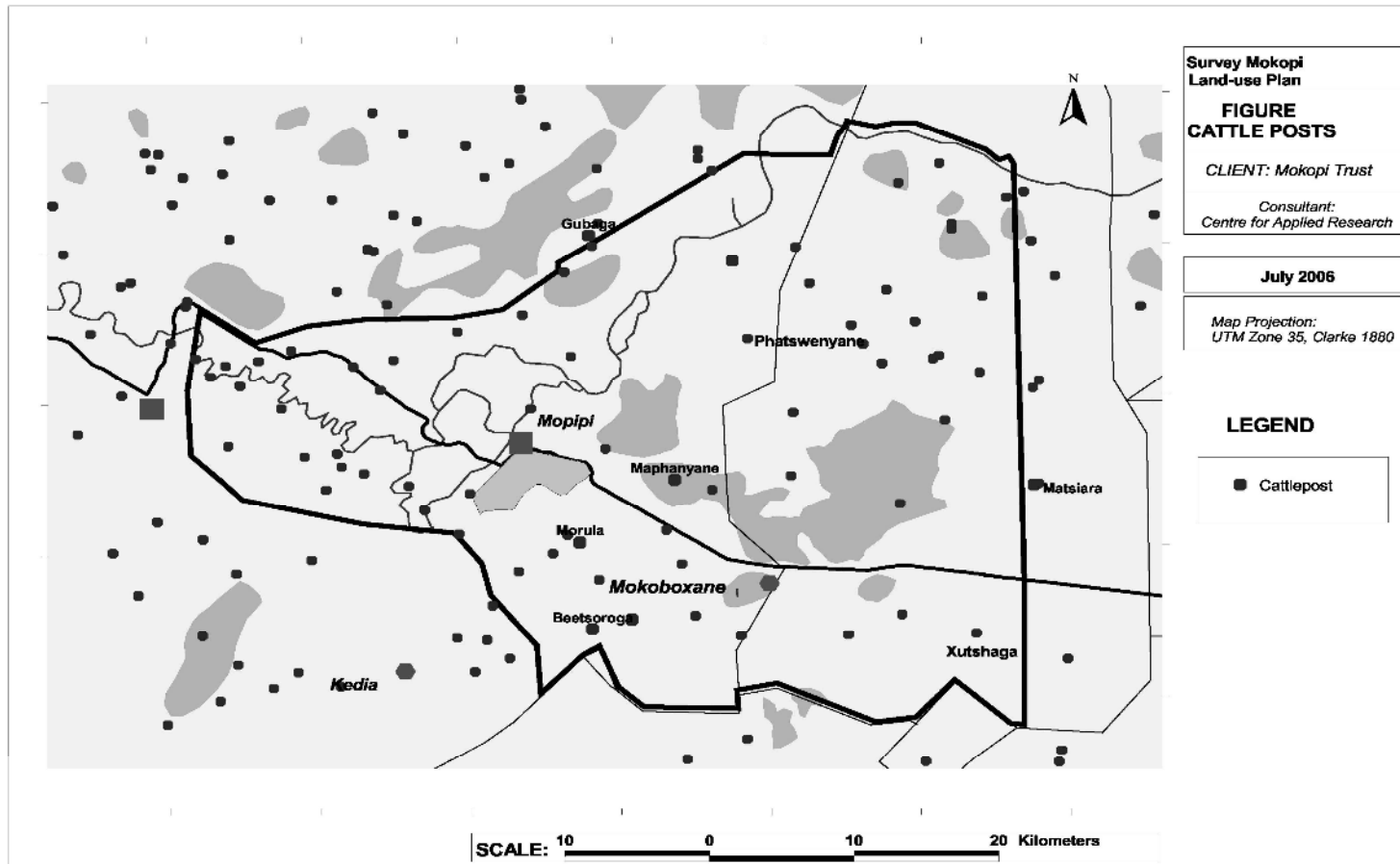


Figure 5.8 Archaeological sites in the MCT area.

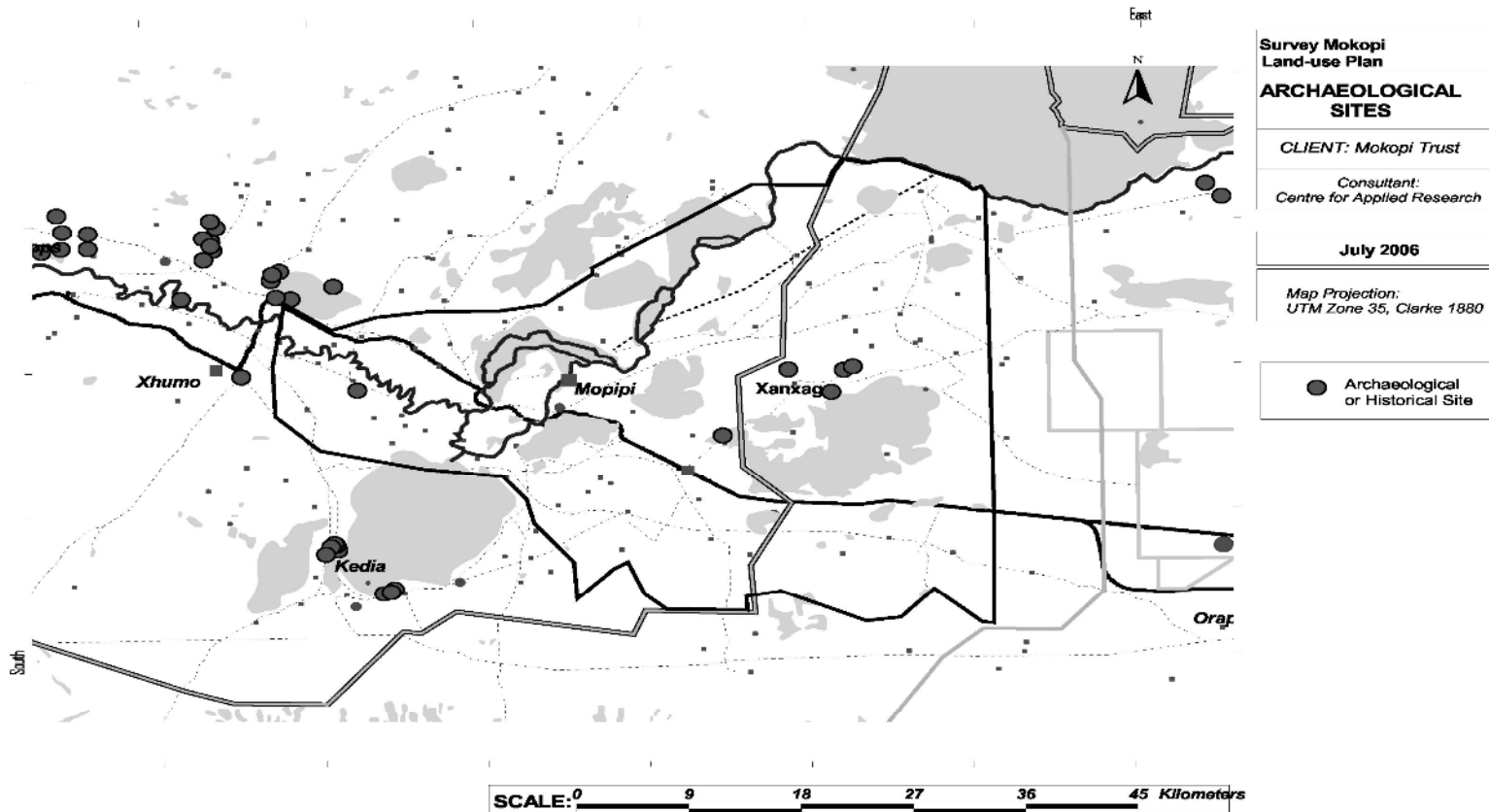
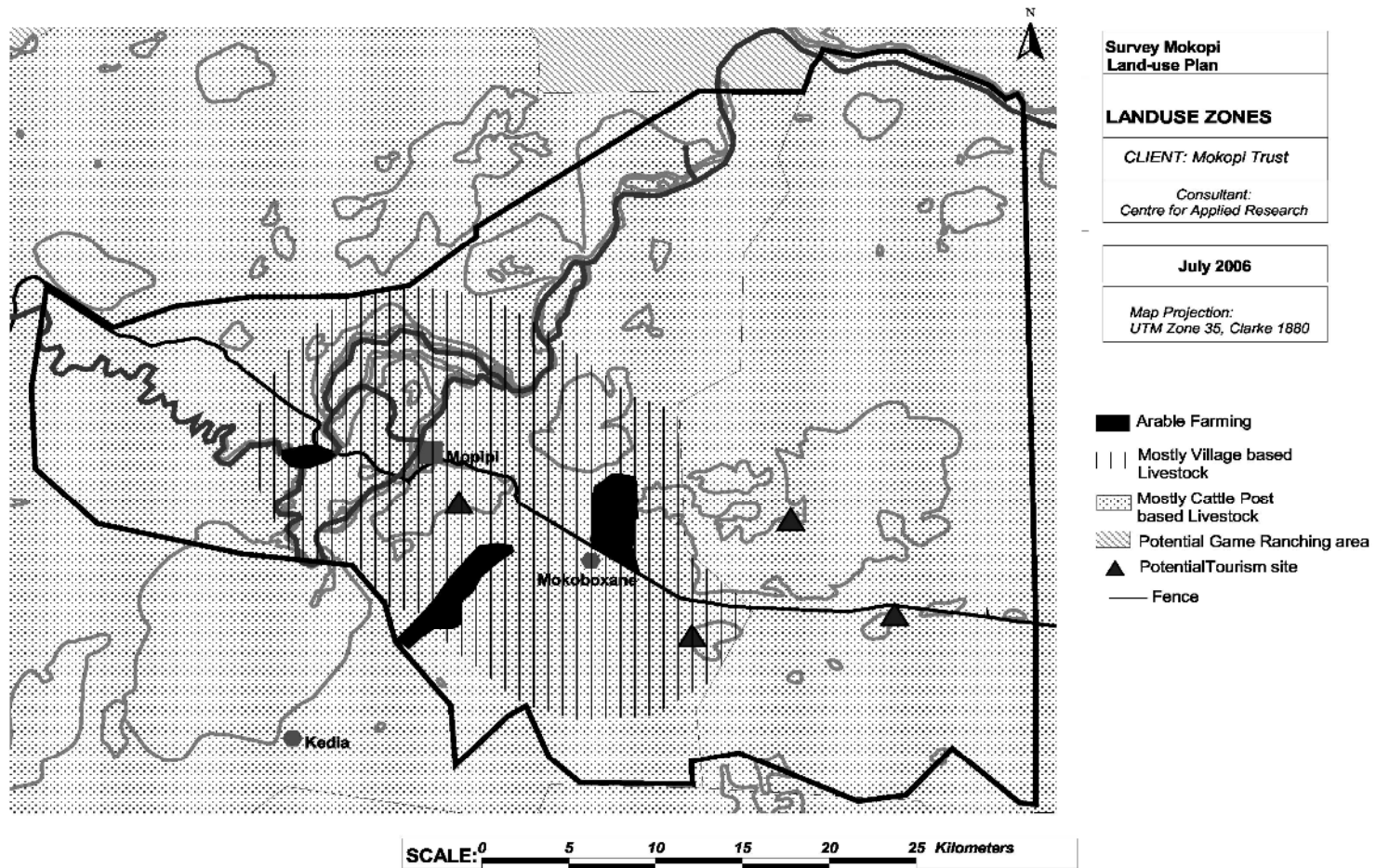


Figure 9.1: Proposed land use zones



Land Use and Range Resources Management Plan for Mokopi Conservation Trust

Appendix 1: Supporting statistical tables

Table 1.1: Mean monthly rainfall with averaged totals

	Dukwe	Sowa	Nata	Gweta	Makalama	Motopi	Rakops	Toromo	Mmadiko	Mopipi	Orapa	Letlhaka
Jan	96.6	156.1	127.3	111.5	94	82.2	93.5	35	59.3	68.3	93.3	105.9
Feb	61.3	97	90.9	82.5	103.8	62.5	60.1	94	40.9	20.9	75	115.4
Mar	46.7	55.3	48.1	56.7	55.6	36.8	47	29.2	17.1	56.9	42.4	61.6
Apr	9.5	3.1	14.9	23.8	19.4	4.2	20.8	10.2	6.2	7.1	10.5	1.7
May	4.4	8.1	2.8	4.8	3.3	1.5	3	3.9	3.4	8.1	4.2	7.5
Jun	1.7	6.6	2.1	0.4	0.6	0.7	1.7	0	0	0	0.3	6.2
Jul	1	3	0.8	0	0	1.1	0.1	0	0	0.1	0.2	0.4
Aug	0	0	0	0	0.5	0	0.8	0	0	0	0	0
Sep	3.9	5.7	3.3	3.6	6.6	0	2.8	2.9	4.2	5.6	2.9	2.9
Oct	20	11.4	20.6	15.6	23.2	29.2	17.7	31.8	16	12.9	24.2	9.3
Nov	62.3	54.2	58.6	43.7	45.1	47.8	40.6	25.4	31.3	29	52.9	53
Dec	68	78.3	89.9	67.1	104.7	48.8	61.4	36.8	64.9	27.3	53.9	86.2
Total	375.4	478.8	459.3	409.7	456.8	314.8	349.5	269.2	243.3	236.2	359.8	450.1

Source: DMS.

Table 1.2: Population and other socioeconomic characteristics of the area

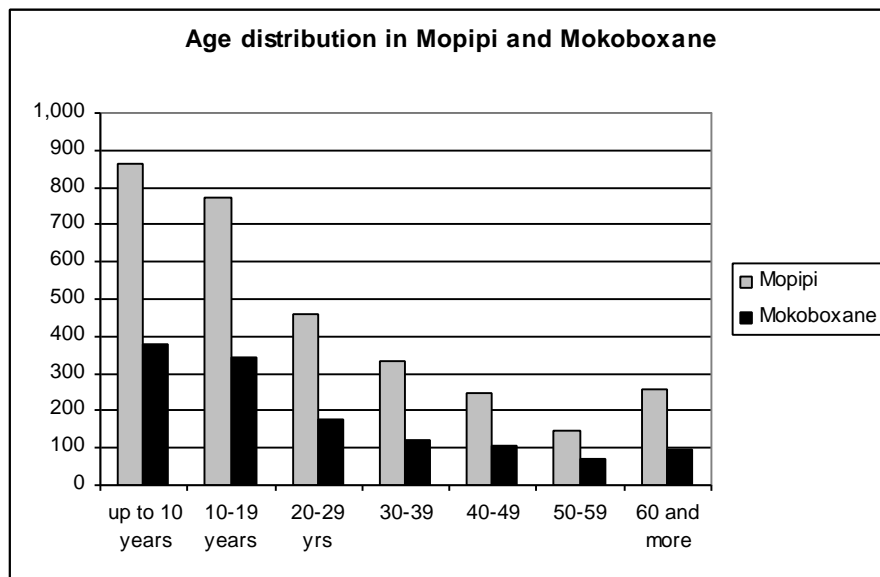
	Mopipi			% (2001 figures)	Mokoboxane			% (of 2001 figures)
	1981	1991	2001		1981	1991	2001	
Total population	1540	2264	3066	-	180	614	1290	-
Households			665	-			272	-
Households using fuel wood for;								
heating space			597	89.7			199	73.2
Cooking			553	83.2			233	85.7
Lighting			37	5.6			30	11.0
Households owning livestock;								
Cattle			470	70.7			155	57.0
Goats			455	68.4			154	56.6
Sheep			160	24.1			20	7.4
Households who planted the previous year			392	59.0			129	47.4
Households with thatch roof			337	50.7			162	59.6
Households with access to land for ploughing								
Own the land			350	52.6			100	36.8
Have access			159	23.9			54	19.9
People in cash employment			342				216	

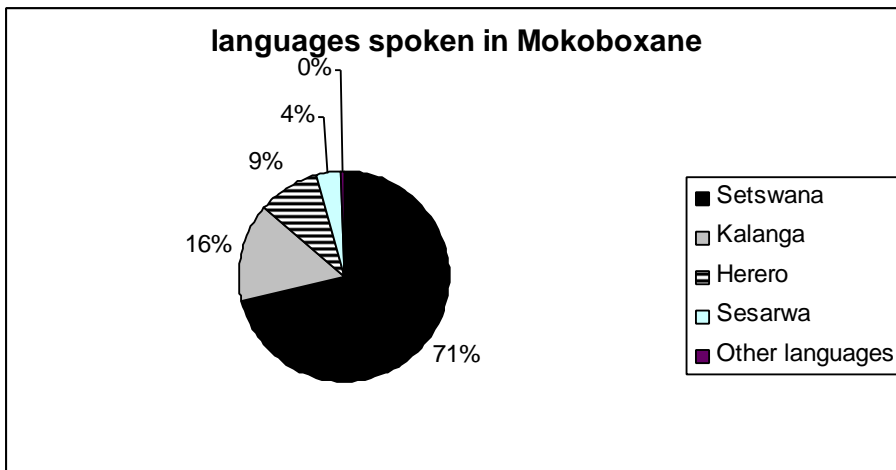
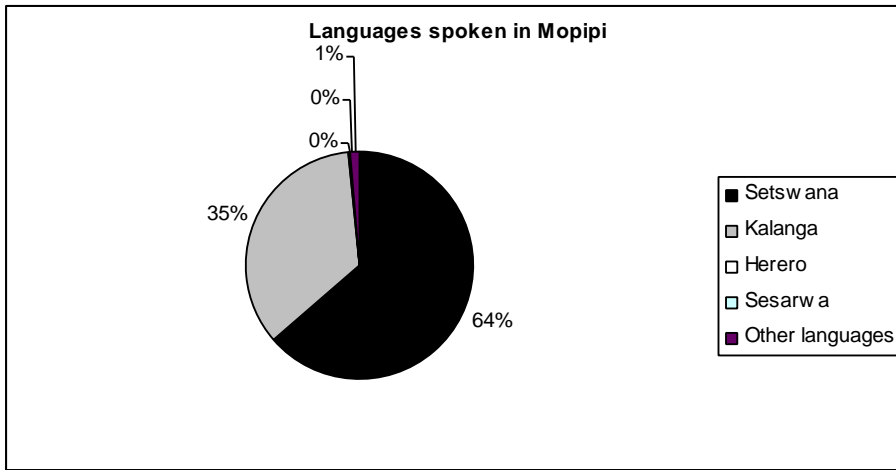
Sources: Population Census report and files

Table 1.3: Other population characteristics

	Mopipi	Mokoboxane
Total population	3066	1290
Male	1232	540
Female	1834	750
Households	665	272
Population that ever attended school and educational attainment		
Pre-school	95	65
Non-formal	82	13
Primary	987	428
Secondary	698	258
Employment; (12 years and above)		
Seasonal work paid people	48	17
Non seasonal work paid people	365	232
Total economic active people	707	372
Total economic inactive people	1364	495
Households receiving remittances		
From within Botswana	456	346
From outside Botswana	16	13
Pensions/rents/maintenance	2401	1055

Sources: Population Census report and files





Source: CSO Population Census data.

Table 1.4: Livestock figures for area 4A and B by cattle crushes

Area 4B	Cattle						Goats				
Crushes	2000	2001	2002	2003	2004	2005	2000	2001	2002	2003	2004
Xhago	722	759			202	500	121				118
Chauwe	365	199			272	184	484				264
Kudubane1	338				251	264	140				92
Kudubane 2	920	1182	949		261	499	227		50		146
Masumantle					473	473					212
Ngweeburu	436	809	711		376	327	256		336		293
Xhanekaga	1500	1501	1223	396	693	747	226		182	18	230
Maditse	654	773	855		343	343	412		495		179
Maditsenyane	1181	967	1280		694	694	653		336		488
Mawela					508	678					316
Seipone	747	1051	672		1015	949	328		799		217
Xwiichaga	434	798	580		148	72	48		357		355
Phokomogoree	205	305	344	185	108	131	184		139		97
Matsiara	554	428	594	173	177	177	434		392	179	80
Bayang	328		398		144	144	324		566		104
Nxaretsao	335	559	546	164	197	152	274		404	215	179
Seophiri	731	1231	113		151	151	507		759		273
Sorokatshaa	958	1198	1053		555	755	765		375		259
Xhaakae						396					
Beetsha East	465	511	368		1534	151	393		218		590
Kubi	1135	913	959			706	438		742		
*Chai						136					
Total	12008	13184				8493	6214				4492
Area 4A	Cattle						Goats				
Xhuutshaa				-		316					
Lebunyane	545	486	474	-	297	238	149	-	91	-	61
Koningo		1232	811	-	438	476	-	-	352	-	117
Dwaatsha east	292	439	197	-	-	102	224	-	83	-	-
Dwaatsha west	575	468	422	-	-	42	440	-	206	-	-
Morula				-	-	195	-	-	-	-	-
Phorokwe	1080	1352	1249	-	702	503	706	-	518	-	457
Mmakgari	1252		2644	-	763	634	736	-	736	-	258
Phwatshwanyane	608	993	1186	-	485	493	557	-	1254	-	253
Beetsha west	1283	1347	1381	-	1534	732	555	-	603	-	590
*Ngerekamo	660	1975	1252	-	650	913	334	-	753	-	288
Makhandlela		439	431	-	124	126	-	-	188	-	74
Gubaga	1526	1480	1542	-	541	701	712	-	606	-	274
Total	7821	10211	11589	-	5534	5471	4413	-	5390	-	2372

Source: DAHP data files

Appendix 2: Main fodder trees and shrubs

Table 2.1 lists 124 fodder trees and shrubs found in dry tropical Africa Source: Fodder trees and shrubs in range and farming systems in dry tropical Africa by M.S. Dicko and L.K. Sikena Series title: FAO Animal Production and Health Papers, 1992. The inventory was based on the extensive reviews and reports made by Edwards (1948), Baumer (1983), Dicko (1980), Dicko and Sayers (1988), Keya *et al.* (1991), Lamprey *et al.* (1980), Le Hou  rou (1980), McKay and Frandsen (1969) and Walker (1980).

Table 2.1. List of main fodder trees and shrubs

Mimosaceae:	<i>Albizia anthelmintica</i> , <i>Acacia albida</i> (<i>Faidherbia albida</i>), <i>A. benthamii</i> , <i>A. brevispica</i> , <i>A. erioloba</i> , <i>A. ehrenbergiana</i> , <i>A. karoo</i> , <i>A. laeta</i> , <i>A. mellifera</i> , <i>A. nilotica</i> , <i>A. nubica</i> , <i>A. raddiana</i> , <i>A. senegal</i> , <i>A. seyal</i> , <i>A. tortilis</i> , <i>Prosopis africana</i> , <i>Parkia biglobosa</i> .
Combretaceae:	<i>Anogeissus leiocarpus</i> , <i>A. schimperi</i> , <i>Combretum aculeatum</i> , <i>C. apiculatum</i> , <i>C. denhardtiorum</i> , <i>C. eleagnoides</i> , <i>C. exaltatum</i> , <i>C. fragans</i> , <i>C. ghazalense</i> , <i>C. glutinosum</i> , <i>C. micranthum</i> , <i>C. mossambicense</i> , <i>Guiera senegalensis</i> , <i>Terminalia holstii</i> , <i>T. ruspolii</i> .
Caesalpiniaceae:	<i>Afzelia africana</i> , <i>Bauhinia petersiana</i> , <i>B. reticulata</i> , <i>B. rufescens</i> , <i>Cassia sieberiana</i> , <i>C. tora</i> , <i>Colophospermum mopane</i> , <i>Cordeauxia edulis</i> , <i>Piliostigma reticulatum</i> , <i>P. thonningii</i> , <i>Tamarindus indica</i> .
Capparidaceae:	<i>Boscia albitrunca</i> , <i>B. angustifolia</i> , <i>B. salicifolia</i> , <i>B. senegalensis</i> , <i>Cadaba farinosa</i> , <i>C. glandulosa</i> , <i>Capparis decidua</i> , <i>C. tomentosa</i> , <i>Crateva adansonii</i> , <i>Maerua angolensis</i> , <i>M. crassifolia</i> , <i>M. parvifolia</i> , <i>M. tricophylla</i> .
Papilionaceae:	<i>Baphia massaiensis ssp obovata</i> , <i>Dalbergia melanoxylon</i> , <i>Indigofera garckeana</i> , <i>I. spinosa</i> , <i>Lonchocarpus capassa</i> , <i>Pterocarpus lucens</i> , <i>P. erinaceus</i> , <i>Rhychosia flavissima</i> .
Tiliaceae:	<i>Grewia bicolor</i> , <i>G. flava</i> , <i>G. flavescens</i> , <i>G. kakothamnus</i> , <i>G. tenax</i> , <i>G. villosa</i> .
Acanthaceae:	<i>Barleria eranthmoides</i> , <i>B. proxima</i> , <i>Disperma Kilimandscharica</i> , <i>Justicia Caendeir</i> , <i>Justicia Caeruleir</i> , <i>J. pinguor</i> .
Convolvulaceae:	<i>Ipomea hardwickii</i> , <i>I. eriocarpa</i> , <i>I. acanthocarpa</i> , <i>I. coccinasperma</i> .
Rubiaceae:	<i>Feretia apodanthera</i> , <i>Gardenia amencana</i> , <i>G. spatulifolia</i> , <i>Mitragyna incenus</i>
Anacardiaceae:	<i>Lannea stuhlmannii</i> , <i>Sclerocarya birrea</i> , <i>S. caffra</i>
Labiatae:	<i>Leucas neuliziana</i> , <i>Hoslundia opposita</i> , <i>Plectranthus iginansus</i> .
Verbenaceae:	<i>Avicennia africana</i> , <i>Clerodendron myricoides</i> , <i>Premna vibumoides</i> .
Burseraceae:	<i>Commiphora africana</i> , <i>C. boiviniana</i> .
Euphorbiaceae:	<i>Acalypha fructicosa</i> , <i>Securinega virosa</i> .
Rhamnaceae:	<i>Ziziphus mauritiana</i> , <i>Z. mucronata</i> .
Simaroubaceae:	<i>Balanites aegyptiaca</i> , <i>B. maughamii</i> .
Amaranthaceae:	<i>Sericocomopsis hilderbrandtii</i> .
Annonaceae:	<i>Annona aremaria</i> .
Asclepiadaceae:	<i>Oxystelma bourmouense</i> .
Bombaceae:	<i>Adansonia digitata</i> .
Boraginaceae:	<i>Heliotropium albohispidium</i> .
Cyperaceae:	<i>Croton dichogamus</i> .
Ebenaceae:	<i>Dispiros mespiliformis</i> .
Erythroxylaceae:	<i>Erythroxylum zambesiacum</i> .
Hypocraeteaceae:	<i>Hypocraetea africana</i> .
Liliaceae:	<i>Asparagus spp.</i>
Loganiaceae:	<i>Strychnos innocua</i> .
Lythraceae:	<i>Hypocraetea africana</i>
Lythraceae:	<i>Lawsonia inermis</i> .
Malvaceae:	<i>Hibiscus micranthus</i> .
Moraceae:	<i>Ficus gnaphalocarpa</i> .
Moringaceae:	<i>Moringa oleifera</i> .
Ochnaceae:	<i>Ochna stuhlmannii</i> .
Oleaceae:	<i>Ximenia americana</i> .
Plumbaginaceae:	<i>Plumbago zeylanica</i> .
Salvadoraceae:	<i>Salvadora persica</i> .
Sterculiaceae:	<i>Cola laurifolia</i> .
Ulmaceae:	<i>Celtis integrifolia</i> .
Umbellifera:	<i>Steganotaenia araliacea</i> .

This list should certainly be longer, particularly if one considers the fact that severe forage scarcity in dry tropical Africa can make herbivores eat anything including pieces of paper and plastic material. Whyte's (1947) assertion that 75% of trees and shrubs in Africa are browsed to a greater or lesser extent by game and domestic animals is surely applicable to dry tropical Africa.

Appendix 3: Species suitable for dust control.

Vetiver grass, (*Vetiveria zizanioides* L.), or khus khus, is native to South and South-East Asia, and has proven effective in the rehabilitation of acid mine tailings in Australia (see e.g. Truong, 2005) and China (see Pang *et al*, 2003) with performance in all cases improved with the use of fertilisers. The latter also applies to *Cynodon dactylon*, a species that features prominently across a wide range of mine tailings rehabilitation projects. In many ways Vetiver grass as a potential coloniser of disturbed ground appears almost too good to be true. It can be grown in areas with an annual rainfall greater than 450 to 500 mm and can live for up to 60 years. Due to its extensive and deep root system, it is very tolerant to drought, fire and slashing, with established plants able to withstand extreme heat (50 °C), and frost (-10 °C). It can be established on very acid, sodic, alkaline, or saline soils and tolerates a range of heavy metals in the soil. It is non-invasive, has no runners nor rhizomes, and only spreads by tillering (Carey, 2006). Consequently established, vetiver plants stay where they are planted.

Vetiver is palatable to stock, especially when actively growing and prior to flowering. Mature plants are less palatable but will be eaten by stock in drought conditions. A sterile cultivar, registered as *Monto vetiver*, has been approved by the Environment Protection Agency, in Queensland, Australia, and tested under a wide range of climatic conditions (Carey, 2006). Van der Merwe *et al* (2004) point out that the use of Vetiver grass for land reclamation is on the increase in South Africa, not least due to its effectiveness.

Cynodon dactylon is an attractive forage option for many beef producers due to its potential to sustain high stocking rates and produce high DM yields, during the growing season (Scarborough *et al*, 2002). The latter authors point out that in the southeastern USA the traditional use of this forage has been to sustain grazing during the growing season, with many producers now interested in winter feeding systems that involve stockpiling the grass as hay, to provide winter pasture for grazing stock. These types of winter feeding systems are attractive, due to their potential to extend the grazing season for beef cows, thereby reducing the need for supplemental hay. It should perhaps be noted however that *Cynodon dactylon* constitutes a weed problem in arable lands in Botswana (Phillips, 1993; Abdullahi *et al*, 2000); van Oudtshoorn, 1992).

Significantly after three good rainfall years, that exceeded the average of 240mm, the top of tailings dam in Zimbabwe progressed from a typical expanse of barren white sands, to a lush plain of long grass, with approximately half of the 40,000 indigenous trees grown as seedlings at a nursery and transplanted, surviving. The main problem during the trials was the destruction of experimental plots by baboons, warthog and kudu (Smith, 2002).

Piha *et al* (1995) on an alkaline tin mine tailings dam in Zimbabwe found that only 14 of the 55 tree species planted in field trials showed high survival rates and rapid growth, with the most promising nitrogen fixers being *Acacia amythetophylla* Steud. ex A.Rich., *A. erioloba* E.mey., *A. galpinii* Burt Davy, *A. gerrardii*, *A.rehmanniana* Schinz, *A.sieberiana*, *A.tortilis*, *Dichrostachys cinerea*(L.) Wight *Faidherbia albida* (Delile) A. Chev., *Leucaena leucocephala* (Lam.) De Wit and *Sesbania sesban*.

Broader more esoteric arguments concerning the contrasting species composition of rehabilitated disturbed areas as compared to the surrounding grazing lands tend to overlook the urgent need to effectively manage the short term erosion potential of the bare areas against the longer term aesthetics and economic arguments. Indeed, for areas that pose a persistent dust hazard the short term expediency associated with using exotic species, because of their rapid growth rates and potential to prevent long lasting dust pollution impacts over a much wider area, must surely outweigh the longer term costs of pastures that differ in species composition from the surrounding undisturbed veld.

Appendix 4: Suitable species for game ranching

Species that occurred within the MCT area in the recent past are discussed below with a view to exploring their potential for game ranching or intensive production. Cheetah, eland, roan, sable, warthog, waterbuck, white rhino and wild dogs are now locally extinct and not discussed here.

Buffalo

Intensive production of buffaloes, especially when linked to trophy hunting, can be a lucrative business. A buffalo hunt is currently worth US\$10,000. The MCT is located within a buffer or surveillance zone – an area where no buffaloes are allowed. A situation that also affects the proposed Hima Game Ranch at Kedia.

The minimum habitat size to keep free ranging buffaloes is 400ha – as specified by the various conservation agencies (Conroy, 2005). Until such time as disease free buffaloes are allowed south of the red line fence (Kuke fence and Area 4B this valuable game species and the substantial economic returns it can provide, will remain unattainable to game ranchers and/or community based organisations.

The below table considers the intensive production of wildlife species that used to occur within the MCT area. The overall conclusion is that there is no real alternative to harvesting the surplus of a 'natural' population. This opportunity existed in the 1970s but has become increasingly less realistic since the drought of the 1980s and today must be explicitly stated as a 'pipe-dream' because of the isolation of the MCT from the wildlife populations of the CKGR and MPNP.

Eland

Eland's placid nature, high reproductive rate, rapid fattening rate, excellent quality milk and meat and an apparent independence of water led many researchers to believe that the eland was better equipped to utilise savanna and semi-arid rangeland than domestic stock (Du Toit, 2005). However, as the latter author points out most studies have concluded that under the limiting conditions imposed by extensive wildlife production, the eland cannot be kept at the same stocking density as cattle. Because of its high degree of mobility, low social cohesiveness and relatively small natural herd sizes, meat production from eland is also less than from cattle (Du Toit, 2005).

The experience of the Game Harvesting Project at Kedia (1986-1991) that focused upon eland failed for a number of reasons, including drought, unsustainable harvesting, the restrictions to mobility imposed by veterinary disease cordon fences and mismanagement. The Kedia Project also illustrated the essential point that extensive wildlife production cannot work without the provision of livestock free land. Indeed, the expectation that game can 'fit in' around heavily stocked cattleposts within the area set aside for them is simply unrealistic. In this respect, livestock free or lowly stocked areas, are an essential prerequisite to any attempt to reintroduce and manage game populations within the MCT.

Springbok

Springbok are adapted to arid and semi-arid areas that receive a rainfall of less than 450mm per year. The distribution is determined by the absence of tick-borne diseases such as heartwater or babesiosis. Regions with an annual rainfall of higher than 450mm are not suitable for springbok production simply because of the presence of various species of the tick genus *Amblyomma* that transmits the disease.

Springbok graze on the pans and prefer shrubs and geophytes, carefully selecting the most nutritious plant parts. In the Kalahari, like the gemsbok (*Oryx gazella*), springbok can survive without surface water, but in a confined situation will need to drink 3 to 4 litres per day. Springbok are mixed feeders with a grass:browse ratio of 32:68 (Conroy, 2005) and as the latter author points out being concentrate feeders they do well on lucerne and will prefer it to grass.

On the basis of the large number of springbok that can be kept on a wildlife unit, the excellent productivity and the high quality of meat that is produced, Conroy (2005) stresses that the springbok is an ideal alternative to domestic livestock production in the arid regions of southern Africa. Springbok can also be produced in combination with domestic livestock as a viable mixed animal production enterprise (Conroy, 2005). Although the latter author notes that in a drought supplementary feeding in the veld will not succeed if livestock are in the same camp, because the livestock will dominate. By contrast if springbok are kept on their own there should be no problems (Conroy, 2005).

It seems likely that immediately south of the MPNP extensive springbok production could provide a return that is greater than that from domestic livestock. Trophy hunting and photographic safaris could also boost the income derived. Trophy hunting while providing a high return seldom involves taking more than 5-6 per cent of the population, leaving a further 30 – 35 per cent of the population to be marketed as meat, for biltong hunting, or for live sales (Conroy, 2005). As the latter author points out even after this exercise there may still be a surplus of animals that has to be culled for the purpose of herd and veld management (Conroy, 2005).

The exporting of springbok meet can be a lucrative business but requires a high level of organisation and efficiency that is difficult to achieve in a relatively remote area. Moreover, the surveillance zone nature of the MCT and the stringent disease restrictions would preclude the possibility of meat exports.

Summary

Species	Comments
Buffalo <i>Syncerus caffer</i>	No buffaloes are allowed in the surveillance zone
Eland <i>Taurotragus oryx</i>	High degree of mobility, low social cohesiveness and relatively small natural herd sizes – results in lower meat production than in cattle. Susceptible to tick-borne diseases and mainly nocturnal feeding behaviour are the main obstacles to semi-intensive production.
Greater Kudu <i>Tragelaphus strepsiceros</i>	Temperamental, Highly susceptible to diseases such as anthrax, pneumonia, tick-related diseases and the viral disease rabies.
Springbok <i>Antidorcas marsupialis</i>	High quality meat – potential to produce in combination with domestic stock. Considerable potential.
Ostrich <i>Struthio camelus</i>	Can be kept successfully on wildlife ranches but are primarily grazers that can severely overutilise the vegetation. Intensive production while a better economic alternative requires careful planning and commitment.
Impala <i>Aepyceros melampus</i>	Nxai Pan is one of the few areas in southern Africa where springbok and impala can be found together.

Appendix 5: Wildlife resources and the Makgadikgadi Pans area

5.1 Wildlife species

Elephants

The grasslands of Makgadikgadi appear to be too saline for elephants (Ferrar, 1995). The latter author also points out that those that venture this far south are exclusively bull groups which move down to Nxai Pan in the wet season, generally returning north as the surface water dries up. Those that head west do cause damage to the BLDC fences and water points and occasionally some move southwards, while a small group of 2-4 bulls are reported to be permanent residents on the Boteti, south-east of Moreomaoto (Ferrar, 1995). In good rainfall years it has been known for lone bulls to move through the CKGR down to Kgalagadi District, before being removed as problem animals. Today the electrified fence around MPNP will make such occurrences less likely, although the Hainaveld farm fences and the Kuke fence do not constitute a barrier to elephants.

Buffalo

The Department of Animal Health actively prevents contact between buffalo and cattle populations in the area between Nxai Pan National Park and south of the Boteti. Indeed, any buffalo that extend south of the buffalo fence in Nxai Pan NP are shot.

The five most important factors that determine the suitability of the habitat for buffaloes are food, water, shade, wallows and competition from other herbivores. The pools that exist in the Boteti River do provide suitable habitat, with a reportedly disease free population that existed south of Xhumaga herded north by the use of a helicopter in the late 1990s, and any strays eradicated.

Wildebeest and Zebra - Makgadikgadi

Wildebeest and zebra populations in the Makgadikgadi undertake a classic migration, although the main concentrations of each species stay quite separate. Both species graze the short grass plains along the western edge of Ntewe pan in the wet season (Dec-April), for as long as surface water and green grass permit, and then migrate westwards to the Boteti River as the region dries out. The entire dry season (May - November) is then spent along the riparian fringe of the Boteti, roughly between Makalamabedi and Tsoe, with the animals moving out in (once) large and spectacular herds as soon as it rains. As the DHV (1980) report states, '*whether the quality of food or availability of free water, or both, is the chief cause of the migration is unknown.*' (Vol. IV.p.18).

For the Makgadikgadi wildlife populations the Boteti River can be regarded as a 'critical refuge area' providing surface water that is in close proximity to shade and forage resources found within the riparian fringe. This combination of water and forage provision should be emphasised as critical, because it occurs at a time of increasing heat stress (the dry season) which greatly restricts mobility. The zebra and wildebeest populations therefore converged on the river from the Makgadikgadi Pans, as part of a seasonal migration, while domestic stock with similar water and forage requirements had year round residence. The potential for conflict is immediately apparent, particularly in a run of poor rainfall years when there is an absolute shortage of forage around surface water and the energy demands of traveling large distances from the river simply cannot be met.

Wildebeest - CKGR

The first comprehensive study of large herbivores within the Kalahari ecosystem (DHV, 1980) concluded that the wildebeest population, estimated at over one quarter of a million, were essentially nomadic and opportunistic in their spatial and temporal movements, according to the availability of green grass and melon crops (*Citrillus lanatus* and *Citrillus naudianus*), in the dry season (Murray, 1988; Lindsay, 1992).

However, in drier than average years the wildebeest must seek access to water, which means either moving southwards to the Orange/Molopo River, or north-eastwards to Lake Xau, from the southern and western Kalahari. Both sets of migrants have met with catastrophe during the movements in droughts that have been documented in the available historical records.

Year	Description	Source
1930	mass die-offs in eastern Botswana	Campbell 1979, 1981 Child, 1972
1941	movements towards and deaths along the Molopo River	Spinage 1992
1962	large numbers moving east along the Kuke fence	Silberbauer 1965
1964	carcasses in CKGR, die-off of >15,000 along Boteti River	Silberbauer 1965, Child 1972
1969	movements towards the Molopo (and Orange?) River	Williamson et al 1988
1970	die-off at Lake Xau	Child 1972
1979-1980	migration through CKGR to Lake Xau	Owens and Owens 1986
1980	movements towards the Molopo (and Orange?) River	Williamson et al 1988
1981-1984	movements towards the Molopo (and Orange?) River	Williamson et al 1988
1983	major die-off of >52,000 at lake Xau	Williamsom and Mbanjo 1988
1985	die-off of >5,000 at Lake Xau and Mopipi movements towards the Molopo (and Orange?) River	Calef 1985 Williamson et al 1988
	high mortality in Kalahari Gemsbok NP, South Africa	Knight 1991

Significantly, in the 1980s drought, those wildebeest that negotiated the veterinary cordon fences and made it to Mopipi Dam, then faced competition with livestock and people for both water and, more critically, the scarce available grazing around water (Parry, 1987a; Williamson and Mbanjo, 1988). Mortalities resulted from the need to make a round trip of up to 100km in order to attain the essential, but isolated, resources of water, shade and grazing. The latter had been seriously depleted by heavy livestock grazing in the Mopipi/ L. Xau area, such that these extremely stressful conditions coupled with harassment from Mopipi residents caused heavy additional mortality (Williamson and Williamson, 1984).

Hartebeest

Hartebeest have declined drastically over the past seven years (Ferrar, 1995). The reasons for this decline are not clearly known, although the combined effects of competition with humans and livestock for water and its surrounding forage, habitat displacement and over-hunting are likely to have been pivotal.

Gemsbok and Springbok

Gemsbok occur in small numbers throughout the Pans, with springbok also preferring the areas of short grass around these depressions with a resident population centring on Nxai Pan. Illegal hunting seems likely to have been significant in drastically reducing overall springbok numbers in Makgadikgadi over the last seven years (Ferrar, 1995).

Giraffe

Giraffe reportedly occur throughout the MPNP area, but tend to avoid the salt pans during the wet season (Ferrar, 1995). As browsers, the Boteti River riparian zone is likely to be a favoured habitat, although reliable information on both numbers and distribution is lacking.

Ostrich

Ostriches used to be widespread in the MCT but are today a rare sight. Several were spotted on Lake Xau although they were absent from all the Pans visited. Veterinary cordon fences, ranch fences, the new predator proof fence around Makgadikgadi Pans NP and hunting have undoubtedly all played a role in almost removing this species from the area entirely. For those reported by the DWNP aerial surveys it is important to note that the numbers are small and the confidence that can be attached to the results therefore limited.

Browsers

Due to their independence from surface water supplies, relatively drought resistant forage (i.e. browse) and more cryptic habit (which makes hunting of these species difficult), populations of browsers such as kudu and impala have shown greater constancy than those for grazers. The Boteti woodlands undoubtedly constitute an important habitat for these species, although the estimated numbers should be treated with some caution, because they are difficult to census from the air.

Locally extinct species

Many large herbivores are now locally extinct or at best marginal to Makgadikgadi: buffalo, cheetah, eland, roan, sable, warthog, waterbuck, white rhino and wild dogs (Ferrar, 1985). Separation of the relative roles of such factors as human and livestock encroachment, habitat displacement, drought, fences and over-hunting, in causing these declines is difficult. Indeed, there seems little doubt that for many species it is their combined effects that has proven so devastating.

Summary

<i>Species</i>	<i>Characteristics</i>
<i>Elephant</i>	Makgadikgadi Pan region is too saline to be attractive to elephants. Small group of bull elephants have taken up residence at Moreomaotao
<i>Buffalo</i>	Movements south of BLDC ranch actively discouraged by patrols. Small group resident at Moreomaotao - larger incursions prevented by veterinary patrols
<i>Zebra</i>	Distinct sub-population moves between Chobe (dry) and Nxai (wet) as part of a seasonal migration. Another sub-population moves between the Pans (wet) and the Boteti River (dry)
<i>Wildebeest</i>	Chobe - Nxai group Pans - Boteti River group Kalahari sub-population - movements from CKGR to Boteti now entirely prevented by fencing of the eastern boundary of the CKGR
<i>Hartebeest</i>	Little information exists concerning their movement patterns and habitat requirements - small populations only
<i>Gemsbok</i>	Resident population centring on the Pans
<i>Kudu</i>	Cryptic browser - Boteti riparian fringe
<i>Giraffe</i>	Small population size - avoids Pans in wet season
<i>Springbok</i>	Declining population centres on Nxai Pan
<i>Impala</i>	Boteti riparian zone and open woodlands
<i>Hippo</i>	Once precarious existence in the permanent pools at Xhumaga – population relocated to the north

5.2 Animal population numbers in Makgadikgadi

5.2.1 Wildlife

The drastic reduction in large herbivore biomass that has occurred in the Makgadikgadi System is captured below. It should be noted that all figures are an underestimate of actual populations, although the reductions in the size of the wildebeest and zebra populations is staggering.

<i>Species</i>	<i>1978</i>	<i>1991</i>	<i>1993</i>
<i>Zebra</i>	100,295	25,000	9,432
<i>Wildebeest</i>	52,991	5,000	1,618
<i>Gemsbok</i>	1,249	2,000	946
<i>Springbok</i>	6,895	15,000	31
<i>Ostrich</i>	2,903	5,000	1.038

(NB 1978 figures are from DHV (1980); 1991 and 1993 figures are from DWNP aerial surveys).

Predators

Depredation of the livestock on the western side of the Boteti River has long made the area the most notorious for PAC in the whole country. The dry season concentration of wild ungulates on the Boteti River that coincided with the arrival of the flood, by providing relatively easy prey for lions and hyenas, did result in some alleviation of the problem, although the issue has always been a major grievance of the local communities – who saw no benefits from the tourism in the Park but were required to live with predators that threatened their lives and livelihoods.

Problem Animal Control records kept by DWNP for the communities along the Boteti reveal how over three decades the problem has shifted from hippos and crocodiles, when the River flowed, to lions and hyenas before the erection of the MPNP fence and to wild dogs and leopards afterwards. Lions remain a constant threat, particularly from the CKGR, although the MPNP fence has apparently alleviated the situation with regards to populations coming from within MPNP. Local wildlife officers reported that due to the theft of solar panels, large sections of the fence were not electrified, enabling hyenas to dig under the fence, with these sites also subsequently used by lions. Jackals were not explicitly mentioned although they feature prominently in PAC reports (Vandepitts et al, 1993).

Borehole Provision – Makgadikgadi and CKGR

The reality of the huge die-offs that occurred, coupled with critical international pressure, led to the Botswana Government's decision to drill and equip boreholes for wildlife in both the CKGR (1988) and more recently in the Makgadikgadi Pans. In both cases the intention is to compensate for the loss of seasonal/drought grazing areas in the Mopipi/Lake Xau/Boteti area by providing water on a permanent basis – in the northern CKGR and Ntwetwe Pan, respectively.

However, artificial water provision within the Kalahari ecosystem, while appearing to be the logical solution, creates a number of fundamental conservation dilemmas, not least the disruption of a wilderness area (see Sweet, 1986 and Lindsay, 1992). Of all the ecological issues inherently tied up with it (see Lindsay, 1992), including the disruption of resident Kalahari water-independent herbivores through grazing depletion and the attraction of predators, and the increased possibility of disease transmission (e.g. anthrax) (Lindsay, 1992), the most fundamentally disconcerting is that the boreholes will very rapidly be appropriated by cattle owners (Sweet, 1986).

Borehole water provision is an extremely expensive attempt to overcome the fact that the National Parks and Game Reserves in the Kalahari and Makgadikgadi do not represent viable units for maintaining migrant ungulates. In this context, the Boteti River is of paramount importance and provides both a vital source of surface water in drought periods and also linkage with the Makgadikgadi Pans ecosystem.

Migratory Corridor from the Kalahari to the Makgadikgadi System

For more than two decades ecologists and wildlife biologists have emphasised that the most viable long-term option in terms of conserving the Kalahari wildebeest, would be to give the animals a substantial livestock-free corridor to water and nearby grazing along the Boteti River north of Rakops (DHV, 1980; Williamson and Williamson, 1981, 1985; Murray, 1988; Lindsay, 1992; Verlinden, 1994; Ferrar, 1995; Perkins and Ringrose, 1996). Regrettably, this suggestion has not been adopted by policy makers and the chance to open up the Kalahari ecosystem and ensure the maintenance of the longest wildebeest migration in Africa, has not been seized. If it had, the diversification opportunities for the MCT through wildlife and tourism related activities would be considerable.

5.2.3 Domestic stock

Aerial surveys conducted by the DWNP tend to extend as far south of the Kuke fence and while focusing upon the area south of the MPNP, do not cover all of the MCT. The 2003 DWNP dry season aerial survey is an exception and does extend further south, albeit at a lower sampling intensity. The results from this survey illustrate how the large herbivore biomass is dominated by domestic stock.

Appendix 6

Responsible tourism guidelines for the hospitality industry

Economic Guidelines

- Buying locally-made goods and using locally-provided services wherever quality, quantity and consistency permits.
- Facilitating business linkages with small and medium enterprises, e.g. through preferential procurement policies.
- Encouraging customers to spend money in the local economy, by providing them with opportunities to purchase locally made goods (e.g. crafts and curios) and visit local tourism attractions.
- Recruiting and employing staff in an equitable and transparent manner.
- Maximising the proportion of staff employed from the local community.
- Providing support and advice to local enterprises and entrepreneurs.

Social Guidelines

- Helping create staff and community awareness of relevant health issues, including HIV / Aids, tuberculosis, malaria, hepatitis and waterborne diseases
- Providing resources and / or funds for local community health facilities.
- Providing first aid training to staff and community members and distributing protective items (e.g. condoms).
- Contributing to local social infrastructure projects (e.g. schools, clinics) and reporting on contributions made.
- Supporting local scholars, youth sports teams and other community causes and reporting on the number and value of projects supported.
- Ensuring gender equality, career development and the implementation of national labour standards.
- Developing and publishing a social contract to guide interactions between the local community and tourists.

Environmental Guidelines

Air quality and pollution

- Managing and reducing, where possible, emissions into the atmosphere.
- Eliminating or minimising the effects of noise pollution (e.g. reducing vibrations, fitting silencers).
- Ensuring quality air in public areas through the reduction of the dust hazard.

Energy management

- Regularly measuring and monitoring all energy usage.
- Investigating instances of overuse and taking appropriate measures.
- Fitting energy saving light bulbs and other power saving devices (e.g. timers).
- Insulating hot water pipes and tanks.
- Using renewable energy (e.g. solar)

Waste & Pollution

- Using natural and recyclable materials and products.
- Sorting and separating different types of waste (e.g. cans, glass, paper) – storing and recycling them through an effective management system.
- Trapping wet waste and disposing of it responsibly (e.g. using it to boost local vegetation rehabilitation projects).
- Introducing schemes to manage waste with local community participation to empower them to participate in recycling schemes.
- Setting targets to reduce the amount of waste produced and the proportion of waste that is recycled or reused.

Water conservation

- Regularly measuring and monitoring water usage.
- Implementing water saving programmes.
- Fitting water saving devices.
- Recycling water where appropriate.

Natural Environment

- Investing a percentage of revenue towards species conservation or habitat restoration and management.
- Investigating the environmental practices of suppliers.
- Ensuring that visitors are aware of the impacts that they may have on the ecology and providing them with information on how they can behave

Appendix 7: Brief analysis of proposed MCT activities

1. Cluster of tourism projects

1.1 Acquisition and development of the Mopipi dam area

Purpose(s)	Job creation, development of dam area, control of bush encroachment and reduction of dust in Mopipi										
Activities	Revive old structures around Bay Club for environmental education and diamond mining museum, possibly conference facility Renovate and up-grade Bay Club Develop dry dam activities such as quad bikes, donkey-horse rides and small game area; bush walks, cultural activities and possibly small wet area Planting of trees to reduce and capture dust Reduce bush encroachment Re-vegetation of strip near Mopipi with grass and tree species Trips to Orapa Game Reserve and diamond mine										
Market(s) oppportunities	En-route tourists and weekend tourism										
Constraints	Skills and expertise, finances and lack of wildlife resources										
Requirements MCT	Acquisition of ownership of Bay Club and Mopipi dam land area, cooperation Land Board, financial resources, management skills for activities or Joint Venture Partner, marketing										
Costs and revenues	<table> <tr> <td>Renovation and up-grading of Bays club</td> <td>P 200 000</td> </tr> <tr> <td>Env. Info centre- museum and conference facility</td> <td>P 100-150 000</td> </tr> <tr> <td>Quad bikes: per bike</td> <td>P 15 – 20 000</td> </tr> <tr> <td>Recurrent expenditures per month</td> <td>P 10 – 20 000</td> </tr> <tr> <td>Revenues per month</td> <td>P 10 - 25 000</td> </tr> </table>	Renovation and up-grading of Bays club	P 200 000	Env. Info centre- museum and conference facility	P 100-150 000	Quad bikes: per bike	P 15 – 20 000	Recurrent expenditures per month	P 10 – 20 000	Revenues per month	P 10 - 25 000
Renovation and up-grading of Bays club	P 200 000										
Env. Info centre- museum and conference facility	P 100-150 000										
Quad bikes: per bike	P 15 – 20 000										
Recurrent expenditures per month	P 10 – 20 000										
Revenues per month	P 10 - 25 000										
External requirements	Debswana assistance, grants, land and water rights rights, training and Technical Assistance										
Laws-regulations	Permission from Debswana and LB/ dep. Of Lands, land and water rights, exclusive user rights										

Note: estimates of costs and revenues are indicative only.

Project assessment:

- Socio-economic. Medium investment and recurrent expenditures. Revenue raising: good perspectives for external financial support. Some poverty reduction and additional livelihood opportunities
- Environment. Some environmental rehabilitation and environmental awareness raising.
- Overall: **high priority** provided external support is forthcoming. Possibly JVP

1.2 Development of pan(s) for wilderness overnight stays

Purpose(s)	Job creation and environmental protection of pans
Activities	Development of campsite with simple basic services, bush walks and cultural activities (also linked with sites of foot prints), trips to OGR and mine
Market(s) opportunities	En route tourists, local and weekend tourism
Constraints	Skills and expertise Finances
Requirements MCT	Site management skills Some capital
External requirements	Training, marketing, resource rights
Costs and revenues	Investments: P 30 – 60 000 Recurrent expenditures/ month P 500- 1 500/ month Revenues/ month P 1000-1 500/month
Laws-regulations	Application of permit and support from the mine, application for financial assistance, exclusive tourism user rights

Note: estimates of costs and revenues are indicative only.

Project assessment:

- Socio-economic. Low investment and recurrent expenditures. Some revenue raising from picnicks and overnight stays; good perspectives for external financial support. Some poverty reduction and additional livelihood opportunities. Good complement to Mopipi dam development
- Environment. Very limited; awareness raising of scenic beauty. Need to conserve natural resources.
- Overall: **high** provided external support for investment is forthcoming. Good in conjunction with Mopipi dam. It is recommended to start with one pan and develop other pans depending on the market. Another possible expansion at a later stage: provision of tented camps.

1.3 Application for community zone in MNP

Purpose(s)	Acquire additional resources and livelihood options (incl. jobs, income)
Activities	1. Acquire community zone in MNP 2. Develop utilization and conservation plan for area
Market(s) opportunities	En route tourists, weekend tourists, supply of inputs for economic activities and subsistence (e.g. thatching grass) Could become valuable complement to tourism development
Constraints	Permission required from DWNP
Requirements MCT	Control use of area.
Costs and revenues	Costs are minimal. Some development costs if application would be successful Revenues: modest to medium subsistence and commercial revenues
External requirements	DWNP permission, training
Laws-regulations	Application for permit from DWNP, acquisition of resource user rights

Note: estimates of costs and revenues are indicative only.

Project assessment:

- Socio-economic. Low investment and recurrent expenditures. Some revenue raising; good perspectives for external financial support. Use for subsistence and commercial tourism. Good complement to other tourism projects. Currently no zone planned for southern MPNP.
- Environment. More positive attitude towards MPNP and sustainable use
- Overall: **medium priority and medium term** depending on DWNP cooperation. Good in conjunction with game ranching.

1.4 Negotiate access to Orapa Game Park (OGP) and mine

Purpose(s)	Offer tourist additional value
Activities	1. organise guided trips to OGP 2. visit of diamond mine
Market(s) opportunities	Wildlife complement to other tourist attractions Demonstrate diamond mining process and benefits
Constraints	Transport (costs) Cooperation Debswana
Requirements MCT	Transport arrangement
Costs and revenues	Main cost items are mostly transport and escort guide costs. Expected to be modest Revenues: likely to exceed costs
External requirements	Debswana approval and Orapa access.
Laws-regulations	Application for permit from the Mine, support from the mine, permission to charge fees to tourists and other users

Note: estimates of costs and revenues are indicative only.

Project assessment:

- Socio-economic. Low investment and recurrent expenditures. Some revenue raising. Good complement to other tourism projects. Mine security may be a problem. Requires transport.
- Environment. Not directly. Management remains responsibility of Debswana
- Overall: **medium priority but short term** depending on negotiations with Debswana. Good in conjunction with other tourism projects.

1.5 Game farm or combined unfenced livestock game utilisation

Purpose(s)	Create employment and income; better use of north-eastern part of the MCT area and suitable for State Land area that will be transferred to community
Activities	Complement for tourism and tourism diversification
Market(s) opportunities	Products: photo safaris, biltong, hunting and possibly live sales.
Constraints	Veterinary requirements, high capital costs (fence and game), low game density, management skills. Profitability modest and revenues time lagged.
Costs and revenues	Capital costs are estimated to be P 1.5 to P 3 million; Cost saving opportunities: donation of game by Debswana and reduced fencing needs Recurrent expenditures are modest Revenues: modest and time lagged. Overall profitability is initially expected to be marginal
Requirements MCT	Management skills/ JVP
External requirements	Support from DWNP and JVP??
External requirements	Support from DWNP and JVP, acquisition of rights to use state land, support from LB, Community rights,

Note: estimates of costs and revenues are indicative only.

Project assessment:

- Socio-economic. High investments and recurrent expenditures. Delay in revenues. Currently, problems with veterinary regime, and probably requires part of CT10.
- Environment. Not directly. Management remains responsibility of Debswana
- Overall: **medium to long term** depending on strategy of MCT. Good in conjunction with other tourism projects.

2 Livestock related projects

2.1 MCT management of village livestock areas

Purpose(s)	Resource rehabilitation and conservation, jobs and indirectly income generation due to improved resource base. Improved subsistence
Activities	Design of acceptable NRM system with: <ul style="list-style-type: none"> • Agree on memberships • Assess max. livestock numbers (normal-wet and dry) • Stock ceilings for individuals (normal-wet-dry) • Establish RR monitoring procedures-system • Introduce grazing fees • Temporary additional water points and grazing reserves-rotational grazing (winter and summer areas)? • Joint herd management? • Establishment of one bush control unit with five people • Consider forage provision • Firebreaks
Market(s) oppportunities	Less relevant
Constraints	Finances-grazing fees, stock control, cooperation- enforcement, conflicts
Requirements MCT	Community support Financial support
Costs and revenues	Capital costs modest (mostly water provision @ P 30 -35 000 and bush cutter @ P 15- 20 000) Recurrent expenditures: labour Revenues: firewood and higher livestock productivity (after some time)
External requirements	Training, conflict resolution
Laws-regulations	Support from Agricultural Resources Board and Land Board, community rights and bye laws.

Note: estimates of costs and revenues are indicative only.

Project assessment:

- Socio-economic. Important but hard to achieve. Requires community cooperation and agreement. Modest costs and potentially significant benefits but in the long run. Empowers communities
- Environment. Significant as open access disappears and resources would be sustainably managed.
- Overall: **high priority** and short-term but demanding and challenging. Requires cooperation from LB.

2.2 Control of bushes in village livestock areas

Purpose(s)	Resource rehabilitation, job creation
Activities	Establishment of one bush control unit with five people
Market(s) oppportunities	Increased productivity of rangelands and supply of fire wood or input for charcoal
Constraints	Finances- viability (long term benefits (doubling of productivity) and short term costs; P 1 000/ha)
Requirements MCT	Bush cutter (P 10-20 000) and selection of labourers + system (e.g. rotation?). Community support Distribution of firewood, possibly link to charcoal project.
Costs and revenues	Capital costs: bush cutter Recurrent expenditures: labour (reduced if done through labour intensive DR-programme) Revenues: firewood and higher productivity in the long run.
External requirements	Training Financial assistance (e.g. drought relief projects)
Laws-regulations	Support from community, acquisition of community rights, application for financial support and assistance

Note: estimates of costs and revenues are indicative only.

Project assessment:

- Socio-economic. Relatively high costs, and limited immediate benefits. Possibilities to reduce costs through LB- projects. Significant productivity benefits on medium to longer term; also firewood benefits.
- Environment. Considerable, especially in combination with CB- grazing management.
- Overall: **medium to high priority** as part of village grazing area management and LB- drought relief projects.

2.3 Cattle holding pen

Purpose(s)	Collective improvement of cattle conditions, better returns and improved market access; job creation
Activities	Establishment of cattle pen in enclosure (e.,g. within the drift fence)
Market(s) opportunities	Improved market access
Constraints	Red zone and buffer zone quarantine requirements Finances
Requirements MCT	Earmarking of piece of land; fodder production would improve the viability and benefits, water provision.
Costs and revenues	Capital costs; fencing and water provision Recurrent: labour and management Revenues: weight gains and higher cattle prices
External requirements	Discussion with DAHP regarding disease control and quarantine requirements
Laws-regulations	See above.

Note: estimates of costs and revenues are indicative only.

Project assessment:

- Socio-economic. Cost of development and management. Revenues from higher cattle values/ sales will only materialize after quarantine requirements have been lifted.
- Environment. Considerable, especially in combination with CB- grazing management.
- Overall: **medium to long-term priority** as part of village grazing area management.

3 Arable and fodder production

3.1 Better utilisation of dry molapo farming area

Purpose(s)	Increased food production (mostly subsistence) and some income generation
Activities	1. Encouraging and monitoring of use of molapo fields 2. Encouraging those who will not use field to 'rent it out', for example to the MCT, or recapture by Land Board. 3. Ensuring that all suitable molapo fields are allocated (if there is land left, some to the MCT) 4. Use of fertilizer or cattle manure to maintain soil fertility 5. Improve practices and crop choice to achieve higher yields.
Market(s) opportunities	Increased local food security; possibility to sell surplus
Constraints	Continuous farming may lead to depletion of soil fertility; need to improve farming practices.
Requirements MCT	Shift in emphasis towards molapo areas Willingness to broker land hiring or get directly involved as the MCT
External requirements	LB and MoA to support MCT role in promoting dry molapo farming Dep., of Crop Production (ALDEP)
Laws-regulations	Land allocations need MCT support (and LB approval)

3.2 Pilot project with Sanitas strip ploughing method

Purpose(s)	Increased food production and some income generation
Activities	1. Improved ploughing technique to catch rainwater (creation of micro catchments) inside the drift fence (1 or 2 fields) 2. requires assistance from Sanitas experts
Market(s) oppportunities	Increased local food security; possibility to sell surplus
Constraints	Limited application of technique in communal dryland farming
Requirements MCT	Support from Sanitas and IVP
Costs and revenues	If IVP funds the pilot, virtually no costs for IVP and significant potential benefits if the system works (i.e. has higher yields)
External requirements	Funding and technical support
Law regulations	--

Project assessment

- Socioeconomic. Potential benefits from trial
- Environment: better use of limited rainfall and soil moisture
- Overall; high priority if supported by IVP.

3.3 Fodder production

Purpose(s)	Livestock productivity increase; coping with droughts, depressurising rangelands
Activities	Establishment of fodder area within dryland farming zone
Market(s) oppportunities	Local, Orapa, and Letlhakane.
Constraints	
Requirements MCT	Management skills
External requirements	Support from MoA or DFRR??
Law regulations	--

3.4 Tree nursery

Purpose(s)	Environmental rehabilitation and food security; dust control and possibly cash income
Activities	Establishment of nursery with indigenous species Experiments with veld products (e.g. mokola palm)
Market(s) oppportunities	Local, Orapa, and Letlhakane.
Constraints	Limited market
Requirements MCT	Small piece of land and water
External requirements	Support from MoA or DFRR
Law-regulations	--

4 Veldproducts

4.1 Common property management of veld products

Purpose(s)	Resource conservation and rehabilitation, subsistence and cash benefits
Activities	Establishment of a community-based veld products management system for mophane, fuel wood and other valuable resources, including: <ul style="list-style-type: none"> (f) Monitoring of main veld products (g) Establishment of sustainable harvesting practices (h) Monitoring of harvesting and education (i) Controlled harvest in cattlepost livestock areas (j) Permits for commercial harvesting of veldproducts in MCT area
Market(s) opportunities	At this stage mostly subsistence oriented. A few veld products have a commercial potential (e.g. wildlife, mophane worm and hoodia), but resources are very limited..
Constraints	Finances and required cooperation of local population.
Requirements MCT	Manpower and skills
External requirements	Agricultural Resources Board and CBNRM MCT commercial rights to veld products harvesting
Laws-regulations	See above.

Project assessment:

- Socio-economic. Less conflicts; preventive strategies; revenues from commercial use. Requires exclusive veld product user rights for MCT.
- Environment. Reduced risks of future depletion of veld products.
- Overall: high priority.

5 Acquisition of water points

Purpose(s)	Acquiring of water rights to support livestock and other activities
Activities	<ol style="list-style-type: none"> 1. Identify possible water points 2. Apply for rights transfer OR 3. Develop additional water points 4. Design and collect user charges
Market(s) opportunities	Essential input for production and resource management
Constraints	Costs Management capability
Requirements MCT	Management of water points
External requirements	Transfer of water rights
Laws-regulation	Trust water rights

Numerous small scale activities: bee keeping, biltong production, poultry, fodder production, pottery etc. These are probably better done on a small scale and by individuals or small groups. The MCT could assist with training in proper harvesting techniques and marketing.