

**BOTSWANA ACTION PROGRAM AND PLAN**

Kjell A. Christophersen, Team Leader, E/DI  
Peter Warshall, University of Arizona  
Scott McCormick, Associates in Rural Development  
Lee Hannah, USAID AFR/TR/ANR

February 1989

Natural Resource Management Support Project  
(AID Project No. 698-0467)

Contract No. AFR-0467-C-00-8054-00



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## EXECUTIVE SUMMARY

This report fulfills US AID's Action Program and Action Plan for Botswana and prepares the background for the Project Identification (PID) team's visit in February, 1989.

The team reviewed the natural resource base (atmospheric, water, soils, mineral, animal and plant) and how it is utilized in Botswana. Botswana has one of the most complete baselines of natural resources information in Africa. It supports an active dialogue concerning NR policies on all levels of society with continuing changes in legislation and regulations. A National Conservation Strategy may be near adoption which will act as an umbrella for natural resources management (NRM)

The team also reviewed international, national, local, economic, cultural, and institutional influences on natural resource management. "Bottlenecks" have been highlighted. These include fragmentation of responsibilities among too many divisions of the GOB; a "brain drain" of talent from the public to the private sector; an inability to enforce specific NRM laws at a local level; the possibility of the GOB becoming overwhelmed by a rapid influx of natural resources aid; the need for a non-governmental organization (the Natural Resources Conservation Trust?) to help coordinate new NR programs; and the shortage of manpower (with or without formal education) in many natural resource sectors.

The team then wrote thumbnail sketches of over 40 projects suggested by members of the GOB, NGOs, other consultants, the US AID Mission, the US Peace Corps, and others (Annex 1). Priority areas have been identified for the PID team. They are regional (cross-border) projects; education and training; planning, research and monitoring; pilot multiple-use projects; and policy dialogues.

The teams feels that, to be successful, natural resource management projects must be implemented carefully and require long time-frames. In general, success cannot be judged for six or more years. The multiple-use pilot projects appear the most effective way to incorporate conservation with development priorities by providing multi-faceted aid to local communities. By changing attitudes and assuming responsibilities for their natural resources, local communities can secure sustainable incomes from sensible NRM practices.

The US AID mission now spends 14 percent (with family planning) or two percent (without family planning) on natural resources and NRM. The team felt a greater committment in the CDSS was warranted either by re-focusing the agricultural and private sector strategies or adding a NRM project to the new CDSS. The Mission is also invloved in a regional SADCC program which, hopefully, will have a NR component.

## 1. INTRODUCTION

### 1.1 Background

This report responds to the requirements of USAID's (Africa Bureau) Plan for Natural Resources Management (PNRM) concerning the development of a NRM Action Program and an Action Plan, and to the requirements from USAID/Botswana to prepare background information for the NRM PID (to be developed in February, 1989). The team's terms-of-reference (TOR) did not include the preparation of SADCC or regional projects but, because of the mission's pressing interest, the team incorporated suggested projects that might receive SADCC funding.

The report contains the NRM Action Program and Action Plan based on information obtained from: 1) interviews conducted by the team, 2) information obtained from the literature, and 3) central themes from the (nearly approved) National Conservation Strategy (NCS) for Botswana. The Action Plan is defined as the portion of the Action Program that could be absorbed through a refocusing of the Mission portfolio or through the new project for which a PID will be developed in February, 1989.

The report contains five sections, an Executive Summary and four annexes. Section 1 states the purpose and objectives of the report, describes USAID's PNRM, and gives an overview of the wealth of information available on NRM in Botswana. Section 2 presents a descriptive "state-of-the art" overview of Botswana's natural resources. They include minerals, atmospheric resources, water, soils, vegetation and animal resources. The cultural, socio-economic, institutional, educational and economic constraints to improved natural resources management are discussed in Section 3. Section 4 synthesizes priorities, constraints and opportunities and develops the Action Program. The Action Program discusses the actions required to reduce the constraints to improved NRM, the recommended geographical emphasis, a description of how to define the most promising technologies to extend and policy and institutional conditions that must be present to achieve the Action Program targets. Section 5 -- the Action Plan -- examines the Mission portfolio and recommends how it could be refocused to ensure that PNRM goals are adequately addressed. Annex 1 lists several demonstration/pilot project ideas and research ideas for by the PID team. Annex 2 provides several "how-to" steps to conduct financial and economic analyses of NRM interventions. Annex 3 lists the persons contacted by the Action Program/Plan team during the Jan. 26 - Feb. 5, 1989 TDY. Annex 4 lists a number of opportunities for the Botswana Work Force and Skills Training (BWAST) project to support training in value-added industries.

The Action Program/Plan team consisted of:

- o Dr. Kjell A. Christophersen, Natural Resource Economist and Team Leader;
- o Dr. Scott McCormick, Land Use Planner and Sociologist;

- o Dr. Peter Warshall, Biologist
- o Dr. Lee Hannah, Ecologist.

Funding for the study team was provided through the Natural Resource Management Support Project (USAID 698-0467)

## 1.2 Purpose and Objectives

The purpose of this report is to present an Action Program/Plan to USAID/Botswana. The Action Program is mandated by the Africa Bureau's PNRM. The PNRM was developed to "...better articulate and coordinate A.I.D.'s approach to Sub-Saharan Africa's environmental problems -- desertification, soil degradation, loss of biological diversity -- with its strategic role of increased agricultural productivity..." The PNRM guides USAID's efforts to improve NRM by "...establishing priorities to facilitate the best use of limited resources." The Botswana Action Program was developed using the technical criteria of the PNRM and following the PNRM directive to develop natural resource strategies without regard to budgets available to A.I.D.

The Action Program determines the kinds of activities and support (institutional, policy, etc.) required to achieve sustainable NRM (agriculture, livestock, wildlife, forests, biological diversity) over a relatively long time frame (20 years) over a significant area in Botswana. The Program is developed without regard to project Mission approved assistance or staffing levels.

The Action Plan is specific to USAID/Botswana. It is intended to define the linkage between the Action Program and the Mission current portfolio and future programming, as well as identifying new initiatives, if needed. The immediate concern for the Mission is that the Plan is integrated into the CDSS in support of A.I.D.'s goals of balanced resource protection, restoration and enhanced use of the soil, water, vegetation and genetic components of the natural resource base in Botswana.

The objectives are as follows:

- o To identify and recommend actions necessary to improve NRM in Botswana, and suggest how USAID/Botswana can best contribute. This will include analysis of government natural resources priorities and of USAID/Botswana capabilities and prospects.
- o Promote support for income generating opportunities through sound NRM practices.
- o Promote support for institutional changes necessary to encourage and support widespread adoption of available and extendable technical packages in the short, medium and long term.

### 1.3 Natural Resource Priorities In Botswana

Botswana has a well articulated set of natural resources objectives and policies. National objectives are set in the National Development Plan. The sixth National Development Plan (NDP VI) covers the period 1985-1991. Overall national objectives are fourfold: rapid economic growth; social justice, economic independence, and sustained development. Improved natural resources management can make important contributions to each of these objectives.

One of the major policies for NDP VI is to "initiate further planning of the management of natural resources." The strategies to achieve this are: "implementing recommendations of the June, 1984 national workshop on management of Botswana's environment;" and an educational effort to "set in motion a national understanding and acceptance of the need to conserve natural resources." Chapters of NDP VI lay out priorities for Agriculture, Water Resources, and Wildlife, National Parks, and Tourism. Utilization of wildlife resources for rural employment is stressed in NDP VI, as is strengthening of forest and range management. The National Wildlife Conservation Policy approved in 1986 stresses sustainable use of the wildlife resource for income and rural employment generation. A Tourism Policy is in preparation.

### 1.4 The NCS and Status of Donor Support in Natural Resources Management

The status of the NCS is uncertain at the present time. It has been presented at the Cabinet level twice and been deferred both times. Some anticipate passage of the NCS before April, 1989, and others not until after the elections (to be held in August/September, 1989). Meanwhile, the donors who wish to become much more active in the NRM area (EEC, NORAD, SIDA and others) are in a waiting mode. Major funding for yet undefined field projects will be released once the NCS has passed. Presently, donors are funding only research and studies and provide some long term technical assistance. There appears to be little NRM coordination between donors. They are, however, interested in closer collaboration and NRM opportunities. USAID/Botswana will have the opportunity, with the Action Program/Plan, to assume the role of coordination between donors in Botswana.

The team did not have access to the draft NCS for the preparation of the Action Program/Plan. This report, therefore does not necessarily reflect possible NCS priorities. Nor is the implementation of the Action Program and Plan dependent on passage of the NCS.

## 2. BOTSWANA NATURAL RESOURCES

Botswana has one of the best environmental baselines in Africa. The appendices of the NCS, the Profile of Environment and Development in Botswana, US AID's Biological Diversity Assessment, the Land Use Planning documents from Ngamiland, the Okavango scientific research documents and the Dutch work on the Kgadagali Baswara are just a few examples of the excellent material available. This short chapter will quickly summarize some of this material from a natural resources point-of-view, including their advantages and concerns. The summary gives a broadbrush overview from which US AID and other donors can focus their contribution to Botswana's NRM.

### 2.1 Atmospheric Resources

Botswana's air quality is excellent except near the Selebi-Phike copper-nickel mine where release of total suspended particles and sulphur dioxide has over-burdened the atmosphere's dilution abilities. The GOB has set pollution standards, monitoring systems and will enforce new air pollution controls.

Local wind erosion occurs in heavily over-grazed areas and areas in which bare patches of arable land have not revegetated quickly. The need for soil stabilization by agro-forestry and windbreaks is a new concern that will be addressed in the program sections.

The intense solar radiation and relatively cloud-free atmosphere of Botswana makes solar water heating and, perhaps, solar generation of electricity an attractive alternative. The utilization of this energy source is still in its infancy.

### 2.2 Mineral and Other Geological Resources

Botswana's relatively high standard of living and social services rests on its mineral resources. Diamonds have been the most reliable resource. Copper and nickel fluctuate with international markets. Coal has been the major fuel for industrial energy and will become a major source of urban electricity. Reprocessing of gold mining wastes has proved profitable on a small scale. Natural gas and oil are still in exploratory phases. The production of salt and soda ash is about to begin.

All minerals are finite resources. At this time, it is not possible to predict how long they will boost the economy of Botswana. They are the economic engine by which Botswana has a grace period to diversify into other sectors. A major concern is the impact of diamond exploration leaving new roads and boreholes in its wake. In turn, this leads to uncontrolled grazing and poaching. Other concerns include conflicting water supply needs and water pollution from the copper/nickel mines.

The Tsodilo Hills and Drotsky's Caves in western Ngamiland are two important geological treasures to Botswana. They are part of a

growing tourist industry in the area. They and other unique features (e.g., pictographs and Lobastse caves) need protection.

### 2.3 Water Resources

Botswana's major water concerns are erratic low rainfall and the high cost of pumping groundwater, and the unfavorable geographical distribution of water supplies relative to perceived needs. The major sources of surface water are at the opposite ends of the country (north and south) making transport to the interior or east/west districts too costly. Some areas rich in water cannot be utilized for either agriculture or drinking because of a high salt content. It has been suggested that industrial development take place near the best water sources (moving people to the water, rather than water to the people). In addition, the major surface water sources (the Okavango, the Limpopo and sometimes the Chobe rivers) flow through several nations. Secure in-stream water rights for the inner delta of the Okavango, and diversion water rights for the international rivers, are unresolved and urgent concerns.

Other concerns are pollution from the copper/nickel mines; health problems associated with waterborne diseases; pollution from livestock and probably humans; the distribution of boreholes and their associated water rights; increased knowledge of groundwater supplies; water conservation in urban areas, including re-use potentials; and the environmental impacts of proposed dams and diversions. Water planners are now in the process of balancing surface water supplies with drought fall-back groundwater pumping.

### 2.4 Soil Resources

Because Botswana is geologically ancient, its soils are old, often highly leached and infertile. Except in limited areas of heavy clays and loamy sands, the predominant soil texture is sandy. Eighty percent of the country is covered with Kalahari Sands (the sandveld). Although inherently infertile and poorly structured, these soils are said to respond to fertilizer and manure if there is sufficient water.

The eastern areas of the country have a mixture of soils ranging from ferruginous, reddish-brown sandy loams that are suitable for crop production, to heavy-textured, leached, acidic soils found in pans and fossil river beds. Around hills, the soils are stony and shallow. In general, soils are a major natural resource constraint. Preservation of the topsoil is a major concern since the subsoil is even less fertile. Topsoil losses have been occurring around overgrazed boreholes, on slopes and on large cleared fields in the hardveld, by wind in the melapo regions and by fire in some of the peat areas. These will be addressed on a geographical basis as the needs are site specific.

## 2.5 Vegetation Resources

The plant resources of Botswana are the economic base of over 80 percent of the population. They have local, regional, national and international significance. Internationally, Botswana has been a leader in protecting its biotic communities with over 17 percent of the land gazetted as national parks and game reserves. These parks are the source of tourist income to the country -- income requiring virtually no depletion or deterioration of the natural resource base. Equally important, its grazing lands have been the economic base for cattle (beef) export which is the largest sector dependent on biological resources. The wild plants (veld products) sector has one of the greatest potentials for diversifying the Botswana economy. Wood products, especially kraal fencing and firewood, are crucial components of the Botswana household economies. Domesticated crops and dryland farm management are central concerns for future development.

The most significant biotic community is Botswana's Okavango delta, its swamp grasslands and fringe forests. The Okavango is and will remain a major focus for the GOB and the international community. Plant resource concerns include the spread of *Salvinia* over the open channels and lagoons, the burning of the papyrus swamps by poachers and hunters, the loss of permanent swamp to other land uses and the loss of seasonal swamp to cattle grazing.

A few biotic communities have not received protection (the Acacia nigrescens/C. apiculatum tree savanna, the close tree savanna on rocky hills, mixed mopane bushveld and the Combretum imberbe bushveld)

A major opportunity for conservation development in Botswana may be veld products. Four plants have been sited: the grapple plant for medicines; thatching for homes; mokolo palms and dye plants for baskets; and orchards for mopane worms and silk cocoons. Another 120 species with commercial potential have been identified. At the moment, either the market cannot be determined or utilization of the plants to meet market demand may threaten the plant. The incidence of each species population and possibilities for regeneration are immediate needs.

Details of firewood utilization and fence post cutting can be found in many documents. Similarly, details of over-grazing by cattle and, in one instance, wildlife have been thoroughly reported. It is clear that 25 percent of Botswana's vegetative cover has been degraded. This means that perennial grassland has been transformed into annual grassland and/or brush encroachment has occurred or canopy cover has been lost exposing the soil to wind and water erosion. The vegetation can still recover with good rain but may have a larger component of unwanted trees and less nutritious grasses for many decades to come. Heavily degraded areas (usually patches) will not recover -- even with good rains. They will need investment and special management to regenerate good canopy cover, nutritious species, and improved soil infiltration. Finally, about 1.7 percent of the land can be considered

desertified. Desertified land has begun to lose or has lost its soil microbial community. It is truly a sterile environment. Costs of restoration are usually prohibitive.

Compared to Sahelian countries that have suffered from a 16-year drought, the situation is cause for alarm but has not yet reached crisis proportions. Botswana has a period of time to practice "preventive medicine" and return the majority of its land to a condition that can be more resilient to the next drought. The situation is similar to the Sahelian countries in the early 1970s, when the return of normal rains led to the rapid increase in livestock and the rapid spread into more marginal pastures. When the recurrent drought hit the Sahel, it was too late to slaughter the herds for market and too late to implement pasture regeneration and protection. Botswana, so reliant on its vegetative cover for cattle and livestock, can learn many lessons from the Sahel.

At the moment, vegetative cover and species composition need most attention around villages with sedentary livestock, firewood and fencing utilization; around boreholes in which there is no seasonal grazing plan; along some of the fences where wildlife concentrate; along some trekking corridors; and within cities. Cityscapes have been largely ignored. The creation of "green cities" or green belts around cities has more than aesthetic value. It can also control the "city island" weather effects which include increased temperatures and wind velocities. Beautiful cities can themselves provide a tourist destination and business incentives. Possible projects for regeneration and restoration of grasses shrubs and trees of value should be a high priority for donors.

Veld fires used to be a major influence on vegetative cover. Botswana has successfully campaigned to reduce fires. While local problems remain they are linked to hunters' setting fires to poach wildlife or the uncontrolled fires in the Okavango peat areas. The annual or bi-annual burning of the veld has been managed well.

The major true forest in Botswana is in the north. This is Botswana's only source of hardwoods. At the moment, the Forest Reserves need good timber inventories, assessment of sustained yield levels of cutting, requirements for replanting and cutting fees that can be re-invested to maintain a sustained yield logging system.

## 2.6 Animal Resources

Botswana has one of the last remaining wildlife, especially large mammal, treasures of significance on the planet. More than 150 species of mammals, 500 species of birds, 157 species of reptiles, and about 40 species of amphibians live in four major regions (southern and central Kalahari; Makgadigadi Pans; northern Botswana; and the northern Tuli Block). The numbers have fluctuated greatly with recurrent drought. Regeneration of large mammal herds has become more problematic with the increase in arable land and the extension of cattle grazing. Nevertheless, the Okavango is the best preserved of the three major interior deltas in Africa. The

GOB has set aside 17 percent of the nation's land for wildlife conservation and, should the Wildlife Management Areas (WMA) be effective, over 35 percent will have some form of protection. The longer these areas are preserved, the greater their economic value as well as their existence value becomes.

Other documents have reviewed the status of individual species and races of international, pan-African and national concern, including domestic varieties of Tswana cattle. Botswana plays an important role in maintaining between 15 and 20 vulnerable, threatened or clearly endangered species. The natural resource concerns associated with maintaining viable populations of species are typical of the whole planet: extensive habitat has been fragmented into habitat islands; the habitat islands have become scattered; and there are no protected linkages between them. Although many documents address pieces of this dilemma, there is no overall view of habitat islands and the wildlife corridors needed to maintain populations species by species. Linkages to protected areas in Zimbabwe and South Africa as well as cross-border management needs with Namibia and, possibly, Zambia need more attention. Internally, there is a need to ensure that any new fencing includes an environmental impact statement and is properly installed. To ensure that fragmented habitats are both large enough and linked extensively enough to prevent mass die-offs during drought periods certain additions to game reserves or national parks are necessary (e.g., extension of Makgadikgadi Pans to ensure wildlife watering and links to the Naxi Pan National Park).

As Botswana's population and technical capabilities expand, wildlife will increasingly be viewed as a pest, not a resource. Increasing urbanization, isolation from wildlife and alienation from tribal values may decrease the public's desire to protect wildlife, especially when cattle are a major form of investment and old age insurance. The control of tsetse so that humans can occupy more land; the elimination of predators (lions, hunting dogs, hyenas) and wild ungulates that reduce cattle production, and the lucrative international market in ivory, trophies and wildlife skins are tension-filled topics within Botswana.

In the near future, Botswana must decide on the proper mix of consumptive and non-consumptive uses of its animal resources -- both domestic and wild. Subsistence hunting must change from a right to a privilege as game populations become smaller and more fragmented. Trophy hunting must be carefully monitored as it reduces populations of the rarer species. Various subsistence and small market animal resources (mopane worm, fish or silk worm) will require monitoring to ensure viable populations in less managed areas and "culturing" in new productive systems based on farming systems. Ostrich and crocodile farms have already proved themselves viable on a limited basis and hopefully have reduced the hunting pressure on wild populations.

At the moment, following models used by World Wildlife Fund (WWF) in Zimbabwe, the GOB has begun to investigate possibilities

to combine wildlife and livestock into viable productive systems. The advantages of maintaining rangeland resources as well as wildlife populations have not yet been widely accepted by the ministries of the GOB.

The non-consumptive use of wildlife (tourist viewing and photography) plays an important role in Botswana's economy. All other sectors of the economy are extractive of natural resources. Wildlife viewing brings in cash income with no export except information. On the other hand, it does require protection of habitat and requires allocation of water and land resources from other forms of production. Anti-poaching teams and park management are additional expenses. Given the extraordinary wildlife resource, the integration of non-consumptive tourism and park and game reserve management is the most important focus of animal resource management.

### 3. SOCIAL AND INSTITUTIONAL SETTING FOR NATURAL RESOURCE MANAGEMENT IN BOTSWANA: CONSTRAINTS AND OPPORTUNITIES

This section addresses the socio-economic setting of natural resources use in Botswana. It focuses on the constraints facing government, donors, districts, and, most importantly, those who use natural resources for subsistence and commercial purposes. Where incentives and disincentives to access and the utilization of resources are introduced, as proposed in the NCS and other policy documents, the possible socio-economic, institutional and economic implications must be well understood. It is also important to consider, and if appropriate, incorporate ideas developed by local resource user groups. Understanding socio-economic situations of local resource users increases the probability that local users will develop their own projects promoting sustainable natural resource management.

#### 3.1 Socio-Economic Characteristics of Botswana: Natural Resources Management

Interaction between people and natural resources in Botswana occurs in all sectors: mining, agriculture (including livestock), forestry, hunting/gathering, fishing, and wildlife. Approximately 80 percent of the population resides in rural areas. While rural households depend largely upon agriculture for their livelihood, they also tend to diversify their economic activities by working in the mines, in the cities, as fishermen, hunter/gatherers, or livestock herders. This section discusses the traditional social institutions for the use of resources in agriculture, the right to allocate land and water, and the conflicts which arise due to the interaction of people over competing uses of natural resources. The section ends with a description of the constraints to and opportunities for eliminating the conflicts. A historical perspective is used to outline the circumstances in which the management of natural resources, especially vegetation and water, have changed.

##### 3.1.1 The Economy

In Botswana, most people are members of Setswana speaking tribes or clans. There are also several minority groups including the Bakalanga, the Basarwa, the Baherero, and the Bayei.

Botswana's economy has expanded rapidly since independence due to the utilization of diamonds and cattle. Although the mineral sector has dominated the economy, high external prices for beef have led to a rapid expansion of the national herd. From 1966 to 1980, the national cattle herd more than doubled to almost 3,000,000 head. This has placed an enormous stress on vegetation and water resources.

Between 1980/81 and 1984/85, the number of people employed in the mining sector (7,100) remained constant despite the fact that the sector grew 24 percent during the National Development Plan (NDP V) period, and is expected to grow another 3.5 percent during

NDP VI (Botswana, NDP VI, 1985). It is not anticipated that the number of unemployed will decrease significantly during NDP VI. Approximately 52 percent of the employable population will remain un- or underemployed or actively seeking work during the NDP VI period. The best short-run employment opportunities appear to be found in the agricultural sector, primarily in livestock. The performance of the traditional agricultural (crop production) sector has been poor. During good years, production of cereal grains rarely exceeds 250 kg./ha. and recurring drought years make crop production a risky venture.

Botswana's economy is susceptible to variations in the prices for its two major exports -- minerals and beef. This vulnerability, especially for diamonds, makes improved NRM all the more important. In the agricultural sector, there are concerns with respect to range degradation, soil erosion, and water resources depletion. The overuse of fuelwood is also a growing concern.

### 3.1.2 Traditional Agro-pastoralism

Traditionally, Botswana practiced transhumant agropastoralism. In this system, activities occurred within and between three concentric zones. In the inner zone, the village (motse) and the permanent residences were established. The inner zone was used for small-scale cultivation and winter grazing. The surrounding contiguous zone, the lands (masimo), contained land and water for the arable cultivation of subsistence crops and the grazing of traction animals. Crop production occurred during the long rainy season between October and April/May. The outer zone of the system contained land and water for the establishment of cattle posts (meraka) for the grazing of livestock during wet periods of the year.

Seen as both the engine of economic development and the cause of environmental degradation, the livestock sector has, until recently, received the overwhelming attention of government planners, donors, and environmentalists. Traditionally, livestock was controlled by the community, most notably the chief (kgosi) and the more influential members.

Cattle represent more than an economic asset to Botswana. Traditionally, they were used to cement social ties between the owner and other members of the community. The institution of mafisa allowed holders of cattle to lend portions of the herd to others. This transaction delivers prestige and political power to the lender and a social commitment from the borrower. Cattle were needed (transferred) at several points in a person's lifetime -- at birth, initiation, marriage, and death. Cattle were not killed for subsistence purposes, only for ceremonial activities. At death, a man transferred his cattle through inheritance to the males of the lineage (Shaper, 1939).

A very important social transfer of cattle occurred through brideprice (bogadi). Prior to marriage the husband's family

contributes cattle to the family of the wife to connect the children of the union to the husband's family. Bogadi could be reclaimed by the husband's family only if the woman bore no children (Shapera, 1947).

Land and water rights are crucial to agropastoralism. In general, the rules of access to land and water are usufruct in nature and depend on social relationships and, to some extent, capital improvements. Both resources were held by the lineage and rights to use were allocated by the traditional authorities, most notably the chief (kgosi) or his representatives in the wards (dikgosana).

Land for residence in the village and for cultivation was allocated to young men upon marriage. The household could receive two plots, one for use by the husband and one for his wife. The usufruct rights for land were in perpetuity and could only be rescinded if not in continuous cultivation. Village settlements were generally located at permanent water sources and access was the right of all residents.

Access to grazing land depended on membership in a lineage. Grazing areas (dinaga) were allocated to the lineages and management of these areas was the responsibility of an overseer (modisa wa naga). Although disputed, the badisa appeared to have some power to direct the movement of cattle with respect to vegetation and water (Shapera, 1947; Hitchcock, 1980).

Before the drilling of boreholes, livestock watered at shallow pans, wells, dams, haffir dams and in river basins. Herders developed strategies that allowed access to principal sources and several fallback sources. Access to water for livestock depended on the type of water source and the contribution of a livestock owner to its development. A herder could completely control a well that he dug, while also have access to other fallback sources (for drought periods) where he contributed some, but not all, of the labor or capital expense. The objective was to control some form of access to many sources of water, to cover many different circumstances and ecological situations (Fortmann and Roe, 1981).

### 3.1.3 Recent Changes

Privatization of and changes in land tenure and water resources have affected the movement of livestock and access to land and water. In the eastern communal areas, the strategy for watering livestock remains as described above. However, in the sandveld, boreholes have been drilled by individuals over the last forty years and the capital expenditure has allowed these people de facto exclusive rights to grazing areas by controlling access to the water source (Fortmann and Roe, 1981; Hitchcock, 1978).

The proliferation of boreholes and the spread of perceived land degradation within the communal areas contributed to the development of land tenure changes related to livestock. As a result of several consultancies (eg. Chambers and Feldman, 1973),

the GOB introduced the Tribal Grazing Lands Policy (TGLP) of 1975. The objectives of TGLP were the establishment of a land use planning and zoning process, the commercialization of the livestock sector and the development of the communal areas. The land use planning exercise was to zone land as either commercial, communal or reserve. Commercial land was to be allocated as leasehold land to large cattleowners, the communal land was to be used for grazing by small cattleowners and the reserve land was to be held in trust for future generations. The goals were to remove the large cattleowners from the communal areas to TGLP ranches to ease overstocking, develop the ranches according to "efficient" ranch management techniques, commercialize the entire livestock sector to encourage offtake and increase productivity and provide livestock extension services to communal area cattleowners. The revenue expected from the rent of the TGLP ranches was supposed to pay for the developments of the communal livestock sector.

The implementation of TGLP has affected the use of plant, water and soil resources in Botswana. Programs addressing NRM must work with the new national land use laws and the changing social values of land and water. TGLP has introduced exclusive rights to land and water for large areas of Botswana. The impact has been to decrease that land available for the expansion of the communal areas. Herders and government normally assumed that overstocking and land pressure could be overcome through expansion of grazing into undeveloped sandveld areas. Therefore, until recently, the solution to overstocking in the communal areas was to move the herds of large cattle owners onto TGLP ranches and open up new grazing areas through the drilling of additional boreholes. However, it is now clear that areas for expansion do not exist. The setting aside of reserve areas have never occurred because of the overwhelming demand for more grazing areas. Range management must occur in the existing land areas and not be based on the expansion of cattle into new areas. There are no more "new" areas onto which expansion can occur.

#### 3.1.4 Production Activities on the TGLP Ranches

Several studies (Banks, 1980; Odell, 1987) indicate that the objectives of TGLP have not been achieved. TGLP allocated 6,400 hectare (ha) ranches to individuals and small groups. The GOB, with backing from the World Bank Livestock I and II projects (LP I and LP II), provided investment opportunities for the development of the ranches. Loans were available for fencing, water provision, paddocking, and the construction of firebreaks. Experience has been that few of the ranches have been developed to date (District Officer, Lands, Ngamiland, 1989; Sandford, 1980; Bakure and Dyson-Hudson, 1982). Of major concern is the grazing of TGLP livestock in the communal areas instead of within the boundaries of the demarcated ranches. This occurs due to lack of fencing, herding of the TGLP cattle or the deliberate dual grazing of TGLP cattle on both ranch and communal areas.

The World Bank is presently supporting the development of the TGLP ranches through the National Land Management and Livestock

Project. This project expects to provide credit for the development of 200 ranches and to strengthen extension to those ranches (NDP VI, 1985). The project also provides funds for the expansion and upgrading of the range ecology unit of the MOA. Ranches continue to develop slowly.

The continuing problem with the development of the ranches and the increased commercialization of the livestock sector relates to the values attached to cattle, the lack of enforcement of stocking levels on the ranches and the assumption by ranchers that TGLP granted them exclusive grazing rights to an area which can be run as a cattle post. In effect, most TGLP producers continue to practice traditional livestock activities on the ranches. There remain few social or economic reasons to change production modes.

### 3.1.5 Production Activities in the Communal Areas

Within the communal areas, livestock remains an important asset for both large and small producers. Many communal area households, however, do not own or have access to livestock. Several studies indicate that between 35 and 50 percent of all rural households do not own cattle. The holding of cattle has been used as an indicator of wealth, with poor households owning less than 10 head, medium households having less than 40 head and wealthier households having more than 40 head. Poorer households derive the majority of their income from wages, remittances and arable agriculture. Wealthier households derive their income from livestock production and wage employment.

Livestock plays an important role as draught power in arable agriculture. Households aspire to increase their herds to, in turn, increase crop production. Since most households do not own livestock, they must depend on borrowing or hiring draught power to plough. Given that timeliness of plowing is correlated to agricultural productivity, ownership of livestock allows more flexibility in plowing to take advantage of the rains. Therefore, there is an economic incentive to increase one's herd. The minimum number of animals needed to field a team of draught animals is 20. This is also the minimum number needed to minimize loss of the herd from drought. This suggests that rural households involved in agriculture strive to increase their herds to at least 20 animals. At the present, at least 50 percent of the population has fewer than 20 animals.

Because of the variability of rainfall, rural households strive to minimize risk in crop production. In general, households broadcast a mixture of seeds, such as sorghum, maize, millet, melons, cowpeas, and groundnuts, and then plow it under. Few purchased inputs are used. Chemical fertilizers are used sparingly. Households will use manure if they have access to it. Mixed cropping also allows households to minimize seasonable labor constraints. The Ministry of Agriculture (MOA) introduced the Arable Lands Development Project (ALDEP) as a means of reducing labor and input constraints. Another objective was to increase crop production by introducing row plowing and planting. ALDEP

also provides loans to farmers for fencing of arable lands to protect them from livestock.

### 3.1.6 Other Significant Groups and Natural Resources

Three specific groups of people whose interaction with natural resources is changing need to be highlighted. Agriculturalists from the Gomare/Nokaneng area west of the Okavango Delta, the remote area dwellers (RAD) and women all face changing lifestyles due to changes in land and water use.

In the molapo area east of Gomare and Nokaneng, agriculture has depended on the annual flooding of the Thaoge River. Over the last several years, the water has not consistently reached the area. As a consequence, agricultural activities have changed from recessional agriculture to rainfed agriculture. Rainfed agriculture in the molapo increases the potential for increased wind and water erosion of the fragile fluvial arenosols. Being forced to shift from recessional agriculture will also impact social institutions, such as land tenure, and economic opportunities of the area. Sustainable alternatives need to be examined, especially in light of the recommendations to divert water from the Boro to the Thaoge River.

Hunting and gathering activities have long provided subsistence and commercial products to many households in the more remote areas. There are between 10,000 and 20,000 subsistence hunters today. Plants provide the majority of food for hunter-gatherers and provide important supplemental food sources for agro-pastoralists. The traditional activities and the land areas of the remote area dwellers (RAD) are changing due to a combination of factors. Many RAD communities have been associated with areas within TGLP zoned areas and within proposed Wildlife Management Areas (WMAs). Research activities have been supported in Botswana to identify plant and animals that are used by the RADs. Commercial enterprises have been proposed for increasing the income earning potential of these communities. However, the RAD community continues to face land pressures from other competing land use activities, such as livestock and tourism. Some have lost land now in reserves, parks or freehold status.

Women in Botswana also occupy a special role with respect to those natural resources used in agriculture. Generally, women contribute significant labor to crop production. After the fields have been cleared, women are responsible for planting, weeding, harvesting, storing and threshing. These tasks are done in addition to domestic chores. Women also collect drinking water and firewood. Projects that suggest interventions in agriculture, or in water conservation or in woodlots, must consider the inputs and needs of the women. Some agricultural programs may assist women, but, in the process increase natural resource degradation. ARAP, for example, provides subsidies for the hiring of tractors to plow lands. Women who lack means of plowing may see the subsidized tractor hire as a reasonable way to ease this agricultural

constraint. However, the opening of new lands by tractor may increase soil erosion.

Women are also gatherers of food and building materials from the veld. Training accompanying the introduction of value-added commercial activities must not exclude women. Potential projects or interventions dealing with household energy should include specifically the needs of women. The introduction of woodlots and agroforestry techniques should consider the labor profile of women, especially female headed households. If projects to conserve natural resources increase the burden of those responsible for managing them, they will not succeed.

### 3.2 Institutional Setting

Institutions involved in the use and conservation of natural resources in Botswana can be divided into four categories: donors, governmental, non-governmental and indigenous. All four have a major but distinctly different role to play in the management of natural resources. At times, they overlap and conflict. For example, six ministries, seven departments, 11 divisions, 1 parastatal, the university, the Botswana Agricultural College and 5-10 donors all influence the management of pasture and browse plant resources. For a more detailed description of those institutions, see USAID's Agricultural Sector Assessment, Gaborone, 1988.

At the local level, the kgotla remains an important institution for the discussion and settlement of community issues. It has been suggested that this institution is the most appropriate for the management of natural resources at the local level. In the allocation of land and its use, traditional authorities (dikgosi and dikgosana) still play a major role. In grazing areas, the institution of badisa appears to have diminished in power, if not disappeared.

### 3.3 Personnel

Botswana has the institutional infrastructure to implement resource management. However, the critical mass of personnel in government and in the private sector to effectively research and monitor natural resources is missing. Examples exist within several of the ministries. Within the Ministry of Agriculture, there are only five range ecologists and six soil scientists to cover the entire country. Land boards, those institutions responsible for the allocation of land and water rights, need training programs designed to improve allocation procedures, record keeping, enforcement and land use planning.

This lack of personnel may impede implementation of programs and projects to manage natural resources. Extreme care should be taken to plan programs, projects and activities so that existing institutions are not overwhelmed.

### 3.4 Conflicts, Constraints and Opportunities

Land and water access and use conflicts have developed in many areas. Examples of these conflicts include:

- o The allocation of arable land in communal areas competes with livestock activities. Increasingly, land clearing for crop production encroaches on the more marginal lands which increases the incidence of soil and vegetation degradation.

- o Livestock activities of different groups conflict with other groups and individuals. In the communal areas, the spacing of boreholes often exceeds the maximum number allowed per area, leading to overstocking of livestock and vegetation loss and wind erosion.

- o Conflicts over land use between livestock owners and remote area dwellers are common. Competition for land and water within yet to be developed Wildlife Management Areas (WMAs) is intensifying.

- o Conflicts exist between wildlife and livestock at the borders of national parks, in the Okavango Delta and within WMAs.

The constraints to overcoming these conflicts are social, institutional, and economic. Overstocking and overgrazing of land is probably the most serious in the communal areas. The lack of incentives to increase the offtake of cattle is often blamed for the overstocking and subsequent degradation of soil, vegetation and water resources in both the communal and TGLP areas (McGowan, 1987). It is assumed that a proper mix of incentives (price structure, marketing opportunities, credit and extension services, etc.) will encourage a higher cattle offtake when needed. In turn, this will lead to decreased stocking rates and higher returns. There is little research on the question of how livestock owners would respond, by size of ownership, to increased prices and marketing opportunities. The problems of households in the communal areas need to be addressed as they apply to the total agro-pastoral system. The social and economic reasons for owning or desiring more cattle needs to be better understood before economic incentive programs are introduced. Herd and household dynamics need to be better understood in the agricultural system. There is the possibility that better prices, production and off-take opportunities will lead to larger herds, not reduced stocking. Social and economic alternatives to cattle ownership for the acquisition of prestige should be considered.

The problems of conflicting resource use is exacerbated by the lack of clear delineation of group land rights. Competing claims are determined on a case by case basis by land boards and other government agencies. Even if groups desire to control resources within areas they define as theirs, it will always be difficult to control or prevent the use of the same resources by outsiders. This problem also applies to the rights of RAD populations. If the resources of the WMAs, for example, are to be effectively used and

conserved, the groups settled within must be given the rights to control existing natural resources. Working with the groups to develop their own activities, barring access to other groups, would improve the NRM of the areas.

delineation of land rights is constrained by too much overlap between institutions (traditional authorities and land boards) that allocate and plan the use of land and water resources. The lack of adequate record keeping does not allow proper delineation of natural resource boundaries. At the district and national level, land and water resources planners and extension agents do not have sufficient time and resources to develop specific area land use plans and action plans for their implementation.

In the arable sector, soil fertility is decreasing for lack of chemical fertilization, manuring, and soil erosion. Large areas of land remain unused because of weed encroachment and soil infertility (Arntzen, 1985, McCormick, 1982). Other areas are not plowed due to shortage of labor and draught power.

The MOA introduced the Accelerated Rainfed Agriculture Program (ARAP) to induce farmers to plow and plant during less than normal rainfall years. ARAP subsidizes the acquisition of inputs, such as seeds, fertilizers and draft power. It also subsidizes the destumping of fields to ease constraints to mechanized ploughing. This program may increase the area of cleared fields and introduce increased soil erosion (see the project description for the Tutume Tractor Hire Scheme, OTA, Grassroots Development, 1988).

The lack of development of the TGLP ranches, especially fencing, has also exacerbated the conflicts between the TGLP ranchers and residents of the communal areas contiguous to the ranches. Dual grazing of both the ranches and the grazing areas should not be encouraged as it increases the potential for overstocking. Another disincentive to increasing offtake of the TGLP ranches is the lack of an economic rent for the use of the ranches. If ranchers had to pay for the exclusive use of the ranch, it might encourage increased offtake.

Significant opportunities exist for the successful management of natural resources in Botswana. Significant numbers of local level institutions exist (see Willet, 1982) that manage natural resources. These institutions can be tapped as a resource for resolving conflicts in the communal areas. Strong traditions of political participation also exist at the village level. At the district level, the institutional structure exists for developing land use plans. The GOB and various donors have financed numerous research projects over the last decade relating to agriculture, land tenure, local institutions, and rural industrialization. These are starting to be coordinated and compiled (see KCS's Ecological Zones Project as an example). Finally, the open discussion and commitment of the government and non-governmental organizations to natural resources management increases the chances of its implementation significantly.

### 3.5 Conclusions

Several institutional constraints exist to implementing NRM in Botswana. This includes the fragmentation of responsibilities among several ministries, NGOs and traditional authorities. This is particularly true with respect to enforcement of land and water rights of community groups.

Another problem is the lack of qualified personnel to implement successful NRM programs and projects. A contributing factor to this problem is the substantial brain drain of qualified personnel from the public sector into the private sector.

#### 4. SYNTHESIZING PRIORITIES, CONSTRAINTS, AND OPPORTUNITIIES: DEVELOPING THE ACTION PROGRAM

##### 4.1. Approaches to Improving Natural Resource Management

In general, NRM can be improved by creating incentives, enforcing disincentives or eliminating "perverse incentives." Perseve incentives are actions that encourage the degradation of renewable natural resources. A "perverse incentive" may be the destumping subsidies in areas where it increases wind erosion of the soil

The central question concerning NRM in Botswana has been the controversial issue of range maintenance. As the World Bank emphasized, NRM is difficult because of the skewed ownership of cattle, the lack of political will, the lack of popular obedience to rules and the inability to enforce laws and regulations. Disincentives have not worked. The new approach, found in NLMLP pilot projects and World Bank recommendations calls for streamlining cattle pricing and marketing as an incentive to offtake. The World Bank also recommends that alternative, competitive, and equally attractive forms of investment be encouraged to attract money away from accumulating cattle. Other consultants have recommended a continued policy dialogue that includes incentives such as wildlife utilization to reduce degradation of the browse/grass resources. Ultimately, the cultural change will rest with teachers and teaching materials.

Disincentives have a place in all societies. In Botswana, the government is considering stiffer punishments for poaching and needs to sponsor more effective anti-poaching teams. Disincentives can be used to ensure that borehole drilling is reported to Land Boards or by graduated taxing on herd sizes.

Ultimately, NRM will occur from influences on all levels (international treaties, donors and publicity; national administration, legislation, enforcement, coordination, monitoring, research; economics; provision of services; social organization of land, water and plant/animal resource rights; and local influences from family members, village councils, etc.). A more complete inventory of practical incentives, disincentives and the elimination of perverse incentives would be of benefit.

##### 4.2 Geographical Emphasis - Botswana

For the Action Program, the geographic scope includes all of Botswana and even the region. All persons contacted by the team kept referring to the northern area (Ngamiland, Chobe) as an area with a combination of unique natural resources (eg, the Okavango and the hardwood forests) and accelerating utilization (e.g., fire control, water projects, hunting, tourism, timber harvesting, accelerated farming, cattle expansion). In addition, US AID favored projects with a bi-national concern. The northern area borders both Zimbabwe and Namibia with cross-border wildlife and tourist movements. From this point-of-view, district, land board, national

park (Moremi) and tourist planning; wildlife and timber monitoring, an EIA on the Pandamatenga farms, and conservation education should be directed toward the northern area.

From other points-of-view, the Kalagadi, the Ghanzi Districts and the western portions of Southern, Kweneng, and Central Districts should be the focus of donor aid for integrated NRM. The Kalahari Game Reserve and the WMAs need planning to integrate wildlife interests and the land/water/utilization rights of RADS; the fossil valleys and pans need research, the water/land rights issue on communal grazing land needs resolution, and planning within the dezoned TGLPs needs to be supported. This region also includes the Ministry of Agriculture supported pilot projects under NLMLP. Its borders with Namibia will make bi-national projects increasingly attractive.

From a long-range point-of-view, the cities take on great importance because the rural sectors cannot absorb the labor manpower available. The increasing migration to cities, on one hand, takes pressure off rural natural resources but, on the other hand, requires new industries to absorb the labor force. The cities will require conservation education to reduce demand on water and energy resources, to prevent water and air pollution, and create a healthy, high quality urban environment. The education system and media will substitute for the oral traditions of rural life and the importance of wildlife, soil and other resources will require teaching.

Finally, certain needs are nationwide. These include Wildlife Clubs (now confined to the area around Gaborone); agroforestry and soil erosion control extension; range/livestock management agreements; water point, plant resource and hunting license inventory and monitoring, etc.

#### 4.3 The Economic Context

##### 4.3.1 Need to Define the Economic Engines

The documents consulted in the preparation of this Action Program/Plan all make specific recommendations on how NRM could/should be improved in Botswana. Few, if any, however, address the economic and financial implications of what they recommend. There is almost a universal lack of detailed economic and financial analyses of alternative development options. An Action Program, nevertheless, should be anchored to a realistic economic "engine." For example, it would be fruitless to recommend that farming system research results be extended at the farm level if the technical packages offered do not make economic sense to the farmers. The economic engines must be financially attractive at the local level -- where technical, policy, institutional and other interventions meet their ultimate test. If they do not make sense at this level, they will not happen. In the design of projects, therefore, donors and GOB must be sensitive to the local field realities and put together the kinds of technical packages that farmers, herders hunters and others will enthusiastically support.

The economic driving forces in Botswana are the diamond industry, donor inputs (including bilateral and multilateral agreements and food programs) Botswana's foreign exchange reserves, and its internationally stable market for beef export. These generators of wealth have given Botswana a window of time in which to diversify the economy and prepare for the day when the kimberlites give out. Because diamonds are a non-renewable resource, the future soil and plant resources assume overwhelming importance. Because of the inherent low fertility of the soils, the long-term goal of Botswana must be a sustainable economy that can always export products in exchange for grain and petroleum imports.

Identifying the economic engines to improve NRM is a two-step process -- what-to-do and perhaps more importantly, how-to-do it. The "what-to-do" component is simply the actions perceived to be required and as recommended in the various NRM studies for Botswana. In the livestock sector, for example, the actions required might include a) encouraging higher offtake to reduce the number of animals on the range to within carrying capacity, b) adjusting livestock production input subsidies and services, and c) establish new forms of investment that will be attractive to Botswana citizens. How to successfully address these recommended actions is another matter. The problem here, as has been discussed above, is that livestock is more a way of life -- an expression of status, wealth and influence -- than a simple income earning asset. The "how-to-do it" component is, therefore, not a simple task to achieve. The "formula" for increasing livestock offtake must be one that livestock owners, at all income levels, can accept and will support, one that does not unduly violate the cultural and social realities of livestock.

Several "how-to" steps to identify realistic economic "engines" are presented in Annex 3. They include how to identify interventions that are sufficiently attractive on their own without having to resort to direct financial incentives to attract participation, and which will be subject to cost sharing arrangements.

#### 4.3.2 Economic Constraints

Three general economic constraints to improved NRM are briefly discussed below: a) aversion to risk, b) Interpretation of the internal rate of return (IRR) as constraint to promoting NRM activities, and c) other constraints.

o **Aversion to Risk:** As discussed above, NRM interventions will not succeed unless they make financial sense at the local level. Farmers, herders, hunters, and others must be totally in favor of the interventions or they will not succeed. Among the rural poor, however, there is usually a tendency to be risk averters. The traditional ways of farming, herding cattle or practicing subsistence hunting have worked to provide subsistence living but rarely, if any, surplus. A project proposing to extend technologies or interventions that are different from the

traditional ones will rarely be met with enthusiastic participation unless the risk factor is taken into account. New technologies mean parting with the traditional and familiar ones which they know work, even if they only produce a subsistence level of living. In the context of the financial analysis of NRM interventions, therefore, one should use a high discount rate to account for local aversion to risk. The promise of high returns on the investment must be present to overcome the risk factor.

The PID team for the SADCC NRM project should consult the Financial Analysis Volume III in the recently completed Sub-Saharan Regional Assessments (Shaikh et al, 1988) for a pragmatic approach to analyzing NRM interventions from the perspective of farmers, using high discount rates. Reference is also made to Annex 3 of this report for a brief discussion of several "how-to" steps in the economic and financial analyses of NRM interventions.

o **IRR: Constraint to Prioritizing NRM Activities:** It is often suggested that NRM activities cannot compete effectively against other, revenue-generating, projects -- that the internal rates of return (IRR) are not sufficiently attractive to generate enthusiastic support for their approval. Consequently, the tendency is often to either manipulate the estimated cost and benefit streams to generate an "acceptable" IRR, and/or rely on subsidies and other direct financial incentives to promote NRM projects. In the opinion of this team, no manipulation of the benefit and cost streams should, of course, take place, nor should there be any extensive reliance on subsidies and incentives as a means to elevate the attractiveness of NRM projects vis-a-vis alternative projects. Subsidies and incentives should be used cautiously and be regarded as temporary measures only -- to get the projects underway.

NRM projects should, to the maximum extent possible, be allowed to compete on an equal footing with other proposed projects. In this regard, it is of utmost importance to recognize the limits of the information that the IRR imparts. It only shows the rate of return of a project based on the quantifiable benefits and costs included in the analytical spreadsheets. For a revenue-generating project, the majority of benefits and costs are quantifiable and are thus included. For a NRM project, however, the benefit and cost streams are more difficult, if not impossible, to quantify. Only the quantifiable elements contribute to the IRR. The two projects are not directly comparable by the IRR only. It is probable that the unquantifiable benefits of the NRM project are more important than the quantifiable ones, and thus, that their presence may more than outweigh the extent to which the IRR falls short of any pre-established "acceptability" level. For this reason, the IRR should never be used as the sole decision-making criterion. A NRM project with a low, or even negative IRR based on the quantifiable benefits and costs only, should not be automatically turned down.

o **Other Constraints:** All proposed NRM activities that farmers, herders, hunters, and others will be asked, by way of

donor projects, to undertake, require investments either in the form of time, or money. Two rules-of-thumb should apply:

- Promote first the kinds of field interventions that have low or zero recurrent costs. The project will "prime the pump" by providing the initial infrastructure and operating expenses to get things going. Later, project generated revenues should be sufficient to cover any recurrent expenditures and, most importantly, to maintain the availability of credit to participants.

- Field interventions that require participants' time rather than cash investments are probably easier to extend at the local level than capital (money) intensive interventions. Commitments of participants' time should also be held to a minimum. Interventions that are too time consuming will not attract participants.

#### 4.4 The Action Program

This section describes the basic natural resource management needs for Botswana and the areas in which donors can supply aid

##### 4.4.1 Setting the Stage: The Existing Donor Commitment to NRM

Botswana is receiving increasing donor support for projects involved with the protection and maintenance of renewable natural resources (water, soils, rangeland, arable land, forests, and wildlife). As mentioned earlier, the passage of the NCS will accelerate these contributions. There is a probability, however, that the administrative capacities at all levels of the GOB to handle this influx may endanger the program's success. Donors may prefer to work through NGOs in order to simplify administrative implementation.

There have been few projects related to the environmental impacts of minerals or the atmospheric resources. Soils work has centered on mapping, not improvement of fertility or erosion control. Water projects have focussed on dams, sanitation, long-term water planning and groundwater resources. Little work on water conservation and education, and agricultural/industrial water conservation planning is known. The forestry sector has been active with projects by IVS, New Zealand, NORAD, GVS, DVS, and CUSO. But, projects on native tree regeneration, nurseries and agro-forestry have not begun. The Chobe area timber industry needs particular attention. A huge amount of time and money has been spent on the pasture (grassland) sector but it has not been combined with local communities or the creation of local structures of responsibility. The browse sector has been largely ignored. Although the EEC, UN and others have supported wildlife activities, the sector needs much more attention. Natural Resource and conservation education has begun in a small way through KCS, the Environmental Educational Reference Group, UNEP outreach and others. But, a major emphasis on education and training at all levels has been missing from international support. Donors have helped with environmental

impact assessments, the support of many NGOs involved with NRM and education, and policy and administrative issues of concern to the GOB. A major project sponsored by NORAD and the Netherlands was IUCN work on the National Conservation Strategy. It is difficult to know if certain projects considered secondary impacts on linked natural resources such as locust, tsetse or quelea control on other species.

Until this year, when the resident representative departed from Botswana, the UNDP provided a forum to coordinate all projects. The last compilation occurred in December 1987. At the time, there were 45 projects funded by 16 bilateral or multilateral donors. Fourteen had been completed; 25 were on-going; four started in 1988 and two were in the pipeline. The list needs updating. It is rapidly becoming obsolete.

The suggested projects (Annex 1) lists which donors have been active in which areas. For instance, NORAD has been active in forestry and agro-forestry; SIDA in water resources and planning; US AID in land use planning and training, etc. The crucial importance of Botswana based NGOs, especially the KCS, can be seen from a review of these projects. Major donors have been the EEC, the UN, NORAD, the Netherlands and the UK.

In summary, as expressed in the suggestion list, certain areas have great needs: regional coordination and information exchange, conservation education, training at all levels, national park and district planning, agro-forestry research and extension, "package" pilot projects that combine conservation, development incentives and creation of local institutions with responsibility for monitoring and natural resource management; the development of value-added industries related to wildlife and veld products, especially tourism.

#### 4.4.2 Description of the Action Program

The team has summarized 40 different projects and a series of "package" pilot projects that combine the development of structures for NRM responsibility with economic development. After interviewing representatives of the key NRM donors, the projects identified were those judged to be of interest to A.I.D. The list is summarized in Table 4.1 below and described in detail in Annex 1. Seven projects have a regional basis which may interest SADCC. Cross-border wildlife management and people exchanges with Zimbabwe on natural resource concerns (law, agroforestry, range management, poaching) are the two priority areas. The team felt that education and training should receive strong emphasis (10 projects) Botswana needs more citizens employed in NRM as it has become dependent on expatriate consultants because of a lag in education and training. High priorities include creating skills in value-added products derived from hardwoods, veld and wildlife products; training administrators and land use personnel at the local level; and conservation education at the primary, secondary and college levels.

Planning, monitoring and research projects play a crucial role in a fast-moving economy with a high population growth rate of 3.4 percent per year. Thirteen projects have been identified. High priority projects include national park planning, district land use planning (especially in RAD communities), tourist industry research and planning, agroforestry research (including nursery development) and better implementation of wildlife utilization.

As stated throughout, there is no way to separate conservation from economic development and social values. Perhaps, the most exciting projects try an integrated approach on the local level. The proposed multiple use pilot projects address the question of responsibility for implementation and enforcement as much as NRM. They focus on geographic areas in which wildlife and domestic ungulates require coordinated range management, offtake and utilization; in which veld products could add to the local economy; in which new forms of administration such as WMAs may change natural resource management, etc. These are all long-term projects with a minimum five year period. In addition, to coordinate these local projects, the team suggests donor support of the nascent Natural Resources Conservation Trust -- a new NGO to help network funds, information and local needs to upper levels of the GOB.

Finally, the Action Program focusses on certain policy dialogues that it felt should continue with the GOB and the donor community. The highest priority was reorganization of the administrative structure in order to facilitate linkages between natural resource conservation, development and project implementation.

#### 4.4.3 Projects and Time-Frames

The central lesson of development in Africa over the last twenty years is simply: there are no quick fixes to natural resource degradation and maintenance. In Mali, a consultant team trying to judge the success of fuel-efficient stoves after five years, declared the project a failure. Another team, re-surveying the same area after eight years, found the use of the stoves widespread and popular. It is difficult to know the rates at which technology transfer and the implementation of good NRM practices will occur.

The projects in the Action Program have varied time-frames for implementation and judgment of success. Education programs can be implemented relatively quickly but the results are difficult to judge and occur over periods of five to 10 years as school children grow up and begin to enter adult society. Agroforestry and the improvement of soils may take ten to twenty years before significant improvement in the natural resource base can be documented. Wildlife utilization requires many steps: understanding age, season and sex culling practices; veterinary quality control; identifying and harmonizing markets with culling practices; the facilities to store and transport caracasses; coordination of hide and/or horn processing, etc. In addition, local management associations of wildlife need to be created so that over-harvesting

does not occur. This requires training in judging the amount of reasonable offtake. Finally, some projects will never benefit the generation using the resource. For instance, hardwood and palm regeneration is a societal commitment to provide economic activity and a resource for the next generation. The desire for quick results tends to push donors and governments away from long-term projects -- even if these projects are the most beneficial for a sustained economy.

In summary, the desire for quick results can be ultimately damaging to maintaining and to regenerating renewable natural resources. Patience, especially when new institutions need to be created, is a necessity. In Botswana, the traditional and national perspectives on NRM have just begun to be fused. The process cannot be accomplished overnight or even in five years. Transferring responsibility to the local level for monitoring and implementing NRM can be encouraged but not accomplished with the ease of building a dam or road. It is this social understanding, not the dam or road, that will ultimately create viable resource management. For this reason, modelled on work on-going in the Sahel, the team has given high priority to multi-use pilot projects which will enable a household or community to develop a sustainable livelihood that minimizes the need for national or donor subsidies.

For instance, the MOA's extension work in Lorolwane is a pilot project at an early stage of growth. Over the last three years, a local group has developed a plan to manage their own resources. The plan requires the input of the entire community and has requested from the land board and other district institutions rights to manage their land and water. The Communal Area Management Unit (CAMU) of the MOA is assisting the community with a grazing management scheme and funds for the construction of a drift fence. Few physical outputs exist to suggest that the community has accomplished anything. However, the social organization within the community has developed in a relatively short period of time. Patience and an emphasis on local needs has allowed the community to have a much better chance of designing their own institutions that will sustainably manage natural resources long after any short-term intervention.

Table 4.1 Summary of Project and Research Ideas for Consideration by the PID Team (see Annex 1)

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REGIONAL

1. People exchange program (visits to successful project sites)
2. Cross-border (Zimbabwe and Botswana) wildlife management
3. Cross-border (Namibia and Botswana) wildlife management
4. Cross-border (South Africa and Botswana) wildlife management
5. Long term river basin management
6. NRM economics workshops
7. Law and the environment workshops

EDUCATIONAL

1. Conservation education
2. Training: Land Board, District Council, DLUPU levels
3. Training in value-added veld and wildlife products
4. Training: veterinary wildlife services
5. Women and NRM projects
6. Wildlife Training Center
7. Education: MA in Environmental Planning
8. Education: Ministry of Commerce and Industry priorities
9. Education: agroforestry and soil erosion control at BAC
10. Media projects (TV, newspapers, radio)

PLANNING, MONITORING AND RESEARCH

1. Park planning
2. District land use planning
3. Research: agroforestry (with no. 6)
4. Planning and research: tourist industry
5. Research: pans and fossil valley ecology
6. Research: nursery development for native trees
7. Eastern Botswana: need for protected areas
8. Research: urban attitudes to conservation and wildlife
9. Research: cultural resources
10. Research: renewable energy and fuel substitution
11. Monitoring: wildlife priorities for Botswana
12. City/town planning
13. Research and monitoring: wildlife utilization
14. Planning: waterpoint survey
15. Fire control in north
16. Plant resources mapping

PILOT "MULTIPLE USE" PROJECTS

1. Cattle/wildlife utilization projects, combined with...
2. organization of village level anti-poaching and large mammal pest control associations, combined with...
3. veld products utilization projects, and...
4. establishment of natural resource management groups.
6. Natural Resources Conservation Trust

POLICY DIALOGUE AND GOB ACTIONS

1. Reorganization of NRM administration
  2. International NRM agreements
  3. Donor/NGO NRM coordination
  4. Gazetting remaining areas of planetary significance
  5. Land/water rights of communal area grazing associations
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## 5. THE ACTION PLAN

The Mission portfolio can support NRM activities by including projects in its upcoming CDSS; refocusing existing projects; buy-ins through the AFR/TR/ANR NRMS project, S & T biodiversity project; fallout funding from other missions and influencing multilaterals (eg., World Bank).

### 5.1 Refocusing Mission Portfolio

#### 5.1.1 Present Portfolio

The Action Plan is the Mission portfolio refocused. It suggests ways in which the Mission can better represent natural resources through ongoing and/or proposed projects.

Table 5.1 summarizes USAID/Botswana's current portfolio and proposed fiscal year 1990 (FY90) obligations (ABS, 1988). It also shows the team's estimate of how much of the portfolio -- projects or components of projects -- can reasonably be labeled NRM. The Congressional mandate is that A.I.D. must earmark approximately 10 percent of its annual obligations in natural resources. This earmark applies to the total Development Fund for Africa. Individual Mission levels may be higher or lower. In general, it is expected that Bureau priority natural resources countries will carry the greatest share of this responsibility. As a Bureau priority natural resource country, Botswana is expected to at least meet, and preferably exceed the 10 percent earmark level.

Table 5.1 Projects in Mission Portfolio and FY90 Obligations

No.	Title	Prop. PACD	Planned FY'89 (000 \$)	NRM %	NRM Target %
0221	Ag. Tech. Improvement	9/90	0	25	
0229	Jr. Sec. Educ. Improv.	4/92	1,500	0	
0231	Workforce/Skills Train.	9/89	0	0	
0238	HIG Gaberone West	6/89	0	0	
0240	Primary Educ. Improv. II	5/92	800	0	
0241	Workforce/Skills Train. II	5/94	3,600	4	
0244	Emerg. Crop Prot. Center	9/92	0	0	
0249	Pop. Sector Progr. Assist.	7/93	1,000	80	
0250	Program Dev. and Support		100	20	
0251	Emergency Drought Relief	9/93	0	0	
0253	Prot. Areas Plan./Tourism		0	100	100
0252	Private Sector Development		0	0	0
TOTAL			7,000	14	10

The process of determining how much of the portfolio is NRM is largely judgmental. For example, support for the development of

drought resistant grain species varieties would not be counted. Support for training in water harvesting techniques, etc. would be counted. The Action Plan is based on planned FY90 obligations to be consistent with congressional guidance. Of these planned obligations, the percentages given in the 5th column of the table represent the credit given toward the rule-of-thumb that 10 percent or more of priority Mission portfolios should be spent on NRM activities.

It can be seen from the table that USAID/Botswana FY90 planned obligations will exceed the Congressional 10 percent guideline if the major contribution -- the Population Sector Program -- can be applied to the natural resources earmark. (It is unlikely, however, that AID/W or Congress will accept counting all population programs as natural resources despite the PNRM emphasis on the importance of population control and economic growth to improved natural resources management). If the population program cannot be counted, the natural resources percentage attribution falls far short of the 10 percent target -- to under two percent.

#### 5.1.2 Integrating NRM in Mission Portfolio

Four key NRM issues in Botswana -- education, value added skill training, land use planning and population growth -- are already addressed to some extent by the Mission. Recommendations on how to further strengthen the portfolio are presented below.

#### 5.1.3 Junior Secondary Education Improvement 633-0229 and Primary Education Improvement II 633-0240

USAID/Botswana education projects give the Mission a strong foundation on which to build a natural resources/environmental education effort. Existing channels of working relationships and policy dialog can be utilized directly in this effort. Continued cooperation with Peace Corps and use of existing input into curriculum development will all result in an excellent framework for an environmental education effort without a large management investment in start-up. Mission personnel are also exceptionally well qualified and motivated for an environmental education project.

#### 5.1.4 Botswana Workforce and Skills Training(BWAST) 633-0241

Rural employment generation is a key issue for improved natural resources management in Botswana. Forests will never be seen as needing management until jobs dependent on the processing of wood exist. When jobs are dependent on the resource base, the importance of maintaining the base becomes clear. At present such jobs don't exist. Value-added processing of natural resources, rural employment through entrepreneurial use of the resource base, are virtually non-existent in Botswana. Forest products are exported with almost no processing and range use emphasizes products with very low processing. Development of these opportunities should start in rural areas, close to the resource base. It should be undertaken by private individuals, rather than

the government, to encourage self-reliance and growth (section 5.2.1).

The BWAST project can make a direct and important contribution to this effort which will directly complement and reinforce a natural resources activity. BWAST can provide training and operational experts (OPEXers) to small-scale industries working in natural resources processing in rural areas. BWAST has already supported (and continues to support) an OPEXer in craft development (Beth Terry at Botswanacrafts) and a local craft and enterprise development cooperative. Kennedy Mmopi, of Kgalagadi Gameskins Products received BWAST training and is now providing employment opportunities in value-added processing of wildlife products. This is EXACTLY the type of rural value-added enterprise development that is crucial to improved community involvement in natural resources management in Botswana. In the words of NCS coordinator Seeiso Liphuko, "community people become the policy makers, become the managers, become the best stewards of natural resources".

USAID/Botswana can greatly complement its new natural resources start by enhancing the BWAST emphasis on development of small-scale rural jobs in resource processing. This support can even be directly targeted at pilot project areas, if these are a part of the new natural resource activity in its CDSS Private Sector Strategy. Continued support for training in wildlife and other direct natural resource management positions (a la the Maun Wildlife Training Center OPEXer) will also greatly benefit improved NRM.

Raising BWAST support for rural resource processing enterprise to 15-18% (2-3 OPEXers, 100-200 trainees per year) would bring the Mission NRM portfolio (exclusive of new starts) to about the 10 percent level specified by Congress.

Specific suggestions for training to complement a natural resources activity are given in Annex 1.

#### 5.1.5 Botswana Population Sector Assistance 633-0249

Moderation of population growth is considered critical to natural resources management both by the Bureau PNRM and this team. This sectoral program directly contributes to a high natural resources priority without modification. Mission policy dialogue in this sector should coordinate with policy dialogue in natural resources.

#### 5.1.6 Program Development and Support(PD&S) 633-0250

USAID/Botswana has used PD&S funds strategically to great effect in the natural resources sector. Mission support for land use studies in Ngamiland and the Okavango Delta are landmarks of donor-NGO-government cooperation in high priority areas. This team can only complement the Mission on its past effective use of PD&S funds and suggest that strategic use of PD&S can bear similar good effect in the future.

## 5.2 The Future Portfolio

### 5.2.1 New Starts

In the next few months, the mission will be investigating its Private Sector Strategy for the CDSS, completing its Agricultural Sector Assessment and meeting with the Regional Faculties of Agriculture (SACCAR and BAC). It is recommended that the PID team review the Action Program projects for the possibility of including a NRMS project within the CDSS and that it request the Regional Faculties to include a soil and water conservation component. The PID team should also consider the newly formed S&T Biodiversity Project in Washington for buy-in funding.

It is the recommendation of this team, based on government priorities, progress of the National Conservation Strategy, U.S. Congressional mandates, and specifically on the need for improved natural resources in the country, that USAID/Botswana initiate a new start in natural resources. This new activity may be bilaterally or regionally financed. The team has noted the high number of regional opportunities in natural resource management involving Zimbabwe, and, to a lesser extent, newly independent Namibia.

It is recommended that value of resource (both for utilization and protection), opportunity to develop rural employment in resource processing, and community organization be considered in selecting pilot project sites. Projects should be sited, where possible, to maximize the achievement of multiple objectives, particularly protection of key resources, development of rural employment, effective resource management, development of results with potential application in other areas, both inside and outside of Botswana.

In general, the team has identified northern Botswana as a priority area because of its biological importance, a relatively high population concentration in close proximity to utilizable resources, relatively superior logistics, and the rapid change in the area likely to occur with the paving of the Nata-Maun road. But, other areas are of importance as well (section 4.2).

### 5.2.2 SADCC NRM Project

The four components to be included in the PID to be developed immediately following the preparation of the Action Program/Plan mirror, to a large extent, the NRM priorities discussed in the Action Program above and listed in Annexes 1 and 2. Because the new project may be regional, funded with SADCC money, only a small portion of the total amount to be earmarked can be credited towards fulfilling NRM goals by USAID/Botswana. Since the total budget for the new project is unknown, however, the portion to be credited to USAID/Botswana is also unknown.

### 5.3 Implications for Mission Management

As the projects become better defined, the PID team will address questions of direct hires, PSCs, etc. They will also address mission questions on how to evaluate any selected PID project.

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ANNEX 1: DEMONSTRATION/PILOT PROJECT AND RESEARCH  
IDEAS FOR CONSIDERATION BY PID TEAM

LIST OF PROJECTS

REGIONAL(SADCC)

1. Exchange of farmers, agro-foresters, herdsman or wildlife workers between Zimbabwe and Botswana. Purpose: to visit each others projects and discuss local organization and responsibilities for range management, reforestation, wildlife, etc. Part of Pilot Project Activities (see below).
2. Cross-border wildlife management with Zimbabwe to address culling of elephants, hunting, poaching, habitat needs and tourism from a bi-national perspective.
3. Cross-border wildlife management with Caprivi Strip or along Namibian fence. Part of anti-poaching training and implementation program required to maintain bi-national populations of elephants and other migratory species as well as consider new habitat for wildlife in Namibia by opening border fencing.
4. South Africa/Botswana cross-border wildlife management and tourism for Gemsbok National Parks and proposed protected areas on both sides of the Limpopo in the Tuli Block area.
5. Long-term river basin management plans for international rivers (Chobe, Limpopo, Okavango, etc.) to determine water rights by type year (dry, very dry, normal, wet, very wet) as well as guaranteed in-stream flows for fish and wildlife. Talk to Ministry of Water Affairs. May be pre-mature.
6. Regional workshop on natural resource management and economics. A "how-to" workshop of financial analysis of NRMS interventions (e.g., how do you judge if windbreaks or other NRM interventions are successful from an economic point-of-view).
7. Regional seminar or conference on "Law and the Environment" for police, magistrates, prosecutors, criminal investigation team, game wardens, anti-poaching team, attorney general's office, et al. to share experiences and develop an integrated approach. Topics to include punishment levels for comparable crimes; existing laws; natural resource controls on access and limited use of resource; pollution legislation and enforcement, etc.

EDUCATION AND TRAINING

1. Aid to Wildlife Training Institute for both training and education. Administrative needs include a word processor. Training needs include CPR dummies and a trainer in physical education. The more important education needs are linked to tourism. They include additional fencing for wildlife park and the design of the visitor/education center for school children and tourists. The center should be well-maintained and attractive and comprehensive

as this will become the major center for environmental education and tourist information. Consulting with US groups such as the Arizona-Sonora Desert Museum which is a direct analog would be useful before design or construction begins. Additional educational materials for a library and ecology training (monitoring, record keeping) for the institute is needed. EEC has given some support.

2. Increase aid to the Wildlife Clubs Association of Botswana, the Environmental Education Reference Group, KCS educational programs, FAB (forestry conservation and fuel conservation), Thusano Leftatsheng and Curriculum Development Unit of the Ministry of Education, Wildlife Education Unit of DWNP, National Museum, and the University of Botswana.. At the moment, WCAB focusses on secondary schools, but can expand to colleges, university and primary levels. They are limited to area near Gaborone and need aid to expand program to other urban areas and rural communities. KCS has pipeline projects the require financing. All these organizations could come together in a workshop with donors to set tasks and priorities. This is an area ripe for Peace Corps participation. Priorities include primary school curricula, teaching materials, curricula for teaching training colleges, and in-service workshops. In addition, a project to increase exposure of Botswana citizens to their own wildlife and national parks should be included. Contact: KCS plus other groups. Donors have included UNEP outreach.

3. Training to create human resource skills for producing value-added products (e.g., wood carving, tanning hides, product design) related to wildlife and veld product utilization. This is a high priority as most timber is exported as raw logs and hides and leather crafts are in their infancy. Contact: Frank Taylor (Gabahi) and Thusano and Botswanacrafts and BWAST (contact: David Benedetti).

4. Training in veterinary sciences as it applies to wildlife (not cattle) as part of "package" for wildlife utilization of game meat. Part of Pilot Project package.

5. Women-in-Development projects focused on natural resources: gardens with scarce or high-value plants, tree planting in woodlots, increased veld products marketing, etc.

6. Training and workshops for Land Board, District Councils and District Land Use Planning Units on sustained development and conservation -- especially on problems of wildlife/cattle tensions and opportunities for sustained development and opportunities to legislate natural resource management agreements. Four pilot training projects in pipeline include inventory and accounting of land use data in computer systems to speed land use decision-making. Started under World Bank NLMP, may include a Peace Corps trainer. Training support program needs donor support. Contacts: Peter Hancock (KCS) and Nigel Hunter (MLGL).

7. A masters program in environmental planning is in the early stages at the University of Botswana. Curricula and educational materials require a small support program. Contact: Jeff Halen.

8. Education and training in wildlife economics (especially re-investment opportunities); range assessment; increased support for students to Mweke; PhD in forestry, park management and wildlife ecology. High priority of Mr. Matenge of Commerce and Industry.

9. Review of media possibilities for TV and radio programs featuring benefits of wildlife, natural resource conservation etc. Sponsoring a weekly article in government newspaper. See Environmental Education Reference Group for materials lacking.

10. Introduction of agro-forestry courses for agricultural demonstrators (ADs) at the Botswana Agricultural College. Contact: BAC, Edward Kemsley.

11. Although there is a soil erosion control unit in the division of land utilization in the Ministry of Agriculture, they have no extension people in the field. They need to train people and extension agents with counterparts (Peace Corps workers). Contact: M. Mpati at Division of Land Utilization and Liz Muggeridge.

#### PLANNING, MONITORING AND RESEARCH PROJECTS

1. Park planning is very high priority. US AID helped on ecological zoning of Okavango. KCS worked on Central Kalahari Game Reserve. Needs for Moremi National Park, Chobe National Park, Nxai Pans/Makgaidkadi Pans Reserve Complex. PCV has managers with counterparts in Chobe and hopes to have volunteers in Gemsbok and Khutse. Park plans are not in PCV terms of reference. High priority for KCS and Mr. Matenge, Permanent Secretary of Ministry of Commerce and Industry.

2. Research into status of cultural resources (pictographs, inhabited caves, etc.) with National Museum and recommendations for national monuments. Contact: National Museum.

3. Not investigated but research or planning for Gaborone, Francistown, Selebi Phikwe and Lobatse including traffic patterns and quality of life issues (park locations, urban forestry, air quality, public transport, etc.). SIDA has worked on Gaborone Planning.

4. Nursery research and development, particularly for palm regeneration and makoro (dugout canoe) regeneration. Grapple plant and silk trees now under investigation. May need further support. New products not researched. Etsha should be location as it is over-utilized palm area. Identification of areas with over-utilization of roofing thatch and areas where "thatch farming" has a viable market. Contact: Thusano.

5. Ecological research into the importance of pans and fossil valleys to existing wildlife populations of the Kalahari. This can be part of WMA planning program. High KCS priority.
6. District Land Use Planning. KCS has helped on Ngamiland and Nata/Gaeta. Specific priorities should be remote area dweller settlement patterns. The best model is Southern District's Land Use Plan for RADOs. Other areas with a high priority include Chobe because of forestry and tourism; dezoned TGLP RAD communities (e.g. Dikgankgane and Khakhea settlements in Southern District and the Diphuduhudu Communal Service area in Kweneng). USAID has helped with some of the existing plans, which produced excellent products.
7. Assessment of remaining habitats, possible linkages between them, remaining wildlife populations and important biotic communities, natural resource and land/water use conflicts and needs for protection or consensus building on limits to utilization for eastern Botswana. High KCS priority.
8. Assessment of attitudes towards wildlife in urban and rural areas as part of program to development education and public relations needs. High priority KCS. This assessment should include integration of conservation education into church groups or equivalents.
9. Agroforestry research is yet to begin. Need trial plantings of tree and browse species as well as live fences for each ecological zone. Need to know local priorities and what incentives in areas near boreholes, villages, towns, trekking routes, etc. can be used for rangeland and woodland restoration. Village woodlots. NORAD and PC have started projects in this area. Can be extended through ALDEP. Follow-up of NORAD's present project (survey of attitudes and opinions re agroforestry) could use US AID funding. Project could be regional.
10. Not investigated by NRMS team but suggested by others: Renewable energy and fuel substitution program, especially near over-utilized woodlands, that might include further work with fuel efficient stoves, solar water heaters, coal stoves, etc. There is previous research that was not reviewed by team. Contact: Energy Unit of Ministry and Water Affairs.
11. Monitoring and aerial survey of wildlife and range resources is a high priority for draft NCS, Ministry of Commerce and Industry, Wildlife Department, etc. Problems have occurred in aerial survey implementation and inadequacy of trained manpower in range assessments. Test plots in various ecological zones should be set up with University or NGO.
12. High priority for Wildlife Department and Ministry of Commerce and Industry is an assessment of tourist industry (high and low volume returns; safari hunting vs. photographic safaris; environmental impacts; needed infrastructure, targetted international markets, etc.). EEC has study and future work should be based on their as yet unpublished report.

13. Wildlife utilization is, at present, being investigated by a WWF-sponsored team with KCS. Their conclusions will need integration with proposed WMAs. Priority areas include western Ngwaketse (Southern District), east Ghanzi (okwa), Kalahari WMAs and Ngamiland WMA. Contact: NORAD, M. Karlsen. Assessments of the Kedia game harvesting project (Central District) and game ranching scheme (Kweneng District) may be forthcoming from WWF.

14. A waterpoint survey is necessary in Botswana to locate falling groundwater tables; over-lapping grazing areas caused by boreholes; illegal boreholes; the need for new boreholes, etc. Two Districts need updating. Eight need complete surveys. Contact: Nigel Hunter, Geological Survey, Water Affairs and Local Boards.

15. Fires have burned valuable resources in the north. How to best control or prevent fires is not known. In addition, there is no government entity with assigned with fire control responsibility. Contact: John Larson; Nigel Hunter.

16. In order to have a better inventory of fulewood, natural crafts, brushfence and fence post resources, a map of plant resources is needed (scale 1: 250,000). Contact: Liz Muggeridge.

#### PILOT MULTIPLE-USE PROJECTS

It is hoped that a whole series of pilot projects with different emphases can be started and coordinated. These should complement, for example, the on-going World Bank projects or help fund those that the World Bank cannot fund (see Appendix). Pilot projects will occur in different ecological zones (rainfall, soils) so that transferability can be assessed. Listed here as separate pieces of a Natural Resource Pilot Program complex. These are longer-term projects, minimally five years. The projects should target the remote area dwellers, the poor, women, communal lands, marginalized Baswara and others who have greatest economic need and rely most heavily on the natural resource base. In general, the first two years will not include interventions but will stress the socio-economics of the local communities. After understanding how local production systems and income generation occur, the rural sociologist will help form local natural resource committees that will eventually take responsibility for range, water and woodland management, veld products, and wildlife utilization. Phase II would be implementation which includes agreement with local land boards, district officers, and other interested parties on the boundaries of the resource areas and on methods of enforcement of the management plans. The implementation stage may include grants, subsidies, loans, guaranteed markets, provision of services (health, transport, education, training) and other start-up and development incentives.

1. Development of wildlife utilization projects. Safari hunting cropping program, mixed cattle/livestock ranching, possibly game farming of elands, etc. These projects will be identified by WWF and KCS on both freehold and tribal lands. Projects should include

marketing, social lives of people, employment, rules and regulations for transport and butchering, veterinary services for wildlife, range management extension, phosphorus supplements, browse agroforestry, etc. Goal is how to develop the industry?

2. Large mammal pest-control measures. Areas should be identified where wildlife has become a pest -- predators or grazer/browsers. Test control measures that minimize damage to other species or overall populations need to be researched and tested. There are, for instance, hippo problems on the Thamalakane and Matsaudi rivers and at Rakops and Makalalabedi on the Boteti River. There are lion problems in the Kweneng, Ghanzi, Ngamiland, Central and Kalahari Districts.

3. Organization of village level anti-poaching associations (hunters associations) to supplement GOB's anti-poaching units. Research and implementation of agreements to allow limit and controlled use of wildlife in exchange for protecting wildlife.

4. As indicated above under research, wild plant products projects in coordination with Botswanacrafts and Thusano Leftsheng sustained management of Hyphenae palms. Incentives include nursery for dye plants; imported dyes to expand design possibilities; import of palm leaves until plantations become harvestable; taxes on palm beer production, etc.

5. Formation of natural resource user groups for combination of development, wildlife, range, and veld product management. The goal is local management of the resource with maintenance or even restoration of grass/browse quality. Incentives may include subsidized dicalcium phosphate, site-specific disease control, fodder banks, control of non-browse species and nurseries to increase dry-season browse species, price differentials for old, infertile or cows to maintain reproductive rates. The Phase II goal should include adjusting percent, timing and composition of offtake for cattle, small livestock, and/or wildlife.

6. A high priority project is phased support for a new NGO called the Natural Resource Conservation Trust. This will be the first organization to coordinate all the local groups within a village or town for conservation projects; will network various local communities with similar concerns; will act as a lobby or network resource with Gaborone government agencies and Gaborone-based NGOs; will help seek funding or spread information on funding sources to local communities, etc. Phase I would be the selection of the person (Botswana and/or ex-pat) to start up the trust as well as trial meeting with villages to define the trust better. Phase II would begin funding pilot projects to test out how the Trust will work. US AID could help fund the search for steering committee and the first leaders of the Trust.

#### POLICY DIALOGUE AND POSSIBLE GOB ACTIONS

1. US AID/Botswana could continue dialogue with GOB on reorganization of administration in order to improve NRM and

monitoring as well as implement the NCS (if approved by GOB). The dialogue would include the possibility of creating a Ministry of Natural Resources Management, methods of speeding up land use planning, providing extension agents with more field time (vs. paperwork), combining and strengthening forestry concerns (timber, wastage, concessionaire accounting, fuelwood, plantations, etc.). coordinating tourism land use planning with logistics and wildlife management and education, etc.

2. The international community should help the GOB join RAMSAR and the World Heritage Convention.

3. Donor community should help with gazetting remaining national parks, monuments or cultural features by supporting surveying and land use work to best define these areas.

4. UNDP should continue donor and NGO coordination. Should they abandon this service, then another organization should adopt the process as it is crucial to NRM coordination.

5. Land/water rights of communal area grazing associations.

## ANNEX 2: "HOW-TO" STEPS

### **Economic and Financial Analyses (1)**

Economic and financial analyses should be carried out for all technical project components. The difference between economic and financial analysis is one of perspective rather than method. The same discounted cash flow method can be applied in both analyses. Only the assumptions and the point-of-view from which the analyses are made, differ. Hence, the results and their significance differ. Financial analysis is from the individual investor's point-of-view. It measures the private returns of a project to the investor using actual costs and revenues. The analysis does not consider whether the costs and revenues are subsidized or fixed or otherwise distorted by some government regulation. In Botswana's livestock sector, for example, inputs are heavily subsidized as are the export meat prices (to EEC countries). These subsidized input costs and output prices are used in the financial analyses.

Economic analyses measure the returns that accrue to society as a whole regardless of who invests or receives the benefits. The analyses are neutral to the income distribution effects of the project. Taxes, subsidies and other government regulations affecting prices and costs, are regarded as transfer payments within the economy and are not reflected in the cash flows of the project. Thus, the subsidized input costs and output prices in the livestock sector are not included in economic analyses -- only the true economic costs and prices are used (i.e., the prices and costs which would be in effect in the absence of the subsidies).

Time series information on the crucial economic and financial variables must be collected. They include the real discount rate and cost and price appreciation rates. Real rates are adjusted for the influence of inflation. All analyses should be carried out in real, not nominal terms.

The basic procedures for carrying out NRM economic and financial analyses are briefly outlined below. A summary of the information requirements is presented in Table A.1 below.

#### **The Steps**

##### 1. Specify a Range of Management Alternatives

In agriculture (including livestock), wildlife management, forestry, agroforestry, fish production and other NRM interventions, there are many different ways or alternatives of achieving objectives. Each alternative is associated with a particular cash flow evolution over time. Some are expensive, others are inexpensive. Intensive management alternatives produce more of the desired end product but are more costly. Less intensive alternatives produce less product but are also less

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1. The following discussion is taken, to a large extent, from work recently carried out for USAID/Rwanda (Christophersen, 1988).

expensive. There is literally an infinite number of alternatives and combinations thereof that one could define.

The purpose of analyzing several different alternatives is not to identify and choose the economically optimal alternative to implement. It means, rather, that more information will be made available to the decision makers with which they can make better resource allocation decisions. They still may choose to implement less economically attractive or even non-economic alternatives for a variety of reasons. But when they do, they will have the information with which to measure the economic tradeoffs between the alternatives. In this sense, economic results can be used as a common denominator to compare between alternatives.

## 2. Estimate Yield Response to Management Alternatives

The reasons for promoting NRM interventions are ultimately to foster sustained yield management of the natural resource base, to improve soil productivity on farms, and to increase the output of products (higher crop yields, wood products, etc.). These are the benefits of the interventions which must be measured and counted as returns on the investments. In soil conservation and agroforestry interventions, for example, the direct benefits are the increases in crop yields the farmer can expect. In forestry, the direct benefit is the wood produced -- fuelwood, poles and sawlogs. In the livestock sector, the benefits from investments in range improvements can be measured in terms of cattle weight gains (multiplied by beef prices), etc.

## 3. State the Base Case Assumptions

Financial and economic analyses must be anchored to a set of assumptions and predictions about the future. The base case scenario should reflect the most realistic assessment of the probable future behavior of the variables. Assumptions must be carefully developed, and justified, for all of the information categories listed in Table A.1 below.

## 4. Interpret the Results

This step involves the comparison of returns associated with each of the alternatives considered. Always include a "do nothing" option. All of the alternatives should be compared against each other as well as against the do nothing alternative. The alternative with the highest economic return is economically optimal. This return is competitive if it exceeds or at least equals the returns one could reasonably expect to obtain from alternative investments.

## 5. Carry Out Sensitivity Analysis

Sensitivity analyses cover the "what-if" questions. Although base case assumptions are supposed to be representative and realistic, the real world is filled with uncertainties and all variables are subject to unanticipated fluctuations. What would

happen to the analytical results if the price were X instead of the base case assumption of Y? What would happen to the results if costs were higher or lower than those originally assumed in the base case? The base case assumptions should be changed one by one and the effects on the analytical results determined. Where a large change in an assumption causes only a small change in the overall result, the assumption is not very sensitive and need not be as carefully monitored. Where, on the other hand, a small change in the assumption triggers a large change in the overall result, this assumption is sensitive and should be carefully watched.

### **Analytical Techniques**

The most common analytical techniques include net present value (NPV), benefit/cost ratio (B/C), internal rate of return (IRR), and for forestry interventions -- a special forestry application of the NPV technique, the soil expectation value (SEV). The SEV is used less frequently, although it is the most correct approach, particularly in short rotation forestry analysis. All of the techniques are standard and well documented in the economics literature and are not described in detail here. The NPV approach is recommended over the IRR and B/C approaches for all interventions except forestry. The SEV approach is recommended for the forestry interventions.

**TABLE A.1 INFORMATION REQUIREMENTS**

Info. Categories	How
<b>ECONOMIC INFORMATION</b>	
Discount rate	Time series of bank lending, savings rates, indices, etc. Use real rates (1).
Price Appreciation	Time series of agricultural, forestry and fish prices, indices, etc. Use real rates
Cost Appreciation	Time series of labor and materials costs, indices, etc. Use real rates.
Unemployment	The shadow price of labor (2) depends on the rate of unemployment in the country.
Subsidies	If materials used in the interventions (seedlings, etc.) are subsidized, the real (unsubsidized) price must be determined and used in the economic analysis.
Fixed prices	Identify where GOB has fixed prices (producer or consumer) by sector. Use the fixed prices for the financial analysis and the true prices for the economic analysis.
<b>INTERVENTIONS</b>	
Labor (Time)	How many person days it takes to realize the investment. Identify and measure each of the activities required in terms of the number of person days for each.
Materials Costs	Cost of any materials such as tree seedlings, subsidized (financial analysis) or full market price (economic analysis), fertilizer costs, any other materials costs required for the interventions.
Labor Costs	Labor cost/day, supervisory and unskilled.
Crop Yields	Measure yields before intervention to establish reference point. Measure yields during project period w/interventions.

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 1 + nominal rate

1. Real rate =  $\left( \frac{1 + \text{nominal rate}}{1 + \text{inflation rate}} - 1 \right) \times 100$

2. Use shadow prices for labor in the economic analysis when there is unemployment in the country. When a project employs people who are otherwise producing nothing, production is not foregone elsewhere and the true economic wage is zero.

### ANNEX 3: PERSONS CONTACTED

#### USAID/Botswana, Embassy, Peace Corps, and REDSO/ESA:

Barbara Belding, Education Officer

Paul Daly, Agricultural Development Officer

John Hummon, Director

John Kordek, U.S. Ambassador

Tim Olsen, APCD - PTO Programming and Training Officer

Lloyd Pierson, Peace Corps Director, Gaborone

Binkie Ramaologa, APCD Generalist

John Roberts, Deputy Director

C. J. Rushin-Bell, Natural Resources Officer

#### Government of Botswana:

M. Akuje, District Agricultural Officer, Ngamiland District, Ministry of Agriculture

Stewart Child, Department of Water Affairs, Ministry of Water Affairs and Minerals Resources

M. M. Gaalafswa, Acting District Commissioner, Maun

Lucas Gakale, Director of Agricultural Research, Ministry of Agriculture

Nigel Hunter, Dept. of Town and regional Planning, Ministry of Local Government and Lands

N. M. Macheke, District Office, Development, Ministry of Agriculture, Maun

K. B. Mogalatwe, Council Secretary, Northwest District Council (Ngamiland), Maun

John Larson, Senior Agricultural Economist, Ministry of Agriculture

Seiso D Liphuko, Deputy Permanent Secretary, Urban and Housing, Ministry of Local Government and Lands

Edward J. Kemsley, Principal, Botswana Agricultural College

E. J. Matenge, Deputy Permanent Secretary, Ministry of Commerce and Industry

Stewart McArthur, Advisor to CAMU, Ministry of Agriculture

Yvonne Merafe, Senior Rural Sociologist, Ministry of Agriculture

K. M. Mogatle, Assistant Director, Dept. of Wildlife and Natural Resources, Ministry of Commerce and Industry

George G. Morapedi, Senior Economist/Planning Officer, Ministry of Commerce and Industry

K. Ngwamotsoko, Director of Wildlife, Ministry of Commerce and Industry

Thomas Taukobong, Acting Permanent Secretary, Ministry of Agriculture

Staba Tibi, Acting Director for Agriculture, Field Services, Ministry of Agriculture

Other:

Gert Brits, Okavango Explorations

Terry Cacek, Wildlife Training Center, Maun

Ralph Cobham, Cobham Resource Consultants, c/o UNDP, Gaborone

D. H. M. Cumming, Project Leader WWF/Wildlife Utilization Pilot Projects

Lars-Olaf Hook, Senior Program Officer, Swedish Embassy Development Cooperation Officer

Klaus Klaason, Regional Planner, SIDA, Maun

Marit Lillejordet Karlsen, Senior Programme Officer, Royal Norwegian Embassy, NORAD

Larry Patterson, KCS

Karen Ross, Maun

Paul Sheller, KCS Representative, Maun

Jeremy J. Tunnacliffe, Agricultural Advisor, Delegation of the Commission of the European Communities

Inge Tveite, Deputy Resident Representative, NORAD, Gaborone

Elanor Warr, KCS

ANNEX 4. BWAST OPPORTUNITIES TO SUPPORT RURAL EMPLOYMENT  
IN VALUE-ADDED NATURAL RESOURCES PROCESSING

The following training and OPEX opportunities may be useful avenues for BWAST to complement needs in natural resources. The government and USAID could consider these suggestions in light of its priorities and its institutional ability to absorb additional personnel.

Possible Opportunities:

1. Continued BWAST support for BotswanaCrafts production and marketing. OPEX opportunity. Contact: Beth Terry or supervisor.
2. Increased BWAST support for Rural Industries Innovation Center. OPEX or training opportunity. Contact: RIIC Director.
3. Further BWAST support for processing of gameskins and leatherworking. Training Opportunity. Contact: Kennedy Mmopi, Kgagaladi Gameskin Products for suggestions.
4. OPEX support for crocodile farming. OPEX opportunity. Contact: Mr. Ngwamatsoko, Director, Department of Wildlife.
5. BWAST support for silk production and processing. OPEX or training opportunity. Contact: Richard Hartland-Rowe Shashe Silk, Shashe. Phone 284269, 284248
6. OPEX support for production of palm trees used in basketry. OPEX opportunity. Contact: Eleanor Warr, Kalahari Conservation Society.
7. Technical assistance or training in computer data systems for District Officers (Land). OPEX or training opportunity. Contact: Nigel Hunter, MLGL.
8. OPEX support for sustainable harvest and regeneration production of thatching grass. OPEX opportunity. Contact: Ralph Cobham, IUCN.
9. Support for C.O.R.D.E., an NGO specializing in development of rural employment opportunities through local processing. OPEX or training opportunity. Contact: Gavin Andersson, CORDE, Gaborone. Phone 373865.
10. Support for training of wildlife guides for the tourist industry. Training opportunity. Contact: Jeff Shryer, Peace Corps.
11. OPEX support or training of individuals interested in farming ostriches and/or other wildlife. OPEX or training opportunity. Contact: Jeff Shryer, Peace Corps.