EPHEMERAL RIVERS: SUSTAINING PEOPLE, ENVIRONMENT AND DEVELOPMENT IN WESTERN NAMIBIA

BY

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FARM DAMS AND THE ENVIRONMENT

Dams on farmlands throughout the western catchments represent a threat to ecosystems on the lower reaches of the epheneral rivers. Dams may, if properly sited and constructed, hold water throughout a large portion of the dry season, providing an important source of water for livestock. At the same time, however, they withhold downstream runoff, impoverishing farmers, livestock and resources in the lower river. At present, no permission is required to construct dams smaller than 20 000 m³, although they were often registered with the Department of Agriculture prior to 1990 in order to obtain 'property improvement' or 'soil conservation works' subsidies. These subsidies were dropped with Namibian Independence. Permission is required from the Department of Water Affairs to build or renovate dams larger than 20 000 m³, although they are often constructed or repaired illegally. Lack of a complete inventory for dams within each of the western catchments greatly complicates attempts at effective water management. As an example, some farms in the Kuiseb catchment have no officially registered dams but a site visit reveals a dozen or more. Individually, such dams represent no threat and are of tremendous benefit to the landowner. When dams on more than a hundred farms in a catchment such as the Kuiseb are added together, however, they may represent a major loss of downstream runoff.

Small ground dams have recently been recommended as a means of reducing the environmental degradation associated with permanent settlement at boreholes in communal farmlands of the western catchments (89). It is thought that such structures, holding only 3-4 months of water, would distribute livestock and increase access to grazing without encouraging settlement and possible degradation of the environment. Although such an approach appears well conceived, it may contribute few long-term benefits to environmental management in the region. Because of infrequent and violent runoff in the region, the tendency will be to increase dam size to prevent their destruction and maximise storage when runoff does occur. Such structures will also be irresistible to the region's elephant populations. Given the difficulty in protecting even small dams, conflicts will undoubtedly arise. The decision to initiate construction of any such waterworks should be taken only after development and approval of a regional land use plan.

B: Living off the Land

1. The Old Way: Hunter-gatherers and pastoral nomads

Archaeological evidence indicates that people lived as nomadic hunter-gatherers in the western catchments since the mid-Pleistocene, a lifestyle which has persisted into the last thousand years (79). Such archaeological sites are found in every catchment, especially in close vicinity to springs and river courses (80). People that gathered near reliable water illustrated the rocky hill sides with paintings and engravings as in the Hungorob Ravine in the Brandberg Mountain, the Twyfylfontein escarpment and the Spitzkoppe. Evidence from the Erongo Mountains, on the boundary of the Omaruru and Swakop catchments, indicates that people made

regular movements over the past two thousand years to find water and food. During the rainy season, resources on the mountains were used until the dry season caused a retreat to the Omaruru River (105). This dependence upon the river's resources within the dry western regions is a pattern echoed in much of the archaeological material known to date, and persists today.

Hunter-gatherers lived within the Kuiseb, Tsondab and Tsauchab catchments several hundred thousand years ago before the Kuiseb River had carved the deep canyon we see today (157). Their stone tools can be found within the dune field at sites where temporary water was probably accessible during at least some years. More recent material has been found along the river courses, including smaller stone tools and bones. Archaeological sites are usually found near inselbergs or along ephemeral rivers where water could be more easily found and game and plant foods are more abundant than in the adjacent stone and rock desert. These patterns also support the assumption that rivers such as the Kuiseb served as migration routes for both people and wildlife throughout much of the Pleistocene (156). In further support of this fact are numerous examples of coastal settlements, some containing evidence of links with inland regions. At the Ugab River mouth, along the Atlantic coastline, remains of a whalebone hut settlement date from 200 to 600 years ago. Within the Kuiseb catchment, copper was worked at several places along the river, some more than 200 kilometers from the coast. Fragments of !nara seeds at these inland mining sites, as well as copper beads at coastal sites, demonstrate that movement was occurring along the catchment from headwaters to coast (82). Mussel shell middens in the Kuiseb River delta dunes, near the Atlantic Ocean, are remnants from a long history of people living in the lower Kuiseb River. Similar middens are found wherever fresh water occurs along the coast.

Agricultural development in the western catchments began with nomadic hunter-gatherers about two thousands years ago. Introduction of livestock from northern parts of Africa resulted in development of subsistence patterns based upon nomadic pastoralism. There is evidence at the Spitzkoppe of a hunter-gatherer settlement which underwent this transition within the past four thousand years (81). At the base of a ravine on the Brandberg Mountain in the Ugab catchment, the remains of a large encampment testify to the existence of a pastoral community living in this region during the last one thousand years (79). It is apparent from these remains that people and their stock moved between seasonal pastures around the base of the mountain to more reliable perennial pastures higher up. This transhumance activity revolved around seasonal variations in water and forage availability. Other traces of Namibia's earliest farmers include sheep dung at the Hirabib inselberg in the Kuiseb catchment, from livestock living there more than 1500 years ago (146). Tracks preserved in silts of the lower Kuiseb river record cattle from the eighteenth century (78).

Recommendations:

- Life styles of early Namibians living in this arid environment should be studied and included in school history, geography and other text books, environmental education materials, for the tourist industry and for all Namibians.

2. Changing Lifestyles: sedentarism and the colonial era

Nomadic pastoralism, based primarily on the search for adequate water and fodder, began to disappear with the arrival of Namibia's first colonisers in the nineteenth century. The history of colonial occupation in Namibia began in 1884 with Germany's declaration of the country as a protectorate. The German administration lasted until 1915 when the German colony was handed over to South African forces. In 1920, South Africa was entrusted with a Mandate over the country on behalf of the League of Nations. This period should have come to an end in 1945 when the United Nations took the place of the old League. Instead, a long struggle ensued and in 1966 the UN General Assembly officially revoked South Africa's mandate over Namibia, observing that it had violated the UN provisions for the mandate by establishing its apartheid-based administration (184). ' In particular, introduction of the 'Odendaal Plan' in 1964, which initiated the creation of a series of ethnic homelands, undermined the econonic independence of Namibian communities. What followed was a long period of conflict, culminating in Namibian Independence on March 21, 1990. This history provides the basis for understanding agricultural patterns seen today within the western catchments.

Before the turn of the century, the colonial government established a series of 'native labour reserves' such as Sesfontein, Fransfontein, Otjohorongo and Okombahe (86). These served nearby settler farming communities which were developing rapidly. In subsequent years, minor additions of land were made to these areas, increasing their size to accommodate increasing numbers of 'natives' being resettled. These resettlements were driven by the early colonisers' desires to secure the most valuable farmland in the country for their personal use (106). Nevertheless, for a period these 'reserves' supported viable farming enterprises providing dairy and other products to national and international markets (86).

The most desirable farming areas were in the upper catchments which had relatively high rainfall. Farmers derived support from the 1948 Long-term Agricultural Policy Commission whose findings suggested introduction of various schemes to enhance meat production through cattle ranching. A series of subsidies were introduced to help individual farmers establish fenced camps with boreholes and ground dams. These subsidies contributed to a proliferation of ground dams (86) in the upper catchments that still persists today. Subsidies continued until 1989, when they were dropped prior to Independence.

To obtain prime areas of the upper catchments for cattle ranching, the government removed the people living there and 'settled' them on the newly developed reserves. Within the western catchments, people were moved from more productive areas in the east to the more arid west, where agricultural potential for the large numbers being settled was marginal at best (2, 143). In earlier times, these western regions were probably only used on a seasonal basis or during years of high rainfall, and now people were expected to settle there permanently.

a. Farming the arid and semi-arid west

Because of its unique history, former Damaraland (now divided between the Erongo and Kunene Regions) deserves special consideration. Its boundaries were recommended in the report released by the Odendaal

Commission, the South African government's mechanism to achieve separate development. Within this area 223 farms had been surveyed and settled by colonial immigrants during the 1930's (140). These farms, the most westerly farms in Namibia, could at best be regarded as marginal. They were operated as cattle or small stock farms and some were used for karakul sheep.

Because of unreliable production associated with the highly variable climate, many farms in Damaraland had already been abandoned by their owners by 1964 when the Odendaal report was released (143). In other cases, these farms were used as additional grazing reserves for farmers living elsewhere. Stock were occasionally moved onto these western farms to graze and then returned to inland farms. This pattern mimicked movements of nomadic pastoralists in response to rain. It was these western farms that were bought by the government, on recommendation of the Odendaal Commission, and added to existing 'native reserves' to form the new homeland of the Damara.

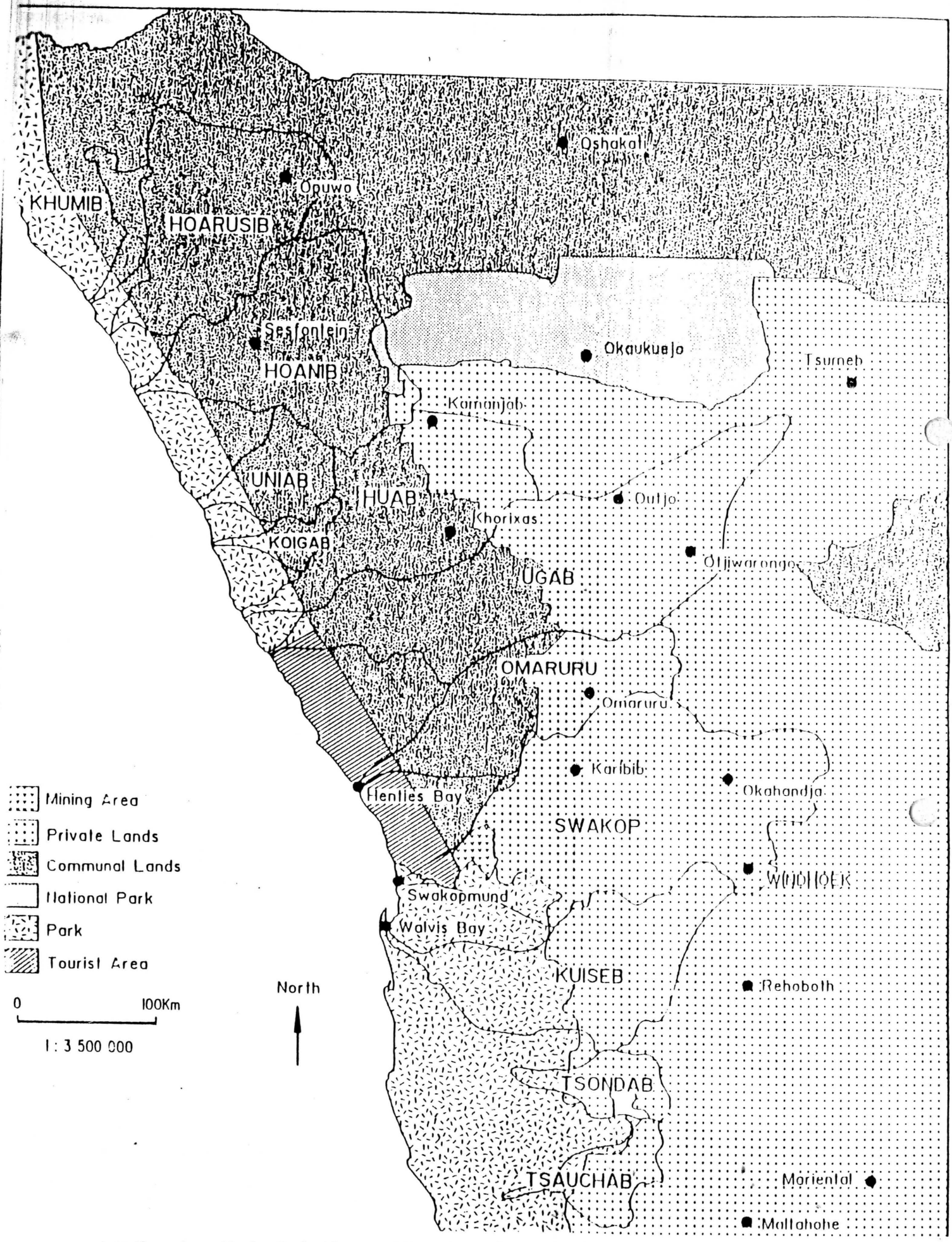
It is worth noting that the 223 Odendaal farms had an average size of approximately 8,500 hectares. The Odendaal Commission stated that Damaraland would offer 108 hectares per individual to new residents. Given that well over half of the region is desert and unsuitable for stock farming, an average of approximately 250 hectares per family was available (143).

b. What we have inherited in the west

The end result of this process of colonisation, resettlement and implementation of the Odendaal Commission's recommendations was a stratification of land ownership within most of the catchments. Headwaters were now occupied by privately held commercial farms (approximately 980 farms throughout the catchments) while middle and lower reaches were absorbed into communal farmlands and proclaimed conservation areas. With land tenure distributed in this fashion, catchments no longer functioned as complete ecological units. One of the most serious effects of forced stratification of land tenure within catchments was the concentration of large numbers of people in areas of inherently low biological productivity with no access to inland areas of higher rainfall. (Wildlife, to some extent, still continued to move between the higher and lower rainfall areas.) Although an open and semi-nomadic farming system would have been the most appropriate land use, it would require large amounts of space because of limitations in the resource base. In addition, floods which originated in headwaters of the rivers were now being held back by increasing numbers of ground dams, to meet water demands of livestock on private farms. These dams reduced downstream river flow, affecting water and vegetation availability for downstream communal farmers and proclaimed conservation areas.

BOX - THE AGRICULTURAL (COMMERCIAL) LAND REFORM BILL

A first draft of this bill was tabled before the National Assembly of Namibia in September 1994. As it refers to land in the upper catchments of eight of the twelve major ephemeral rivers of north-western Namibia, is has a direct bearing on their continued functioning. Perhaps most important from the catchment point of view is the focus on production, from livestock and game farming, and the omission, deliberate or otherwise,



4-32 The end result of colonisation, resettlement and finally, the implementation of the Odendaal Commission's recommendations, is the division of the catchments between private farmlands in their headwaters and state-communal farmland or tourism and conservation areas in their lower reaches.

of alternative economic uses of agricultural land such as guest farms, hunting farms and other non-production (meat or crops) oriented uses. In an arid and water limited country such as Namibia, with very variable rainfall and grazing from year to year, production must also vary considerably. Less dependent on variable rainfall, and hence a more steady use of land, are applications independent of grazing availability such as tourism. What is the fate of a land owner in a dry year, when agricultural use and production from the land is necessarily very low? Must the owner continue to maintain 'production' to the knowing detriment of his own long-term prospects, or will the environmental constraints be recognised? The effects of forced production on the environment within the catchments could be considerable.

In a similar way, occupants of leased farm units must beneficially use the farm through practice of sound methods of good husbandry and proper care and maintenance of improvements on the farm. Annual cultivation or maintenance of livestock is also stipulated. Nowhere within the bill is beneficial use stated to include appropriate, sustainable management of natural resources on the farm. Annual cultivation even in dry years, and maintenance of livestock, will have a marked influence on the farm and the downstream users when rains again fall and erosion is marked. Should use of groundwater be maintained even as the water table drops, and what will be the effects on downstream users? If additional farm dams are encouraged, how much water will find its way to recharge aquifers in downstream communal areas or maintain pod production from anaboom trees for the communal farmers' livestock?

In the past, Namibian farmers moved their livestock over vast areas in response to variable rainfall and grazing. The new Bill dictates that production must be maintained in a single place. Have conditions, people or management strategies changed? Who will benefit in the long term?

An unanswered question in the bill is: what is an economic unit? Is it something that provides a minimum revenue for the state in terms of taxes, or is it something that provides a livelihood, if not a cash income, for a certain number of people? Which management objective will be of greatest benefit to the nation in the short term and in the long term? When viewed from a catchment perspective, which management objectives when used on the smaller number of private farms upstream will have the greatest benefit, or the least negative influence, for the many downstream users on communal farms? All of these questions need serious deliberation before enactment of the bill is completed.

3. Farming Today

a. Farming systems throughout the catchments

In the headwaters of the larger catchments, rainfall is relatively high and less variable. In this setting, fenced camps with seasonal stock rotation have generally provided a suitable management strategy for privately-owned commercial cattle enterprises. Livestock are the economic mainstay of communal farmers, and uses are much more varied than in the private hold areas. For most farmers in the communal areas, livestock is, to a greater or lesser degree, an investment in household food security, present and future, and a repository of

wealth (123). Cattle may also be farmed commercially by farmers in the communal areas both in terms of the scale of the enterprise as well as the turnover and investment of cash in other enterprises. In addition, milk, meat, blood, dung and skins are critical resources in some households (98, 178). Milk is consumed fresh, sour or curdled. It is also converted into butter. Cattle are also used for ceremonial purposes and occasionally for draught power, in more mesic regions of the catchments, where cropping is done on a small scale. The OvaHimba women of the Khumib and Hoaruseb catchments prepare butter as food as well as a cosmetic when mixed with ochre (69).

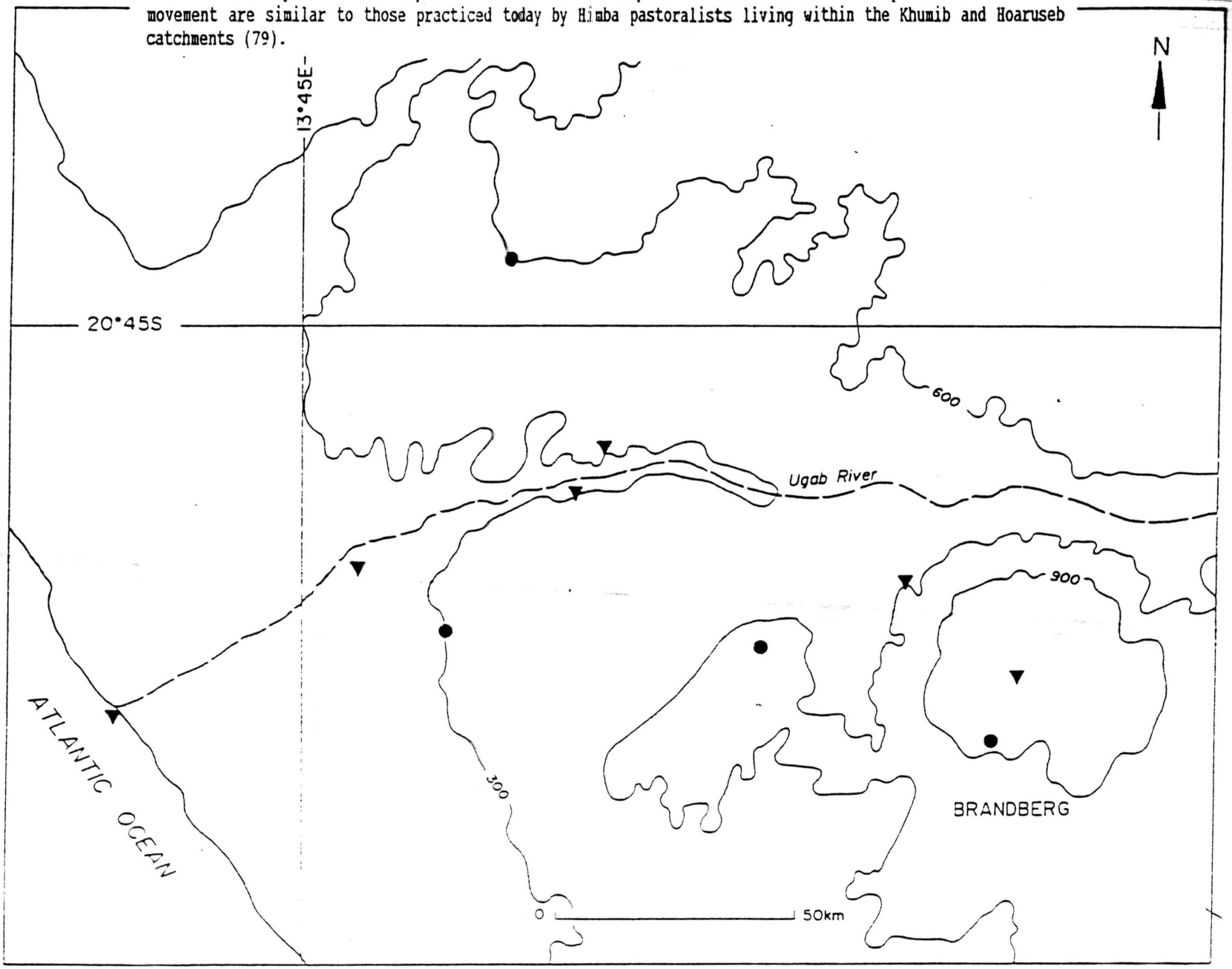
The main constraint that farmers face in arid and semi-arid communal regions of the western catchments is the inherently variable climate, where annual rainfall can deviate as much as 70% above and below the mean from one year to the next (202). Rainfall is also variable in space, falling in widely scattered localities in any one year. As a result, it is impossible, and inappropriate, to set a fixed carrying capacity applicable to the region (17). Any figure set will lead to under stocking in one year, limiting potential livestock production, or overstocking in another year, resulting in fodder shortages and possible rangeland degradation.

To cope with this variability, livestock farmers in western catchments do what pastoral nomads have always done in this region; they move their stock to wherever rain has fallen. Movements of Himba within the Khumib and Hoaruseb catchments have been cited as an excellent example of an appropriate rotational grazing system in an arid rangeland (134). It is thus impractical to consider establishing fenced farms with seasonal rotation between camps. In many years an individual farm might receive little or no rain and therefore open access to large areas of land is essential. In the early 1980's, in response to a severe drought in the region, the Damara Authority even had to arrange emergency grazing in commercial areas further inland, subsidizing transport of stock to and from these areas (91). Although such cases have been poorly documented, they illustrate the importance of a flexible strategy that facilitates opportunistic management of stock populations. The communal system of land tenure works well where there is an adequate amount of land and a firm adherence to nomadism.

If it is not possible to move stock to better grazing during dry years, easily accessible markets which allow sale of stock are essential to avoid heavy losses to farmers. Establishing such markets, remains a problem, however. It seems that many farmers prefer to try and maintain their livestock at all costs rather than convert them to cash income during dry years. This is the suggested explanation for the observation that as market price climbs, numbers of cattle sold decrease in the western communal areas (134). These factors all complicate efforts to reduce grazing pressure during the dry years. In the absence of great needs for cash, stock will not be sold. If communal farmers paid for services the State now provides free of charge, for example, water, grazing and veterinary services, cash flow would encouraged.

An additional problem in western communal areas is that livestock distribution amongst farmers is highly skewed, with 84 farmers owning approximately 25% of livestock in former Damaraland (144). Government policy aimed at alleviating this imbalance offers these farmers low interest loans through the Agricultural Bank of Namibia to purchase private farms outside the communal area.

4-35.1 Early pastoral nomads living in the vicinity of the Brandberg more [illegible] a thousand years ago, moved between annual pastures and dry season homesteads in response to annual rains. These patterns of seasonal movement are similar to those practiced today by Himba pastoralists living within the Khumib and Hoaruseb catchments (79).



4-36 A picture of a communal camp with windmill and cattle.

4-36 Increased access to markets for communal farmers has been suggested as one means of reducing environmental damage during droughts, allowing rapid destocking and restocking in response to climatic conditions (photo: D Heinrich).

Ownership of Large Stock Units in Damaraland in 1993 [1]

No. of Farmers	% of Total Farmers	No. of LSU's	% of Total LSU's	Average No. of LSU's/Farmer
84	3.8	14,237	25	169
176	7.9	11,917	21	68
1,963	88.0	31,067	54	16

[1] Excluding Sesfontein and Otjihorongo

Adapted from Rhode, 1994

4-37 Livestock ownership is strongly skewed in the communal farmlands of the western catchments, where nearly 50 % of the stock is owned by only 12 % of the farmers. Efforts are being made to try to encourage these 'commercial farmers' to leave the communal lands, although there is presently little incentive to do so.

4-39 A picture of Himba farmers herding goats.

4-39 Control over access to land and its natural resources is currently blurred between traditional leadership, local and regional representatives and various branches of the central government. This absence of any clear lines of authority has led to a lack of long-term planning for land use in the region (photo: R Swart).

To date this programme has been a failure with only two communal farmers using these loans to purchase private land. Regrettably, these two farmers continue to use communal areas in addition to their inland farms (144), having adopted an approach similar to that used by occupants of the former Odendaal farms. At present, political will and legislative instruments required to amend this situation are lacking.

Small loans are now also available for farmers to purchase livestock (144). The intention of this program was to assist economic development of 'progressive' communal farmers to a level where they too could acquire private property and leave the communal areas. In two years of operation, this scheme has attracted only 95 applicants throughout Namibia, and only 20 farmers were awarded loans. Rather than alleviating stock pressure in communal regions, it has only served to increase animal density (144).

In view of the large scale movements of stock within the region, northward and eastward in 1990-1992 and more recently southward in 1994, former Damaraland has been described as "one large farm, supporting over 33,000 people within its borders" (144). A serious constraint to operation of this 'farm' is the inability of its managers, all 33,000, to regulate their activities relative to those of everyone else. Increasing numbers of conflicts have been occurring throughout the area. In 1994, when farmers moved large numbers of cattle from the Grootberg area in the Huab catchment southward to the Ugab catchment, in the vicinity of Sorris-Sorris, they apparently did so without approval of the local inhabitants. The influx of Herero speaking farmers into the northern areas of this 'farm' is another example (120). In most cases conflicts revolve around decreased access to existing resources because of increasing population pressures, and because there is a complete lack of definition regarding rights of access to communally held natural resources throughout the region.

Prior to establishment of the 'second tier authority' in former Damaraland in 1978, there was no known traditional system of land allocation; during the late 1960's and early 1970's, settlement of the area proceeded largely without any control (143). A form of traditional leadership was created when the 'second tier authority' was established in 1978. The region was divided into twelve wards, each having its own head and councillors, reporting back to the Damara Council, based in the newly established administrative seat of Khorixas. This structure exercised some control over access of individuals to land, water and grazing, particularly when conflicts arose. However, at Independence, the laws which established such 'second tier authorities' were repealed (187) and their powers removed (32). Thus, all property within former Damaraland with respect to land and infrastructure, including water points and roads, reverted back to control and ownership of the central government. Existing common and customary laws were left in place, providing they did not conflict with the Constitution or any other statutory law.

Currently, control over access to resources such as land, water and grazing is blurred between traditional leadership and representatives of regional and central government. Absence of any form of land tenure or long-term planning seriously complicates efforts of people in the region to achieve control over their livelihoods. As communities living within the western catchments are almost totally dependent upon natural resources for their livelihood, their greatest challenge is to maintain equitable access to resources. As the population grows, available natural resources will become less and less. It will become more and more difficult

to maintain enough stock to fulfil the needs of each and every person. Already conflicts between farmers suggest that there is insufficient space for everyone. The load on the rangeland resources must be stabilised to prevent a disaster which leaves everyone landless. The region's economy must be diversified and ownership of resources must be resolved.

b. The call for privatisation

Calls for privatisation of communal lands have recently been made. An issue of great concern is emphasis of such calls upon enclosure (144). Even more disconcerting is the view expressed in the Government's Report from the Technical Committee on Commercial Farmland that:

> '... a tenure system be investigated and developed in a standard format for the whole country and appropriate legislation passed (130).'

This attempt to simplify the process of agricultural land reform by enacting legislation in a standard format applicable to the entire country purports to provide a simple solution to a very complex issue. What may apply in wetter regions further inland, however, particularly in regard to enclosure and rotational grazing, will not be applicable in the west. Agricultural reform efforts emphasizing individual tenure and enclosure, without a radical shift in land management practices, will devastate the arid rangelands of western Namibia. Failure to recognise constraints that an arid climatic regime imposes on agricultural practice in the western catchments could have a severe negative impact on the region if inappropriate legislation is drafted. Rather, reform should focus on ensuring equitable access to critical resources, water being foremost amongst them. The current uncoordinated and unplanned approach to water supply development within the western catchments, highlighted by recent drilling campaigns, emphasise the urgent need for appropriate reform in this area.

Recent borehole drilling campaigns, carried out by a variety of concerned donors and organisations including the Department of Water Affairs, were done in haste under the guise of 'drought relief.' As such, they illustrate the overall lack of understanding of the naturally low and variable rainfall in the area. Communities had decided where they wanted boreholes but their wishes were largely ignored. Boreholes were drilled in the absence of an overall plan for the region. Rather than enhance the potential for appropriate responses to variations in water and grazing availability, they have had the opposite effect, encouraging further misuse of the region's resources.

In arid rangelands such as those found within the western catchments, land use policies and related legislation must recognise the importance of a rapid response to short-term fluctuations in the environment and resultant patterns of forage availability. This must include mechanisms to enhance the ability of stock owners to rapidly de-stock, re-stock or increase stock numbers to take advantage of occasional surpluses in forage availability (176). Approaches emphasizing privatisation of land, including fencing and subsequent exclusion should be recognised as inappropriate in view of the large scale movements necessitated by the arid climate in the western regions. Rather, policies which foster this mobility and ensure equal rights through grazing and water fees should be enacted and strongly enforced.

c. Rangeland Degradation

Recently, claims that widespread environmental degradation is taking place within arid rangelands, both in Namibia and abroad, have been questioned on the grounds of a lack of scientific evidence (17, 144). In a similar vein, it can be argued that little scientific evidence exists that rangeland degradation is not taking place.

The argument concerning presence or absence of degradation can gain from examining a parallel situation within the marine fishing industry. Today's policies encourage increased use of marine species and ecosystems until there is irrefutable evidence of negative impacts. The results of these misguided policies have been collapses of major fisheries throughout the world. Namibia's own pilchard industry has been depleted in this way (75). As a consequence, there have been calls for the burden of proof to be placed directly upon the user, in these cases the fishing industry (129). Why should natural resources on land be treated differently from those at sea? With an absence of scientific proof for either claim, should not the use of natural resources from which a majority of Namibians gain their livelihood be treated with caution?

Possible evidence concerning presence or absence for degradation may be derived from examining livestock population numbers within the western catchments which fluctuate widely in response to drought. Numbers in former Kaokoland, incorporating the Khumib, Hoaruseb and part of the Hoanib catchments, typify these trends (134). In 1980 cattle numbers were estimated at 110 580, dropping to 15 000 in 1982 due to a severe drought in the region. Only a small number of the regions cattle were marketed, and most died in the veld. By 1989, the population had recovered to 80 137. What is not known is the significance of these fluctuations and the continued maintenance of large herds to the regions' ecological sustainability. Will the region maintain its capacity to provide sustainable resources for livestock production over the long-term?

Such recoveries of herd size have been assumed to be both an indication of the environment's resilience (ability to recover) and evidence that degradation of the natural resource base is not occurring. In reality though, these observations tell us very little about the past state of the environment, its ability to sustain herds of a particular size or the scale of its use. We don't know if the areas open for grazing were expanded in regions that were previously not accessible, through the installation of boreholes. Livestock being supported on these 'new' lands would thus inflate the 'recovery' period figures. It is thus very difficult to assess whether or not any permanent degradation of rangelands is occurring from livestock figures alone.

A further point is that such statements make the assumption that the area's value can only be expressed in livestock units. Other resource values, including suitability for tourism, as well as ecosystem services such as groundwater recharge and wildlife production, are ignored in such assessments, and may in fact be seriously affected by continued high levels of stocking.

It is likely, however, that once degradation has occurred, recovery will be very slow due to low rainfall inherent in the region. An interesting example in this regard is the current absence of annual pastures and harvester ants at sites previously occupied by nomadic pastoralists in the Ugab catchment near the Brandberg Mountain (79). It is thought that continued exploitation of seasonal pastures and seed caches, near the reliable

water points, gradually eliminated the entire seed bank and thus all potential for germinating grasses. If this over-exploitation was in fact what led to abandonment of these pastures, it is remarkable that recovery has not yet occurred more than a century later. Recent work in the central Namib on the response of annual grasslands to seasonal variation in rainfall has shown that such seed banks can indeed be very sensitive to overuse (72).

There is an urgent need for a region specific understanding of the functioning of Namibia's arid rangelands (208). A region specific approach is emphasised because comparisons with other areas, for example Botswanan rangelands, has little relevance to the much more arid regions of western Namibia. Recent claims that livestock will die or have to be moved before irreversible damage occurs have been made largely without any thorough long-term study of the rangeland and its ability to recover. Stock numbers and rangeland condition must be monitored, in association with rain gauges, in order to effectively distinguish between the effects of overgrazing and low and variable rainfall.

Recommendations

- Increase the knowledge of the need for 'opportunistic management' of livestock in variable arid climates of the western catchments -allowing rapid and appropriate responses to both good and bad years.
- Develop market and financial systems which could facilitate the rapid stocking and de-stocking necessary to respond to the variable climate.
- Spread information about functioning of marketing and financial systems and their advantages and disadvantages as widely as possible. Investigate alternatives to allow development of appropriate systems for the western catchment area.
- Integrated land use planning for all the western catchments in their entirety should be initiated immediately.
- Alternative development trajectories for the western catchments, which alleviate some of the increasing pressure on the decreasing natural resource base, must be urgently sought, identified and implemented.
- Alternative and modified farming methods must be identified and studied and information concerning appropriate aspects be shared with farmers in the region.
- An investigation of sustainability of current and alternative land use practises should be undertaken and results made accessible to decision makers on all levels.
- Basic information concerning functioning of the rangelands in the western catchments, including the role of resources provided by ephemeral rivers, must be obtained through integrated, high quality, participatory research.
- Livestock numbers and movements, range condition and similar information should be monitored on an ongoing basis and synthesised with other basic information such as rainfall, river flow and soil erosion. Results of this research should be made accessible on a regular basis to decision makers on all levels, especially farmers in the area.

BOX - APPROPRIATE RANGELAND MANAGEMENT IN WESTERN NAMIBIA

The veld near Khorixas is barren this year, with only scattered grass stubble. Rains were poor again this year, resulting in little grass germination. With no cover on the bare soil and a persistent browseline on the mopane shrubs and trees, the area has clearly been heavily grazed over the past two years. But is it overgrazed and degrading? Low, even exceptionally low rains are a common occurrence in arid and semi-arid rangelands, and the vegetation is well-adapted to survive these long dry periods (66, 196). But does the grazing pressure affect how the vegetation will recover during subsequent years of higher rainfall? This is a question that concerns every rangeland user who wants to use the environment sustainably for stock or wildlife. Unfortunately arid grasslands and their management have received little attention, and applying our understanding of temperate grasslands ecosystems to these dry regions has not been successful (16).

In temperate grasslands, under conditions of ample and consistent rainfall and good soils, grazing regimes are easily manipulated to maintain the productive capacity of the rangeland. Stock numbers (or carrying capacity) can be determined and maintained from year to year, with some fluctuations to account for exceptional wet and dry years. Signs that this grazing pressure is too great and that the area is at risk of degradation include changes in plant species composition, changes in grass cover, and increases in bare soil which can result in soil loss. Depending on the extent of ecosystem change, alterations of stocking rates and grazing periods will usually quickly return the rangeland to a highly productive state.

While the signs of temperate grassland degradation are frequently seen in arid rangelands, in arid areas they do not always indicate degradation - they may simply reflect the naturally low rainfall. Productivity in dryland systems is generally low and highly sporadic in response to rains. Large expanses that have had no rain for 3-5 years, can have bare soils even without any grazing (46, 72). Current thinking questions the utility of applying conventional rangeland management techniques derived in temperate grasslands to drylands (46, 49, 149). Rather managers and scientists have turned to the wisdom of ancient rangeland users to understand and learn how to use arid rangelands effectively (17, 31, 46, 50, 148).

In dry regions throughout Africa (Ethiopia, Somalia, Kenya, Namibia, Zimbabwe) rangelands have historically been used by nomadic pastoralists and ungulate herds (in Namibia, see No. 79). When rains were good, these rangeland users would remain in a place as long as water was available. Given the availability of water in the ephemeral rivers, and at the numerous springs throughout western Namibia, grazing pressures may have been quite high following good rain years with high grass productivity. When rains were poor, however, wildlife and pastoralists moved to areas of higher rainfall where fodder and water were available. Annual rainfall dictated the way that the arid grasslands were used - heavily during high rain years or allowed to rest in times of drought. Thus the primary determinant of rangeland use was rainfall, as this determined the water available for plant growth as well as that needed for drinking (46, 149).

Today rangeland users of arid regions throughout Africa have access to ground water from boreholes that is independent of annual rains. This uncoupling of moisture for drinking and moisture for plant growth can have

both positive and negative implications for arid rangeland productivity and utilization (48). Access can be achieved to large areas that previously received only minimal grazing because of their great distance to natural water points. Throughout Namibia, recent installations of boreholes have increased accessibility of rangeland in arid regions. If boreholes are in fact used to allow access to areas that have received good rains, and encourage the movement of stock and wildlife from dry regions with low or no grass cover (allowing these areas to rest) to regions of good grass cover, then these artificial watering points can be extremely useful. However, what frequently happens is that people and livestock become settled at these watering points, regardless of current rains. Areas receiving no or little rainfall do not rest under continual stocking conditions, resulting in increased erosion, decreasing seed banks, and in general, decreased resilience to the arid conditions - a lowered ability to recover in subsequent good rain years. This has occurred extensively in the Sahel where artificial water points have been provided for the last 20 years (24, 160).

The uncoupling of drinking and plant moisture also results in altered expectations from the ecosystem. It is generally well understood by Namibians that rainfall in arid and semi-arid areas is low. Less well understood is that rainfall in any one part of this arid region is highly variable from year to year, and that 'average' rainfall is meaningless (39). As a result of this variable climate, constant stocking rates used in temperate rangelands are inappropriate in arid and semi-arid regions of Africa (203). Economically and ecologically effective arid rangeland management must be 'opportunistic management'. Because climatic conditions are so variable, adhering to a single, conservative stocking rate will rarely be applicable from year to year. The object of effective dry rangeland management should be "to seize opportunities and to evade hazards" (203). If rains are poor, stock must be moved from the land to other regions, or be sold. The scale required of such moves can be very large.

An alternative strategy for coping with the normal drought conditions experienced in arid regions has been applied ineffectively throughout Africa by well-meaning outsiders resulting in 'bad Samaritan' situations (8, 99). The parched nature of arid regions after many years without rain can be very shocking to those not familiar with the variability of production in arid systems. It is thought that current 'drought' conditions are unusual and hence an emergency which can be mitigated this year by providing drought relief fodder and food (65, 189). As a result, stock are maintained on the land which requires rest, and land users' expectations from the arid land exceed the realities of low and highly variable productivity. Because use of the rangelands is completely uncoupled from moisture availability, the risk of overuse of the rangelands is now a reality. Overuse resulting in altered soil conditions, soil erosion and loss of seed banks can take decades rather than years to recover in arid regions, simply because of the extremely low and unpredictable rainfall necessary to re-establish the productive capacity of the system (203).

The challenge to modern day rangeland users, as well as decision makers that must ensure that Namibia's arid lands will be used sustainably, is to understand and apply the ancient knowledge of nomadic pastoralists to their present-day situation:

- Arid ecosystems will always have lower production than more mesic systems. Installing new boreholes can

increase access to these areas but cannot increase the productivity of the grasslands themselves.

- Arid ecosystems will always support far fewer people, stock and wildlife than temperate systems where production is higher. At a time when Namibia's population is growing rapidly (12), this concept must receive serious consideration by decision makers.
- Effective arid rangeland management must be "opportunistic management". Because climatic conditions are so variable, adhering to a single, conservative stocking rate will rarely be applicable from year to year. to year.
- Because of climatic variability in dry regions, large areas are needed to maintain nomadic herds. This movement must be facilitated by stock owners with much physical labour or high monetary costs.
- In years when rains are low throughout western Namibia (a common occurrence), land users must be allowed and encouraged to remove the stock from the arid lands completely, either by sale or by movement to other regions.
- Risk of failure is much greater in arid systems than temperate systems.

THE UPS AND DOWNS OF DATE PALMS

Date palm plantations have a long history in the western catchments of Namibia. In 1901 a date plantation was established in the Windhoek valley, in the area of today's Sport Klub Windhoek, with 5,533 date saplings. The plantation was completely destroyed by frost the following winter. An even larger plantation was started on the banks of the Swakop River at Ukuib, directly south of Usakos, in 1902. By 1916 the plantation had grown to include more than 10,000 date palms. In 1921, however, due to a scale insect infestation, the entire plantation was destroyed. Some cultivation continued although it was not until 1987 that date farming was fully revived with development of a plantation in the Huab River west of Khorixas at Eersbegin. This project is run by the Namibian Development Corporation, NDC, and is in the process of expanding. Currently, a total of 12 million dollars have been budgeted by the Namibian government for date production (1993-1997) with 4 million dollars alone for the Eersbegin plantation over the period (126).

BOX - IRRIGATED AGRICULTURE

By the turn of the nineteenth century, well developed settlements existed at Otjimbingwe, Gross Barmen, Otjiseva and Okombahe, supported largely by cultivation in the beds of the Swakop and Omaruru Rivers (86). These gardens produced large amounts of vegetables for use by local communities. Such sites were associated with springs or bedrock highs in the river bed, providing moisture conditions favourable to crop cultivation in an otherwise arid region. Regular flooding prevented deterioration of soils in these regions, removing accumulated salts and depositing nutrient-rich sediments. At the same time the region's springs were being developed. The springs at Warmquelle were used for irrigated agriculture as early as 1906 and continue to be used today. Others

in the vicinity, such as at Sesfontein, Ongongo, Kaoko Otavi and Fransfontein have a long history of supporting agriculture in the region.

In addition to cropping in rivers and near springs, some dryland cropping is practised in the wetter headwater regions of many catchments, although such gardens are often supplemented by boreholes and ground dams when available.

Within the past year interest in irrigated agriculture within the western catchments has rapidly expanded. This is reflected both in allocations within the 1994/95 national budget, as well as the commissioning of studies of groundwater potential for irrigation development along the rivers. This trend is being driven by a desire to achieve food self-sufficiency within the region and, at the same time, to reduce the existing pressure on the rangelands through a reduction in stock numbers. At the level of the individual household such efforts may be worth pursuing. A major problem with irrigated agriculture in arid lands, however, is the requirement of a settled lifestyle, transforming formerly semi-nomadic pastoralists into sedentary gardeners. If livestock accompany such sedentarism, local degradation of rangelands will result, as evident in the vicinity of such settlements at Sesfontein, Warmquelle and Khowarib. Households at Khowarib reportedly have an average of 32 goats, supplementing the diet derived from the garden (182). It is thus unclear how successful large scale developments will be in reducing grazing pressure. The above examples within the Hoanib catchment suggest that such developments may, in fact, lead to local increases in grazing pressure. A further restraint on irrigated agriculture in the western catchments is the high evaporation rates and poor water and soil qualities often encountered which can lead to salinisation if not carefully controlled.

In the case of large scale development projects, there are additional reasons for concern. First, large withdrawals of groundwater required for most developments may lower the water table. This decline in the water level may dry up springs within the region, affecting other farmers and wildlife. In the case of developments within river channels, declines in the water table may not only dry up springs but also reduce productivity of the riverine vegetation. If such withdrawals are excessive, the naturally productive vegetation may be eliminated. The expansion of the Eersbegin Date Plantation, currently under way in the Huab River, is a cause for concern in this regard. There are numerous signs that the anaboom trees are already under stress, possibly due to a decline in the groundwater table associated with a reduction in flooding. Withdrawal of groundwater for the plantation can only aggravate this situation and may ultimately negatively affect the large wetland downstream at Opdraend, a site with of national significance for tourism and conservation. Groundwater monitoring wells downstream of the planation are urgently needed to assess effects of withdrawals.

4. Plant use today

a. Current patterns are much like the past

Plants constitute a critical resource for people living in the western catchments. A wide range of uses have been recorded, ranging from foods and building materials to cosmetics and poisons for hunting (98, 178).

A potent toxin is extracted from roots of Adenium boehmianum, and applied to arrows for hunting. Certain species of Commiphora are commonly used for manufacturing utensils for domestic purposes, as well as toothbrushes, soaps and body powders. A large number of Acacia species occur in the region, many producing pods which are important food for wildlife and livestock. Some, such as A. erubescens, produce a sweet, edible gum. Thorny branches of many species are used for fencing and wood of many species is used for fires. In addition, species of Grewia, Salvadora persica, Berchemia discolor and Ficus sycamorus, to name just a few, produce delicious edible fruits.

A recent study in the Khowarib settlement in the Hoanib catchment revealed extensive use of a wide range of woody plants (182). Fruits from a number of species are an important component of the local diet. Resins from several trees, especially Acacia species, are used as a seasonally available delicacy. Plants are also used medicinally (for example mopane leaves), for manufacture of household utensils (for example wood of Acacia montis-usti), as dyes and tanning agents for leather (bark of previous species), and browse for livestock.

Comparing the plant use of one group of people, the Topnaars, living in two different areas of the western catchments, it was recently recorded that they used at least 81 species of plants for foods, medicines, cosmetics and fuel (209). On the Kuiseb, !nara is the most widely used of 46 plant species: seeds are roasted and eaten or sold, melon pulp is eaten boiled or raw, roots are used in various ways as medicine, oil from seeds is used as a cosmetic, and peels and seeds are fed to goats, donkeys and chickens. In Sesfontein on the Hoanib River, higher rainfall means a larger variety of plant foods. At least 55 species are used there and bulbs, tubers and wild fruits feature in the local diet.

Within catchments from the Ugab northward, mopane is probably the single most important plant for people and livestock. In addition to its use as the principle construction material in homes, kraals, fencing and any other construction works, it is also the preferred firewood in the region. Finally, it is an important forage for both wildlife and livestock throughout its range, particularly in the western reaches where grazing is often limited or nonexistent. Branches may be cut and fed to goats and cattle in their kraals.

A riparian tree of tremendous significance is the anaboom. Its nutritious pods, dropped toward the end of the dry season in September through December, are critical to livestock and wildlife. Many farmers throughout the western catchments collect pods from the tree, storing them for dry season forage. In the Ugab River, private farmers from the Usakos and Karibib regions buy large numbers of pods collected by the local residents (91). In the Kuiseb River, the Topnaar community is dependent on anaboom leaves and pods as forage for their goats and cattle. In the 70's, prior to drought relief, they collected and stored pods in hessian bags, lodging them on branches in trees, for use later in the year. Underscoring the importance of pods for livestock fodder, the Topnaar community considered requesting drought relief in 1994 when large floods early in the season washed away the year's production of pods (37). In addition anaboom wood is used extensively for housing construction along the river.

Plant products are also used for production of crafts for sale in and outside the region. Kernels of

the vegetable ivory palm Hyphaene petersiana, are perhaps the best known example within the western catchments. Carvers in the northern Erongo and Kunene regions engrave beautiful depictions of local animals on the 'makalani nuts' which are then hung on leather thongs for use as necklaces, key chains or festive ornaments.

An unusual yet widespread use of a plant resource is that of seeds collected from nests of harvester ants. Seed harvesting species represent the overwhelming majority of all ant species in the region. These ants are very efficient at locating and caching seeds of annual grasses, and accumulate a below-ground food reserve to carry them through long periods from one rain to the next (101). These nests are large and can be easily located. Seeds of several species of Stipagrostis grasses (sawi) and the small herb, Monsonia umbellata (bosui), are dug from ants' nests and winnowed in flat, wooden bowls. The seeds are then ground into flour, typically with the aid of a grinding stone, and then boiled with water to form a porridge. This is eaten as is or with milk, meat or sugar. Seeds are also used in beer-brewing, being mixed with water and sugar and allowed to ferment (178).

b. Vegetation Change - Are We Using Too Much?

In many areas throughout the western catchments concern is growing that current use of the region's plant resources may be unsustainable, leading to a gradual loss of certain species. The basis for such claims is the bare and degraded areas around towns and settlements, particularly in the communal areas of the catchments. Here, high human population densities place a much greater pressure on the available resource base than in less populated regions. The effect upon trees is well known and easily seen. A study at the Khowarib settlement showed that extensive use of vegetation by people and animals was having an impact as far as 4 km from the settlement (182).

Firewood consumption within the western catchments is an issue of serious concern, particularly in rural areas where people don't have any alternative energy sources. Firewood is chiefly used for cooking, but large amounts are used in winter for heating and throughout the year for ironing and heating water. In almost all cases wood is burned in inefficient open fires. Although use of fuel efficient stoves would greatly reduce wood consumption, they are rarely used. Wood dealers in Khorixas say that collectors often walk more than three hours from town to collecting points. (179). During the past several years, extensive collecting in the region has resulted in a deficiency of dead mopane wood and in many areas around Khorixas living wood is cut and left to dry before collection. Some collectors are concerned about wood cutting, however, because they recognise the value of mopane browse for their goats. They have expressed an interest in planting mopane seeds and seedlings but 'only if they grow fast.' Unfortunately the growth rate of mopane in the region is presently unknown. Collectors with access to vehicles bring wood from outlying areas where they farm.

The collection of firewood by tourists is also increasing as more people visit the area. Tourists at campgrounds and lodges throughout western Namibia enjoy fires as a part of their holiday experience, although they might have other means available for cooking and staying warm. Also associated with tourists is an increasing pressure on species used in making crafts for sale. Species such as makalani palms and Acacia montis-

usti (carving), which have restricted ranges, may be particularly susceptible to unsustainable use. Currently, palm nuts are imported from the Grootfontein district where collectors are paid for their efforts (210).

Although claims are often made that changes are occurring in the region's vegetation, studies are limited to those discussed here. Clearly there is a great need for more appropriate research to determine sustainable yields of plant resources in the region and assist with implementation of appropriate management plans.

Recommendations

- Monitoring of plant populations, which are known to be receiving heavy use, is needed to ensure that off take is sustainable and prevent their loss in the long term.
- Research on ecological dynamics of Namibia's arid rangelands relevant to their management must be made a national priority.
- Studies of plant use by people living in the area should be encouraged as older people are usually the repositories of most of the knowledge. (Recent experience has found younger people very interested and older residents pleased to have the opportunity to share such information with them.) The information should be made widely available through appropriate environmental education materials and other communication channels.
- Policies, legislation and regulations for economic development of potentially valuable plant species should be drawn up following internationally established protocol.
- Information and advice concerning possible economic development strategies (for example, one time payments as against long term royalties), and from whom further information and negotiation assistance can be obtained, should be readily accessible to extension workers, traditional leaders, farmers associations and other concerned people.
- Use of fuel efficient cooking stoves, particularly those especially developed for Namibian conditions, should be widely promoted in the western catchments region.
- Use of solar power to replace fuel wood should be promoted as appropriate (e.g. for water heating, light at night) in the western catchments region.

5. Wildlife and its use today

As with the region's plant resources, wildlife has a long history of supporting people in the western catchments. Over thousands of years, diverse and ingenious techniques have been used to harvest wildlife food resources, including poisoning of water pools, use of snares, stone traps and pits, fires, spears, arrows and recently high powered weaponry (178). Early travellers in the Kuiseb catchment saw large pits on the river banks, apparently used to capture rhino (4). Traditional means of harvesting include poisons that were and still are obtained from a wide range of plants, including Euphorbia species, Adenium boehmianum and Fockea multiflora (98). In addition to the wide range of large herbivores found, a number of other animals are commonly used. Birds are eaten throughout the western catchments, especially ostrich, guinea-fowl, francolin, pigeon and several species of doves, bustards and korhaan (178). The sap of Adenium is reportedly used to kill pigeon

and doves by poisoning small troughs. The crop and stomach is then removed before the bird is roasted and eaten. Several reptiles are eaten, including tortoises and leguans. Honey from bees' nests is a delicacy and is used whenever nests are found (178). Other insect-derived foods and insects themselves, including termites, mopane worms, locusts and caterpillars, are commonly eaten as well. Clearly wildlife have been, and still are, an important source of protein for people in western Namibia.

It must not be forgotten that wildlife are also dependent on plants for food. Sometimes wildlife and people compete for this resource. When swarms of locusts and army worms 'invade' an area they frequently eliminate all green vegetation. Similarly, people may reduce the carrying capacity for wildlife and stock alike by cutting mopane for firewood. If mopane is eliminated, the rich protein source associated with mopane worms is also removed. Understanding essential links between plants and wildlife forms the basis for sustainable use of these nutritious resources. If such links are broken, through inappropriate overuse, alternative sources will have to be found, which are often costly.

a. Wildlife - A Resource Almost Lost

Although difficult to imagine now, less than two hundred years ago elephants walked the coast near Walvis Bay and Swakopmund. Well preserved tracks in silt deposits near Rooibank, on the Kuiseb River (78), as well as the recovery of an elephant tusk near Rooikop air base, record their presence several hundred years ago. Travel records of early explorers and missionaries from about 200 years ago tell of large numbers of game, particularly within the western rivers such as the Kuiseb and Swakop (4). These rivers provided the main paths of travel from Walvis Bay to the inland. As a result, we have a much better impression of the historical distribution of wildlife in these rivers than those further north. At the same time, however, rivers that people used for travel were also first to lose their wildlife resources through indiscriminate shooting. Elephant, rhino, lion and wildebeest have long been absent from these southern rivers.

Travels of these earlier explorers marked the beginning of a sharp decline in much of the region's wildlife. As the wetter headwaters of catchments were settled and developed as farms, conflicts arose between wildlife and the new inhabitants. Hunting, fencing, and destruction of springs helped further commercial livestock production which was generally intolerant of all predators, rhino, elephant, vultures and many birds of prey. In the 1950's a reward was offered by the government for killing wild dog and other 'vermin' in the region (84). Rifles issued in the Otjohorongo reserve, and strychnine poison issued to headman throughout the region (132), facilitated a widespread and effective effort at 'predator control'. At the same time, however, transfer of ownership of wildlife on private farmland from the state to the landowner in 1967 did ensure maintenance of populations of huntable and sellable ungulates. These rights did not extend to people in communal areas, however, where a new phase of wildlife decimation was about to begin.

Although headwaters of the western catchments were well developed by the early 1960's, more arid western areas remained largely untouched by settlers. Much of the area had been proclaimed as Game Reserve No. 2 in 1927. Wildlife, although hunted for consumption by residents and occasional visitors from further inland,

was reportedly abundant throughout much of the region (132). In 1970, on the recommendations of the Odendaal Commission, the Kaokoveld and parts of the Etosha National Park were de-proclaimed, establishing the 'native reserves' of Damaraland and Kaokoland. Because of developing conflict along Namibia's northern border in the 70's, access to these areas was strictly controlled. As a result, little was known about activities of the South African Defense Force (SADF), the South African Police and officials of the South African government. By 1977, reports began to emerge of excessive hunting of large game by senior South African officials and SADF personnel (59). Attempts to publicise these activities were suppressed, although recent admissions have detailed the blatant destruction of wildlife, including shooting of elephant and black-faced impala from SADF helicopters (26).

Drought in the early eighties added to the severity of the situation, by causing further reductions of wildlife. At the same time, the South African government was issuing .303 rifles and ammunition to people in Kaokoland, ostensibly to protect themselves from 'SWAPO terrorists' (59). In addition to extensive poaching by the police and army, some residents also used their newly acquired weapons to hunt wildlife. Illegal hunting was slowly brought under control in the early eighties through efforts of several individuals in the then Department of Nature Conservation and the newly formed Namibian Wildlife Trust (26). The first step taken by the Department of Nature Conservation in 1980, when charged with all conservation functions in the area, was to close many regions to all hunting.

b. Community Based Natural Resource Management (CBNRM)

In 1982, recognising local communities as stewards of the natural resource base upon which they depend, the newly formed Namibian Wildlife Trust initiated the community game guard system. Today the Kunene and northern Erongo regions can boast one of the most successful examples of community-based conservation in the world. Currently community game guards, employed by the Integrated Rural Development and Nature Conservation (IRDNC) and Save the Rhino Trust (SRT), both non-governmental organisations, monitor and maintain game populations throughout the region and have thus far proved to be a successful deterrent to poaching.

The success of this approach was shown by a recent survey which covered a large section of the western catchments (26). The main aim of this survey was to provide a baseline inventory of wildlife, allowing development of an informed approach to land use planning and management, particularly in relation to conservation and tourism. A region in north-western Erongo and south-western Kunene, adjoining the Skeleton Coast Park, was found to be an important reservoir of wildlife for the region. In particular, the Huab catchment is an essential part of the range of wild elephant populations. The survey also found that many species decimated in the 70's and early 80's, including mountain zebra, elephant and rhino, had recovered well. These recoveries are attributed to combined efforts of people living in the region, non-governmental organisations and local officials of the Ministry of Environment and Tourism. Regrettably, presumed extinctions of wild dog, Burchell's zebra and eland were supported by this regional survey.

Because wildlife recovery was so great, in 1993 the then Ministry of Wildlife, Conservation and Tourism

was able to allow limited hunting in communal areas where it had been denied since 1980. A few people living in the region were allowed to hunt on a controlled basis (47). In total, 704 animals were cropped. The meat was distributed amongst the community while skins were sold to offset expenses incurred by the IRDNC, who provided transport during the hunt. Although the scale of the hunt was small, its symbolic importance should not be under-estimated in an area where access to such resources had previously been restricted.

A major goal for CBNRM programmes in the western catchments is that they should become self-funding. Although there is certainly potential, it is unclear whether self-sufficiency is attainable because no thorough economic analyses have yet been done in the region. The main example which has been used to justify the assumed future success of CBNRM programmes in Namibia has been the rapid recovery of wildlife populations on the private farms following transfer of ownership from the State to the landholder in the late 1960's. The value of such a comparison, however, is questionable. An often overlooked reality is the quantity of resources accessible to a private farmer and a communal farmer in the western catchments. The private farmer has control over wildlife on an area averaging between 5,000 to 10,000 ha. In contrast, communal farmers in the western regions have access to resources on less than 150 ha, if the area is shared equally amongst everyone. In addition, inland areas where the private farms lie have the potential to carry significantly higher populations of wildlife than the arid west. If consumptive uses are to be sustainable in the west, the number of animals harvested will be much lower and more variable from year to year than in areas with higher rainfall.

For the same reasons, recommendations for wildlife conservancies, should be cautiously evaluated in the arid communal regions. Conservancies are areas where landowners pool their resources and manage them collectively for a common gain. Because of their success and increasing popularity in private farms within headwaters of the catchments, conservancies are being encouraged as an appropriate model for resource management in communal areas (38). Problems associated with many more people in the communal areas, lack of any form of land tenure and relatively unproductive environments of the arid west must be given serious consideration if community based programs are to be economically sustainable.

Consumptive wildlife use within the western regions will not greatly enhance livelihoods of the area's 33 000 inhabitants if shared equally amongst them, because the area simply can not support enough game. As such, there will be few financial incentives to act as responsible stewards of this resource. This problem has been observed in recent reviews of the CAMPFIRE programme in Zimbabwe, where dividends returned from community based natural resource programs have been substantially less than household incomes derived from agricultural practice (119). As a result, dividends are re-invested in the economic mainstay of the household, namely cattle. The result has been continued and increased pressure on the region's natural resource base.

The CAMPFIRE programme involves smaller numbers of people and the environment is able to support much more game than communal areas in the western catchments. The obvious conclusion is that in the west the number of people receiving benefits would have to be restricted because the area can probably not support much more game. People that decide to participate and carefully
maintain their natural resource base would have to be assured that their resources would not be shared with

nearby communities who have over-used their own resources. Establishing such controls within open access regimes of communal areas is difficult, however, because of the absence of any legal form of resource tenure.

A much greater potential for generating income lies in non-consumptive uses such as tourism. There are far more people who are willing to pay to see wildlife in such scenic settings than there are people willing to shoot them (90). What is needed ultimately is a well managed industry which captures revenues from both forms of use. At present wildlife in communal areas is State property and inhabitants have no rights to any form of consumptive use. Reluctance of the Ministry of Finance to support legislation granting such rights is the major obstacle to this much needed reform. Such reluctance seems incongruous, however, in view of the Ministry's mission to steward financial affairs of the State. A transfer of ownership to communities could spark economic growth based upon this resource, generating increased revenues for State coffers.

At present there are disturbing signs that increasing pressures on the environment in the western communal areas, combined with ill-conceived agricultural and water development policies, may be contributing to long-term degradation of critical habitats and therefore limiting potential for alternative forms of development in the region. At the centre of this problem is the pressing need for a land use plan for the arid western areas. In the absence of such a plan, conflicting developments will continue unabated. Development of natural springs as stock watering points, continuing provision of artificial watering points in arid and semi-arid landscapes and continued alteration of the hydrological regimes of the region's rivers through dam building will continue to place increasing pressure on the area's potential to maintain its people and wildlife. What is needed is a plan for how the local people and the Nation as whole should use the region's resources. Because of their low agricultural productivity and their spectacular scenery and wildlife, tourism is being increasingly promoted as the best and only viable option for increasing and diversifying the economy of the western catchments (63).

BOX - THE LIMITATIONS OF COMMUNITY-BASED PROGRAMMES

Although community-based natural resource management (CBNRM) programmes seem to hold much promise, their long-term benefits may be limited if not carefully implemented. While they may have some successes, such as greatly contributing to a reduction in wildlife poaching, they may be unsuccessful at maintaining the habitat on which the wildlife depends. These programmes are based on the belief that sustainable resource management improves an individual's livelihoods. While this may in fact be the case, individuals and communities often act out of necessity in their short-term interest, leading to unsustainable land use in efforts to maximize profits. An important consideration in such discussions, which is often overlooked, is the aspiration of the resource user. Farmers struggling for basic survival and farmers eager to break the economic barriers preventing them from acquiring a higher standard of living may not give thoughtful consideration to the long-term sustainability of their actions. Examples abound throughout the world of short-sighted management and have led to a recent backlash against community-based conservation programmes, emphasizing their lack of success at achieving conservation aims (53, 61, 135, 138, 145)

Recommendations

- Scattered results of research, internal reports and other sources of information concerning wildlife of the western catchments should be consolidated and made accessible for tourism, decision makers, schools and all local residents. Selected monitoring projects should be initiated to record game movements and population dynamics and should develop mechanisms for involving tourists and residents in data gathering.
- Thorough economic analyses of benefits of alternative land uses should be undertaken, with particular emphasis on agriculture, tourism and the consumptive and non-consumptive use of wildlife, within the environmental constraints of the area.
- Thorough analyses of the socio-economic implications of alternative land uses should be conducted, within the environmental constraints of the area.
- Analyses should be made of policies, legislation and regulations required to support alternative land uses, within the environmental constraints of the area.
- Government should provide moral support for NGOs working in the area so that their fund raising could be enhanced.
- Further research in the area on a broad variety of topics ranging from socio-economics to natural history should be supported by international donors as well as national institutions and Ministries.
- Information concerning economic potential of game and wild plants should be made accessible to decision makers on all levels, residents and others dealing with land use decisions.

6. The future: reaping the greatest benefits

a. The unique west

Western Namibia is unique, from both national and international perspectives. Although much has been said regarding wildlife within the arid western sections of the catchments, not enough emphasis is placed on the value of these animals in this particular setting, to the Nation as a whole. In addition to all the other wildlife, the African continent's last populations of desert elephant and rhino still wander unfenced through this ancient landscape of spectacular and varied topography. Expansive landscapes stretch from high mountains, across wide plains and along beautiful beaches. The west is still largely a wilderness and, as such, it has tremendous value to the Nation through its capacity to generate tourism revenue. In short, what the western catchments offer is what people living in other corners of the world pay to see because their open spaces are gone or diminishing rapidly. They are a critical resource to the country, a resource which must be carefully developed and well managed to the benefit of all Namibians.

BOX - GEOLOGICAL TOURISM: DOES ANYBODY HAVE A MAP?

Although the western catchments contain some of the most appealing geological features in the world, no interpretive guides exist to encourage geologically-orientated tourism. Guidebooks could greatly enhance the experience of the large numbers of well educated tourists seeking stimulating experiences. A further constraint

is lack of topographic maps of the region. Although high-quality topographic maps have been produced for the region encompassing the western catchments, many of these maps are out of print and often out of date. Low quality copies of old sheets are available but in no way compare to original colour sheets. Such seemingly insignificant inconveniences can cause great annoyance to tourists. Although the 1:250,000 topographic maps could easily and cheaply be reprinted, this has not been made a priority and no budget allocation has been forthcoming to the Surveyor General. For tourism to return the revenues to Namibia of which it is capable, investments will have to be made to meet specialised needs of tourists.

b. A Growing Industry

It is estimated that 213,000 tourists from around the world visited Namibia in 1991. These visitors contributed approximately 360 Namibian million dollars to the national economy (63). Tourism is the largest and fastest growing industry in the world. In the Namibian economy, tourism currently occupies fourth place, behind mining, agriculture and fisheries but is predicted, by 2002, to be the leading industry (63). At present tourism formally employs some 10,000 people, making it one of the most important employers in the country. In spite of all this, Namibia's tourism industry is under-developed and nowhere is this more obvious than in the western catchments.

Since 1990 there has been a tremendous influx of tourists into the western catchments, particularly in the northwestern rivers such as the Khumib, Hoaruseb and Hoanib, lying within the Kunene region. Sales of petrol at the Palmwag pump, which is the logistical gateway to this region, average nearly 50,000 litres per month, climbing to 100,000 in some months. This is an indication of the numbers of tourists who are entering the region to see its unique resources. In Australian drylands, revenue from tourism is now higher than for livestock. In a similar way, in arid western Namibia, sustainable revenue from tourism has much greater potential than from agriculture (22).

c. Who benefits?

Is the region's popularity with tourists good news? At the moment probably not, as activities of many of these individuals are completely uncontrolled, resulting in damage to the region's resource base. Unregulated tourism results in excessive wear to poorly maintained tracks, which only encourages people to drive off the roads, making unsightly new tracks. Increasing numbers of tourists collect and burn large amounts of wood. Wildlife in many areas, particularly within the western rivers, is put under stress as tourists attempt to get a closer look. As a result, the quality of future visitors' experiences are degraded. But surely these visitors are contributing their fair share to the Nation's economy? Again, probably not. A large number of tourists entering the more remote western areas are South Africans who come to Namibia fully equipped for their travel, contributing little revenue to the region or the Nation. In return they receive the privilege of seeing some of Africa's most unique scenery, and all largely for free. Other visitors, travelling with registered tour companies and concession owners, pay N$500 or more per day for the same experience. This inequity is possible

because the area has no official conservation status and its residents have no right to restrict access to the land on which they live.

Private landowners in the headwaters of many catchments profit from operation of game and hunting farms, guest farms and wildlife conservancies. Similar developments have lagged behind in communal areas due, in part, to lack of ownership rights to wildlife in communal areas. While this is certainly part of the problem, in reality ownership is not an obstacle to the most lucrative economic activity associated with wildlife, namely non-consumptive use through tourism. Rather what is essential to achieving this aim is resolution of land tenure, giving a community or individual the ability to protect resources which support the wildlife. In the absence of land tenure, a community encouraging tourist development within a region cannot prevent someone from moving into the area and settling stock on a picturesque spring, which is critical to the region's wildlife. A legally defendable basis for controlling such activity is urgently needed.

d. The role of parks: use or preservation?

A common observation of tourists in Namibia, both local and overseas, is that parks are inaccessible (63). Although dangerous wildlife in Etosha requires visitors to remain in their vehicles, other conservation areas such as the Skeleton Coast and Namib-Naukluft Parks can be explored on foot. By and large, however, points of interest often go unnoticed, due to lack of interpretive materials such as maps and guides.

Although a few hiking trails exist in western parks, there could be many more. Numerous sites of interest could be developed for day hiking from roadside parking spots. In conjunction with such trails, brochures and maps which discuss features of interest along the route are needed. This model has been used in parks throughout the world and is well known to many tourists coming to Namibia, hoping to encounter similar interpretive aids. While a tremendous amount of research has been conducted on the environment in this country, very little has been translated into a form digestible for tourists (33, 34, 154).

Much interpretative information could be made available for the two main tourism areas within the western catchments, the Skeleton Coast and the Namib-Naukluft Parks. A tourist entering the Skeleton Coast Park and driving northward is unaware that the Ugab River, which they cross just north of the gate, was an essential pathway for pre-historic people and wildlife moving between inland and the coast. They are probably unaware that just off the road lies an ancient village, with huts made of whale bones. Further north, tourists cross the normally dry channel of the Huab River, probably unaware that upriver live many of Namibia's desert elephant. Still further along, they drive straight past one of the most interesting features of all, the multiple channels of the Uniab River where it drains into the sea. Here a rich story could be told of springs and wildlife, of massive floods that come in the night, floating rocks the size of cars down towards the ocean. A walk in the vicinity would reveal agates and silts, washed out of the catchment, along with ancient beaches raised high above the ocean (193). The fact that the spring which discharges water over a beautiful waterfall is derived from a catchment which is critical habitat for rhino and elephant that move between similar springs 50-100 km inland is unknown to the tourist that happens to stop there today.

Within the Namib-Naukluft Park, unique sites also abound which could offer interesting hikes for the more energetic tourist. The summit of the Swartbank Mountain along the Kuiseb River provides one of the most spectacular views in the park as the late afternoon sun lights up the massive dunes to the south of the river. Along the way to the top one passes striking formations of white marble and black volcanic rocks, many covered in thick coats of orange and black lichens. Regrettably, this feature will not attract tourists to the park, along with many other interesting sites, as their is no road, no interpretive map, and no plan for use of the park. Having access to this information and then experiencing it for oneself is what most tourists desire from environmentally related tourism, or ecotourism. Those who are un-interested will pass on by, while those who are intrigued will linger, enriched by the experience. Now unfortunately, most people interested or not, are unaware of the western parks unique resources and their stories. Those in favour of preservation say that this limits the impact that humans would otherwise have on such a beautiful feature. At the same time, however, it encourages use of such a resource in other ways. In the case of Swartbank Mountain, there are plans to mine the marble. Namibians and visitors must be given the opportunity to appreciate the Nation's treasures as they are. In the absence of such interest resources will have little value to the Nation and their future is then as insecure as if they had no protected status at all. Namibia, as a developing country, must use its resources to the economic advantage of its citizens. The government agencies currently charged with maintenance of the Park's environment must try and guide that use now, increasing the value of such areas to the Nation and providing a greater incentive for their protection. Sites such as these will be developed, sooner or later, either as an attractive sustainable feature for tourists or, in the case of the Swartbank Mountain, as an unsustainable marble quarry.

THE SKELETON COAST PARK AND THE NAMIB-NAUKLUFT PARK

The Skeleton Coast Park and the Namib-Naukluft Park together encompass a major part of the lower reaches of the westward catchments. The Skeleton Coast Park extends from the Kunene River in the north to the Ugab River in the south. Toward the north it is 25 km wide, while in the south it stretches some 40 km inland. The Skeleton Coast Park was proclaimed in 1971. Since that time it has developed to encompass a camping site at Torra Bay, open over the Christmas holidays, and a suite of bungalows at Terrace Bay - an old diamond mining camp - open throughout the year. The major focus of the park is to provide access and accommodation for line fishermen enjoying eastern Atlantic surf fishing. A major concession area in the northern part of the park is handed out at ten year intervals, currently to foreign interests.

Despite its current focus on coastal fishing, the tourist potential of the Skeleton Coast Park is tremendous. With provision of field guides, maps, interpretive materials, self-guiding walking trails and other low-cost development, the unique landscape, fauna and flora could bring tangible benefits to Namibia. White beetles, small, sand-diving herbivorous lizards, rich lichen fields, antelope, agates, moving sand dunes and many other attractions would intrigue discerning tourists if properly presented.

A second conservation area, encompassing part of the lower catchments of the Swakop, Kuiseb, Tsondab

and Tsauchab Rivers, is the Namib-Naukluft Park. Originally proclaimed by the Germans in 1907 as Game Reserve 3, it was known as the Namib Desert Park until the Naukluft Mountain farms were purchased from their private owners and incorporated into the park in 1979. At the same time, Diamond Area 2 was also incorporated into the Namib-Naukluft Park. By 1986, further additions resulted in one of the largest parks in the world and the largest park in Africa at 49 768 km². The Namib-Naukluft Park encompasses Sandwich Harbour and points further south along the coast; the Welwitschia Flats north of the Swakop River; Sossus Vlei at the dune extremities of the Tsauchab River; and a host of landscapes in between.

Within the Namib-Naukluft Park a number of campsites have been laid out at inselbergs, along ephemeral river courses, and on the Naukluft Mountain. Several walking trails have been established, in the Naukluft and at Sossus Vlei. Otherwise, the tourism potential has been largely neglected and little information is available (33, 34, 154), although the potential for further development is enormous. As an underdeveloped benefit to the Nation, the Namib-Naukluft Park is equalled only by the unprotected western regions of Erongo and Kunene Regions.

The Omaruru River is the one major western ephemeral river that is not encompassed in or bordering on a Park. Its mouth at Henties Bay does, however, lie between two portions of the West Coast Recreation Area, another area proclaimed and maintained for the benefit of coastal fishermen. As with other west coast conservation areas, it has tremendous potential for further development for the discerning tourist. Field-guides, maps and other information-based materials should be accessible to enhance tourists to experience the unusual plants, animals and landscape.

e. Maintaining our resources for sustainable use

How do we evaluate the most appropriate use of land? This is a difficult question, and as Namibia struggles to develop its economy for the benefit of its citizens present and future, economics must guide such decisions. In the case of the western catchments, two main land uses predominate - agriculture and tourism. As has already been reviewed, the eastern halves of the catchments are extensively used for private and communal farming operations with scattered tourism enterprises, while the western and southern regions lie within proclaimed conservation and tourism areas. What is not so obvious is that between the inland communal area and the Skeleton Coast Park there is a broad strip of land: a no man's land. With minimal rainfall and no value for livestock farming, this area does not support resident people. It does, however, have tremendous potential for conservation and tourism.

Large regions of this area are already being used for tourism and as defacto conservation areas. The Palmwag, Ombonde and Doros Crater Concession areas lie within this area, encompassing a large percentage of it. Despite designation as tourist concession areas, this affords little long-term security in the absence of any enforceable proclamations. Even though these areas are the main range of desert rhino and elephant there, is no official conservation status which grants protection to this critical habitat. Recognizing the value of these

areas, local communities, non-governmental organisations as well as local government officials recently called for a proclamation of these areas as legally protected conservation and tourism areas (26, 63).

Namibia has been quick to secure adequate protection for its marine resources which have tremendous value to the National economy (6, 124). Through the declaration of the economic exclusion zone, construction of a new research building and purchase of patrol boats and helicopters, Namibia is clearly very serious about maintaining the economic output of its fisheries. One hesitates to draw the same conclusion, however, about its commitment to protecting the terrestrial environment upon which the tourism industry depends. Although tourism is thought to have potential to generate revenues in excess of those from mining, agriculture and fisheries, efforts for securing protection of these resources has been much slower in coming.

The most serious constraint to development of tourism in the western catchments is lack of land use planning. There is an urgent need to decide how the region's land will be used, recognising that some forms of land use conflict or are inappropriate. Lack of planning is reflected in the fact that no land use zones have yet been established within the region, which would provide the necessary support for diversified forms of land use. Instead, uncoordinated development goes on. Farmers on private lands within the headwaters of catchments such as the Huab have built ground dams which are reducing flow, endangering livelihoods of downstream private and communal farmers as well as degrading the natural resource base upon which the region's farmers and wildlife depend. Holders of concession areas in the Hoanib and Uniab catchments have found that their resources, including grazing and springs, are under constant threat from neighbouring farmers, uninterested in the region's significance to tourism development and the Nation's economy. Balancing these conflicting demands will require a realistic evaluation of both the National interests and those of people directly involved.

Given the significance of tourism to the Namibian economy and the livelihood of its citizens, it is imperative that resources upon which this sector depends be given appropriate protection and attention. A conservation status for the western sections of the catchments, which recognises and legally mandates their use as conservation and tourism areas, is urgently needed. In addition, the development of appropriate conservation and tourism enterprises with the local communities requires adequate government staffing and financial support. By providing this investment in the region, the State and the private sector can ultimately reap appropriate benefits from Namibia's unique natural resources. Unless a region specific land use decision is made, which takes into account the inherent low production in drylands, there is little future for the region and its unique natural resources.

Recommendations

- It is essential that tenure arrangements be established within the western catchments so that full benefits from alternative land uses, such as tourism, can accrue to the residents of the area responsible for its maintenance and protection.
- Information concerning all aspects of natural resources and their use should be made accessible to Namibian and tourists. It is only with this background that full benefits can be realised from the western catchment areas.

- Land use planning in the western catchment area is of paramount importance in support of informed decision making at all levels.