The Role of Indigenous Technical Knowledge in Natural Resource Management in Ngamiland

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Introduction

Ngamiland is a melting pot of ethnicities. Over centuries, various tribal groups, originating from areas with different environmental conditions and diverse political and socio-cultural backgrounds, moved to the Okavango Delta introducing their own particular forms of land use and specialised productive skills. People gradually adapted their resource management patterns to the Delta environment and modified them by assimilating knowledge and survival strategies from surrounding cultures. Hence the indigenous technical knowledge presently found in the area is a conglomerate of different resource management systems.

Rural people, especially in the remote communities of Ngamiland, still have a wealth of indigenous technical knowledge (ITK) of the natural resources and environmental processes in their area. Based on that knowledge they make rational decisions on how to use and manage the resources effectively and how to cope with the extreme fluctuations of the natural conditions in the Okavango Delta.

Indigenous technical knowledge, often also referred to as local or traditional knowledge, is the cumulative body of knowledge generated and evolved over a long period of time, representing generations of experience, creative thought and actions of societies to earn a livelihood and cope with the changing conditions of the natural, socio-economic and cultural environment (Fernandez 1994, in Mbaiwa 2002). It includes all the skills, beliefs, norms, practices and behavior patterns handed down from one generation to the next (Matowanyika, 1994).

Historical Review of Indigenous Knowledge in Natural Resource Use and Management

The earliest inhabitants, the BaSarwa, were nomadic hunters and gatherers. Initially they did not establish permanent villages but moved in small clans within a given area following the migration routes of game and the availability of temporary water sources. The use of traditional weapons, such as bow and poisoned arrows, traps, snares, game pits, spears, clubs and long sticks with hooks, restricted the efficiency of their hunting activities. Even though animals as large as elephants could be killed, the meat of big game was not acquired regularly (Tlou, 1985; Heinz, 1968). Hunting was more intensive during the dry cold winter months when meat could be preserved as biltong (Mbaiwa, 1999). By following this practice the BaSarwa achieved the resource recovery effect of defined hunting seasons. The main source of protein was small game like springhare, duiker, etc. Veld products formed a substantial part of the diet (Heinz, 1968). A number of food taboos, established in some of the San groups, have contributed to the conservation of certain species. Lifelong taboos for women included many predator species like lions, leopards, hyenas, cheetahs, African wildcats, civets, genets, and aardwolves as well as species like baboons and vervet monkeys. Food taboos for men covered the scaly anteater (pangolin) and the females of the python, monitor lizard, and tortoise (Heinz, 1968). Gradually, various San groups, like the Bugakwe, started to cultivate

crops at subsistence scale. As the soil fertility declined they abandoned an arable plot. When alternative lands areas suitable for cultivation were no longer available in the near vicinity of the homesteads, the main settlement was moved (Heinz, 1968). The low population density, the frequent movement of settlements, and the seasonality and limited success rate of the traditional hunting techniques contributed to the sustainability of the resource base.

In the mid 17th century, the BaYei, gradually moved in small groups from the Chobe-Zambezi River region to Ngamiland, introducing some of their more advanced riverine technology like the use of fishing nets and dugout canoes (*mekoro*) as means of water travel, "which enabled them to penetrate further into the Delta and exploit the resources of the swamps more effectively" (Tlou,1985; Potten, 1976). They also hunted, practised floodplain or *molapo* cultivation, and produced baskets from *mokola* palm (*Hyphanae petersiana*) leaves.

Some San groups, like the BaNoka, or Riverbushmen, who lived in and around the Okavango Delta intermixed with the BaYei and adopted various aspects of their water culture and also some of their physical features (Tlou1985; Heinz 1968).

During the same time as the BaYei, the HaMbukushu started to migrated to Ngamiland from the Zambezi River, escaping the oppression by the expanding Lozi kingdom during the second half of the nineteenth century. They brought the knowledge about the use of iron and blacksmithing into the district and were acquainted with the art of basket making also practised by the BaYei. They were excellent boatmen, hunters, very determined competent dryland cultivators and to a limited extent pastoralists. They mainly cultivated fairly drought resistant crops, like millet and sorghum, that turned out to be well adapted to the low precipitation rates in Ngamiland. As long as land was available, the HaMbukushu practised shifting cultivation and some form of crop rotation to maintain soil fertility. "When the land became exhausted cereal crops were replaced by legumes" (Tlou, 1985: p.23).

The BaYei and the HaMbukushu had special laws regulating the use of the natural resources of their areas. Each village had designated fishing and hunting grounds. Outsiders could obtain permission from the chief or headman to make use of the resources of their area. Poaching was heavily punished (Tlou, 1985).

Towards the end of the eighteenth century the BaTawana split from the Ngwato and migrated to Ngamiland. They were mainly cattle farmers but to some extent also cultivated crops in the drylands. They established themselves as the dominant ethnic group and demanded tributes from the earlier inhabitants. As the BaTawana were more aggressive and had strong political structures, they imposed their rules and their institutions on other ethnicities and founded the first centralized state (Tlou, 1985). Despite the influence of the BaTawana, other tribes were able to maintain some of their cultural traits and traditional ways of natural resource utilisation. The BaTawana had a clear system of controlling resource utilisation. Before the Tribal Land Act came into operation in 1968, ward heads acted as overseers of arable and pastureland for the chief. A person could only be granted grazing rights or allocated land for cultivation when the overseer had identified a suitable area where the applicant could be accommodated. This was usually done in consultation with the entire community (Bendsen & Gelmroth, 1983). One of the adaptive methods for dealing with problems such as disease outbreaks, floods, droughts, and depletion of rangeland and scarcity of firewood resources, historically used by the BaTawana in Ngamiland, was to move their residential area. The BaTawana capital has changed its location nine times in the last 200 years (Potten, 1976).

The Herero, who fled to Botswana from Namibia, after being defeated by the Germans in 1904, were mainly pastoral people. However, they had to adapt their livelihood strategies to a different political system, to new economic forces, and to different indigenous African and colonial European cultures (Vivelo, 1977). The Herero of western Ngamiland traditionally responded to rangeland depletion by moving their cattle posts to alternative grazing areas, provided that they succeeded in finding potable ground water at the chosen site. Over the century the Herero changed their former nomadic lifestyle and gradually became semi-sedentary (Vivelo, 1977).

Traditionally wildlife was hunted mainly for subsistence (Potten, 1976). During the 1850's and 1860's the first white people visited or temporarily settled in Ngamiland. Most were hunters, traders, missionaries, naturalists, explorers, and engineers. Under their influence game was killed in large numbers. Ivory, crocodile hides and ostrich feathers were traded for commodities like arms and ammunition. "Local management systems were unable to control such powerful political and economic forces of escalating demands of hunting wildlife, and gradually colonial powers, and eventually the new independent state, intervened and assumed ownership" (Taylor, 1998). Big game hunting soon had to be restricted as consequence of resource depletion (Potten, 1976).

The Role of ITK in Present Resource Management Practices

Natural resources such as wild plants, wildlife and fish were not only the main resources the first inhabitants of Ngamiland depended upon but also continued to play an important role in the livelihoods of contemporary people in the region (Potten, 1976; Applied Development Research Consultants, 2001; Cassidy, 2003). Particularly in remote rural areas of Ngamiland the population still uses natural resources and local skills to make a living, to build houses and grain stores (out of clay, cow dung, reeds, poles, thatching grass) and to produce household utensils, furniture and means of transportation. A number of examples described below demonstrate that indigenous knowledge is still vivid and relevant in contemporary natural resource management.

The Value of Local Knowledge in Land and Resource Use Planning

Having learned from the failures of the top down planning and decision-making process of the past, the involvement of local communities in planning has been recognised as a fundamental principle to address poverty alleviation as well as environmental protection and achieve sustainable development in rural areas. This also involves strengthening the capacity of local authorities to identify and tackle the felt needs and development issues of their respective areas (MFDP,1997).

An example of successful incorporation of local knowledge and expertise in planning, is drawn from the experience the author gained in Communal First Development Area planning, carried out in western Ngamiland during the 1980s (Bendsen & Gelmroth, 1983). The affected communities showed keen interest in participating actively in the planning and decision-making process on the future use of their area. In the inventory phase local expertise had already been the most valuable source of information to assess the land use dynamics and underlying causes of resource use change in the planning area. For many generations most of the rural people in Ngamiland made a living from the natural resources of the Okavango Delta and have accumulated a profound knowledge on how to use the ecosystem effectively and how to adapt to its constant fluctuations. Using several ecological and socio-economic

indicators, farmers knew how to select areas best suited for particular types of land use. The communities also proved to be ideal entities to identify and rank land use conflicts and specific development constraints, which needed to be addressed. People were in a position to spell out some of their future resource needs and land use aspirations. As a measure to solve land use conflicts (like crop damage by domestic stock) farmers zoned communal areas into different land use categories and fenced off individual fields or arable blocks jointly. By applying their previous cropping experience, plus indicators like the colour and texture of the soil, the shape of the terrain, or the vegetation type and status, farmers could pinpoint areas with future cultivation potential. Having observed the variations of the flooding pattern in their *molapo* fields over long time periods, local land users were able to identify lands areas, with more favourable moisture conditions throughout (in terms of drainage and flood recession). When soil and land suitability maps became available some years later (Jamagne, 1990), they confirmed the ITK of farmers based on long-term experience.

The rural communities were able to include many additional socio-economic factors in their decision making process, like the distance from fields or grazing areas to the homestead or cattle post, local land rights (in the floodplains land rights are still not registered with the land allocation authorities), availability and quality of water for human and livestock consumption, the occurrence of poisonous plants (*mogau*) in some parts of the grazing areas and common migration routes of wild game (elephants, etc.). Many of these criteria, which influence land suitability for given uses, would have been much more difficult, time consuming, and costly to determine by evaluation methods only based on modern science.

Use of local skills in the resolution of resource use conflicts is another area where traditional institutions, like the *kgotlas*, continue to play a prominent role. If land use conflicts are solved at the local level, many area-specific factors and socio economic circumstances of the parties involved can be considered to come to a wise compromise.

ITK in Wildlife Management

Historically the use of the natural resources was locally controlled by cultural norms and rules, enforced through traditional leaders. The centralisation of authority in government weakened the role of local institutions. Natural resource became de facto open access, as there was no institution which effectively enforced laws on resource utilisation (Jones, 2002). By establishing protected areas, a quota setting system, and anti-poaching laws the attitudes of communities towards wild animals changed drastically. Wildlife was no longer seen as an asset, but instead as an impediment to their livelihoods threatening people, livestock, and crops (Taylor, 1998). Through the introduction of the Community Based Natural Resource Management (CBNRM) policy in the 1990s, traditional knowledge and community-based institutions are supposed to regain value as a tool for rural development and resource conservation (Rozemeijer & Jagt, 1999). The concept is based on the assumption that communities will have an incentive to sustainably manage the natural resources in their area if they derive tangible benefits from their utilisation. The Wildlife Management Areas remain under the ultimate control of government while the communities, who manage them, act as custodians. CBNRM is a hybrid system, using modern and traditional knowledge simultaneously. However, it is not always easy to acquire and incorporate both knowledge systems. The monitoring system which forms the basis for quota setting does not include ground observations made by communities. The effectiveness of CBNRM in its present form is still controversial. Driven by local power structures benefits are not always equally distributed and shared nor are they reinvested in profitable community projects. Trusts are still lacking essential skills required in the management of commercial tourism enterprises.

ITK in the Selection of Livelihood Strategies

Faced with constant fluctuations of their environment, people have developed strategies to cope with and adapt to changing circumstances. On a day-to-day basis, they make rational decisions about production choices and combinations of economic activities in which they will engage. In Ngamiland most people maintain their traditional, diversified, low input income generation system as a means of reducing risks in an unstable environment. Having experienced the high frequency of stress and shocks (droughts, floods, livestock diseases, erratic rainfall) affecting almost all land use activities in the Delta, rural people engage in a multitude of economic activities. Almost 90% of the farming households have maintained their traditional cropping system and not followed improved production technologies propagated by the government extension services over the past three decades (Agricultural Statistics Unit, 1991). As most of the rural people have only limited financial and manpower resources they would have to limit the number of economic activities they are involved in if they would decide to intensify one of them. Intensified production systems are more likely to have unintended environmental impacts. Unless very well managed, the application of fertilizer, herbicides and pesticides, the establishment of flood regulating infrastructure, and the introduction of irrigation systems and monocultures would definitely carry the risk of negative environmental impacts. This risk is increased by the fact that most of the areas with higher potential for arable farming are located on the fringes of the Okavango wetland system. As people neither have control over constantly occurring environmental disasters nor over government policies and zoning decisions, which influence and limit their livelihood choices, they tend to increasingly incorporate formal employment opportunities in their livelihood strategies.

Fire, a Traditional Resource Management Tool

From earliest settlement of the Okavango Delta people have used fire as a traditional management tool. Originally, the location and timing of fires was controlled by the chiefs. An area could not be burned in consecutive years nor before late winter, after the grasses used for thatching had dropped their seeds (Cassidy, 2003). By 1930, under the influence of white settlers who perceived burning as destructive, the setting of fires and allowing them to burn were declared offences (Schapera, 1970). Since the Herbage Preservation Act came into force in 1978, burning is legally prohibited. Simultaneously the authority of the chiefs has been weakened and traditional rules of access and obligations have been eroded through the establishment of a centralized government (Cassidy, 2003). Permission for the use of controlled fires for clearing of fields must be obtained from the district fire ranger. However, for farmers from remote areas, this is a tedious inaccessible bureaucratic process.

A study carried out recently by Cassidy (2003) reveals that burning of the wetlands at the right time of the year is still regarded by most people as an effective method of natural resource management. Fishermen set small fires at the fringes of streams and open lagoons to keep them from being overgrown by vegetation and to facilitate the growth of fresh shoots of aquatic plants palatable to fish. Due to the moist environment these fires usually do not get out of control. Livestock owners perceive that fires improve grazing conditions in floodplain areas. People involved in the collection of thatching grass, reeds, and papyrus generally recognise fire as a management tool stimulating the quantity and quality of plant growth (Cassidy, 2003). However, fires set before reseeding of the grass and prior to the termination of the harvesting activities are locally condemned as destructive (Cassidy, 2003). In Wildlife Management Areas, used for hunting and photographic tourism, fires have always been set

intentionally as they improve wildlife viewing, facilitate access, and attract game to the fresh sprouting grassland.

Over generations, people have understood that wetland fires can have positive effects on the environment and on their livelihoods if properly managed. The large number of fires annually spreading across vast expanses of the Okavango Delta indicate that the criminalisation of this indigenous management strategy has not stopped people from applying it.

Cassidy (2003) suggests that "by legalising veld fires they could be effectively planned (frequency, location and extent) and controlled in a manner better suited to environmental conditions and people's needs". Unwanted negative effects of fires and conflicts between different resource user groups could be avoided if the communities, their traditional institutions, and other interest groups were openly involved in the management of fires.

Traditional Resource Use Practices in the Fishery Sector

Traditional fishing gear and fishing practises have remained in use and co-exist with modern fishing equipment in all the villages close to the Delta. Indigenous fishing techniques like spear fishing, the use of traps, clubs, funnel shaped fishing baskets, gill nets out of tough fibre, and the poisoning of fish in drying lagoons, which have been developed for the particular environmental conditions of the Okavango Delta are still practised. The large proportion of female fishermen in Ngamiland (44%) almost exclusively uses traditional fishing techniques (Mosepele, 2001), which are more adapted to their abilities and their preferred fishing areas, the shallow semi-permanent floodplains. Many fishermen (64%) still use wooden canoes (Mosepele, 2001). Especially in poorer households, the use of traditional crafts and fishing equipment is more viable, as it can be home produced from locally available natural materials available. People consider the Delta a fairly robust ecosystem. They know they can clear out all the fish in drying pools without causing permanent negative effects on the fish population. With the new flood the fish stock establishes itself again. A recent study proved that fish stock in the Okavango Delta has not been depleted and that its potential is still under-utilised (Mosepele, 2001).

ITK in Livestock and Range Management

The Herero in particular, but also the BaTawana, are devoted, knowledgeable pastoralists with valuable traditional knowledge and experience in livestock management. Local farmers and their herd boys are not only able to perform certain veterinary tasks like assisting in births or diagnosing illnesses but also have adapted their management strategies to meet the particular threats and constraints of their local environment. Herdsmen know where specific poisonous plants occur and try to keep stock out of these pastures. Areas infested by vector-borne diseases or liable to predation are also avoided. Many traditional pastoralists still practise a seasonal grazing rotation system. To exploit pasture resources more effectively without depleting them, the Herero have maintained a certain degree of mobility (Vivelo, 1977). Farmers build up specialised knowledge, interpret their long-term experiences with certain types of resource use, and record environmental outcomes of their actions. Over generations livestock owners have observed that the fodder value of the *molapo* pastures is poor and associate floodplains with diseases like liver fluke or *nagana* (sleeping sickness in livestock), and security risks for domestic stock. Herds are moved away from the heavily utilized floodplain pastures to dryland grazing areas, as soon as water becomes available in semi-permanent pools.

Hybridisation of Indigenous Knowledge through Commercialisation

As soon as economic value has been attached to particular natural resources traditional technical expertise regains relevance as a tool for rural development. This is evident especially in the tourism sector.

The Use of the ITK in the Tourism Sector

As mentioned earlier, the BaYei and the HaMbukushu have maintained their river culture and are still dependent largely on the natural resources of the Okavango Delta (Applied Development Research Consultants, 2001). Originating from the wild waters and rapids of the Zambezi, the HaMbukushu are described in some of the historical sources (Stigand, 1923) as the most skilful boatsmen. The BaYei also used dugout canoes (*mekoro*) but mainly in shallow waters. Both ethnic groups, as well as some of the River San, are known for their intimate knowledge of the labyrinth of waterways, floodplains and islands of the Delta. Until the 1980s *mekoro* were widely used to transport local goods and people. A mokoro survey carried out by Murray-Hudson in 1988 estimated the total number of *mekoro* in the entire Delta to be 750 –900. When the district road network was improved and public transport facilities became available, the *mokoro* lost its dominant role as a local means of conveyance. However, *mekoro* remained in use for fishing and gained new importance in the tourism industry. The slender canoes are ideally suited to quietly traverse the shallow floodplains overgrown with aquatic vegetation. They do not have the adverse environmental effects of motorboats (like noise, water pollution, and erosion of the river banks). In parts of the Delta the use of motorboats has even been banned because of its assumed impact on the ecosystem.

The growing tourism sector revived this traditional transportation asset and the skills associated with it. Many tour operators hire local boatmen and their canoes. Since 1999, a community based organisation, the Okavango Poler's Trust, has offered its services directly to clients. Tourists are taken out on *mokoro* trips combined with game or bird walks and can experience the Delta by camping in the wilderness on some of the islands. The local technology had to be refined and the local knowledge transformed and adapted to meet the specific, growing demands of the tourism industry. The traditionally produced, wooden dugout canoes have a limited lifespan (4-9 years) and begin to leak as they age (Murray-Hudson, 1988). Hence, they do not always comply with the comfort and safety expectations of international tourists. In addition to that, more stress was put on the resource base with increasing demand. Most *mekoro* are made out of *mukwa* (*Pterocarpus angolensis*) a sandveld tree or out of the sausage tree (*Kigelia africana*), a riparian species. In response to the pressure on these trees the majority of the polers who work in the tourism sector and most of the tour operators decided to invest in fibreglass canoes which are an imitation of the traditional *mokoro* but have the advantage of being longer-lasting, more comfortable, and easy to maintain.

Apart from locally very well developed skills, like the handling of a canoe and the knowledge of the local environment and its threats, some additional capacities like the command of the English language, first aid skills, and a more profound knowledge of the biology of flora and fauna of the Delta are a prerequisite for a guide who works with tourists. Botswana is promoting low-density high cost tourism to ensure maximum returns but minimal environmental damage. To secure the quality of the service, the government has introduced guide licenses as a basic requirement for head polers. Building on existing local knowledge, on the job experience can be gained by working for a tour operator or a community trust in a

team with qualified personnel. Apart from on the job training, the Botswana Wildlife Training Institute in Maun offers specific courses with nationally recognised certification.

Commercialisation of Traditional Handicrafts

Another good example of successful revitalisation of indigenous knowledge is in the handicraft sector. When metal and plastic containers became commercially available, they replaced to a large extent traditional storage vessels such as wooden bowls, clay pots, and woven baskets of palm leaves. By the late 1960s, basket making had almost died out (Terry, 1986). Basket weaving as a form of cultural expression, would have been lost had no monetary value been attached to it (Terry, 1999). Through the initiative of the Refugee Resettlement Officer of Etsha, who started to buy and market traditional baskets, this traditional craft product was revived. With increasing demand local craft producers experienced a shortage of raw materials (*mokola* palm and various dye plants) in the vicinity of Etsha and Gumare, villages with a very high population concentration and a high percentage of women involved in basket making (Bendsen & Gelmroth, 1983; Terry, 1986). Plantation of the palm in communal woodlots failed. However, a few local producers adopted small-scale propagation on individual plots. Later, Botswanacraft took over marketing baskets and several NGOs (e.g. Botswana Christian Council and Conservation International) assisted in improving the quality of the baskets to gain maximum benefit from the resource base without depleting it. By the 1980s improved harvesting techniques, like selective cutting of palm leaves, had been adapted by 81% of the producers (Terry, 1986). An excellent way of disseminating indigenous technical knowledge proved to be the identification of local master weavers as trainers. The introduction of a grading system (encompassing quality, size, and design) contributed to the improvement of basketry and to the conservation of palms by promoting a more economic use of the raw materials (quality instead of quantity). With increasing returns, weavers now must accept to either extend the radius of their collection areas or buy the raw materials from suppliers farther afield.

Limitations of Utilising Traditional Knowledge in Resource Management

Not all the traditional natural resource management systems are still relevant, as the conditions under which they developed have changed (Atteh, 1992). Given the drastic population growth and the increased pressure on the limited natural resources of the Delta, management techniques related to redistribution of human and livestock populations to under-utilised areas are becoming less viable options. With the provision of community services to villages such as infrastructure, health and educational facilities, the settlement pattern and consequently the use of the surrounding arable and grazing areas has become increasingly more permanent. Boreholes combined with the allocation of individual water rights have contributed to the consolidation of cattle-posts. At the beginning of the 20th century, the traditional range management strategy of the Herero was “never to build permanent houses and move from place to place with the herds, depending on the condition of the pastures” (Brincker, 1899 in Vivelo, 1977). Under present socio-economical and political conditions this is no longer feasible.

In the past, cattle were moved into the Delta during severe droughts. Now government policies and programmes combined with veterinary regulations greatly influence the livelihood choices of people. The freedom of moving to new or under-utilised grazing areas or utilising fall back pastures in years of persistent drought is now restricted. The construction of the buffalo fence in 1982 and of other cordon fences in Ngamiland, the establishment and

extension of protected areas like the Moremi Game Reserve, the declaration of the Delta as a cattle-free Wildlife Management Area, and the commercialisation of parts of the communal range land under the Tribal Grazing Land Policy (1975) and later under the Fenced Ranch Component of the National Policy for Agricultural Development (NPAD) all have limited the options of traditional stock owners to respond to increasing grazing pressure and natural disasters in their traditional ways. In total, 37% of the tribal territory of Ngamiland can no longer be used for communal grazing. This has for instance led to over grazing at the margins of the Delta.

Factors Influencing the Decline of Traditional Knowledge

The introduction of formal education, and new religious, political, socio-economic, and administrative systems are the main factors responsible for the decline of indigenous technical knowledge (Atteh, 1992).

Early explorers and colonial officers regarded local knowledge as primitive. Even today, well educated civil servants and professionals often look down upon rural people and consider their knowledge as backward. Even today modern ITK continuous to be undermined and shunned upon as a sign of lack of civilisation (Atteh, 1992). Most government officials involved in resource use planning or management are not posted in the district long enough to be able to gain long term experience and understanding of the unique ecosystem of the Okavango and its specifically adapted local resource management strategies. As modern scientific knowledge is regarded as superior, they only make very limited use of the wealth of local knowledge readily available in the communities.

ITK is usually passed down from generation to generation through direct interaction, observation, practical participation in environmental management, and oral advice given by parents, relatives, and other members of society (Atteh, 1992). Increased school attendance limits the possibility of children acquiring traditional skills by working with their families on the lands or at the cattle posts. Many parents send their children to school with the expectation of a brighter future for them. Education based on modern science is regarded as the key to formal employment opportunities, wealth, prestige, and power while indigenous knowledge is associated with the subsistence struggle of the rural poor.

Traditional skills and local knowledge and beliefs have been better preserved in the remote rural areas of Ngamiland where outside influences are less pronounced. In the fast growing, multiethnic, semi-urbanised environment of the district capital Maun, indigenous knowledge is sadly fading fast.

Conclusions

The indigenous technical knowledge found in local communities in Ngamiland is an amalgamation of strategies, skills, rules, and techniques gained through shared adaptive man-environment interactions to make a living and survive natural and economic hardships.

Not all the traditional knowledge has remained relevant as some of the conditions on which ITK was based have changed considerably. The factors that have contributed to the decline of ITK in Ngamiland are the centralisation of the political and administrative system, the

introduction of formal education, and changes in the socio-economic conditions (Atteh, 1992). Some of the areas and natural resources which were used by local people to gain their livelihoods and on which ITK focused have been put out of bounds through legal exclusion and territorial claims by the state for protected areas, livestock disease control measures and through commercialisation of tribal land (Wilks, 2002). The criminalisation of indigenous management practices, like the use of veld fires, undermines its effectiveness as resource management tool. If the value of fire could be substantiated by research findings, its legalisation combined with strict management and control could reduce the detrimental environmental effects of its illegal application.

Even though certain aspects of local knowledge are gradually fading away in urbanised centres, ITK still plays a vital role for the livelihoods of the rural population in Ngamiland. In the subsistence economy the application of ITK predominates. The rural population maintains a diversified income, low input livelihood strategy based on ITK as means of reducing risk in an unstable environment.

Indigenous knowledge and skills have been adapted to new conditions and demands whenever tangible livelihood benefits for individual members of a community can be derived from their application. Hybridised with modern knowledge systems, traditional knowledge can co-exist to meet the changing demands and challenges of rural development. Jobs in the tourism sector, which are based on locally acquired capacities complemented with new expertise, have become an important additional source of income, especially in remote areas where no other employment opportunities exist. A large percentage of rural dwellers have no formal education (40% never attended school in Ngamiland, CSO 1991) and hence have few other opportunities in the national job market. The use of traditional skills hybridised with some elements of modern knowledge is an effective way of employment creation, contributes to halting rural urban drift, and is a starting point for rural development.

ITK is applicable as one of a number of tools in planning, decision-making, and monitoring of the use of natural resources at local level. The use of a participatory bottom-up planning focused on local priorities, needs, constraints, and abilities is an attempt to activate and incorporate indigenous knowledge and get local support for the implementation of resource management plans. ITK can only be incorporated as an asset for sustainable rural development and resource conservation if government officials, planners, decision makers, and scientists improve communication links with local communities, recognise the value of ITK, and develop a positive attitude towards it. Not to raise false hopes and expectations all stakeholders have to be made aware that the result of the planning process is a trade off between interests of all individual users and conservation goals.

The initiation of the Community Based Natural Resource Management (CBNRM) policy is a serious attempt of the government of Botswana to create a forum for the representation of local institutions and inclusion of traditional knowledge in the management of natural resources as a tool for rural development and conservation. Its effectiveness in its present form is currently being evaluated.

Non-governmental institutions have recognised the value of local indigenous knowledge and have supported it by recording oral history, traditional music, and dances to preserve cultural identity and provide new income generating options, mainly in eco-cultural tourism and in the handicraft sector.

The Okavango Delta is a wetland of international importance. Its significance in the light of climatic change, desertification, regional water balance, and biodiversity reaches far beyond the level of local livelihoods. Both long-term conservation objectives and the interests of all stakeholders have to be considered and balanced. Therefore, modern and local knowledge regimes will have to be skilfully merged to manage and use natural resources in a sustainable manner for the benefit of local stakeholders, the nation as a whole and the international community.

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