

Traditional ecological knowledge and community-based natural resource management: lessons from a Botswana wildlife management area

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Abstract

The advent of community-based natural resource management (CBNRM) in Botswana in the late 1980s ushered in a new paradigm in natural resource management. The strategy marked a change from state-controlled to community-controlled wildlife management. The expectation is that under community control, local expertise on biodiversity, termed in this paper as traditional ecological knowledge (TEK), plays a significant role that is supposedly facilitated through local institutions and traditional practices. This paper examines the incorporation of TEK in the CBNRM projects in KD 1, which is a controlled-hunting area (CHA) in the north-western part of the Kgalagadi North sub-district, Botswana and illustrates that the projects acknowledge and demonstrate the utility value of TEK in sustainable natural resource management. It concludes that TEK systems and institutions could serve as entry points into sustainable natural resource utilisation and management. This could be achieved through the exploration of cultural practices of the local people and integrating useful aspects into the modern natural resource management expertise.

Keywords: Traditional ecological knowledge; Sustainable development; Community-based natural resource management; Controlled-hunting area

Introduction

Based on legal and economic frameworks developed from colonial times, the current structure of natural resources management processes in Southern Africa have tended to marginalize traditional approaches to and institutions for natural resource management (Awori, 1994; Christofferson and Johnson, 1997; Harrison, 1987). These approaches and institutions had evolved over millennia in direct response to the need to manage local ecological resources and conditions. It is also noted that legislation introduced in the colonial period disenfranchised many local communities with regard to land tenure and use rights of the natural resources (Christofferson & Johnson, 1997; Hansen & Erbaugh, 1987). Further, it destabilised the traditional mechanisms of resource conservation. It is now widely acknowledged that most traditional ecological knowledge (TEK), which influenced these institutions and approaches to resource management, was practical and ecologically sound (Baker, 1993; Chambers, 1983; Klee, 1980), and that it could therefore have a role in the design of sustainable resource management programmes today.

It is in this context that the study whose results are reported here was conceived. The study investigated the nature of TEK and the extent to which it was utilised in the design of a community-based natural resource management (CBNRM) project in one of the wildlife management areas in South-western Botswana. The paper starts by briefly introducing the study area. This is followed by a brief discussion of the community-based natural resource management strategy in general and as it is used in the Botswana context. Thirdly, the methods used to capture and process relevant data are outlined. A discussion of the study's findings is then presented, followed by conclusions.

The study area

The study was carried out in a controlled hunting area (CHA). This is a CHA within a wildlife management area (WMA) in the Northern Kgalagadi sub-district, just north of the Kalahari Trans-Frontier Park (formerly Gemsbok National Park) in south-west Botswana legally known as KD 1 (Fig. 1). KD is an acronym for all CHAs in the Kgalagadi district. Adjacent to KD 1 are two other CHAs, KD 2 and KD 3 in the south-east and east, respectively. A WMA is an area where wildlife utilisation and management is the recognised form of land use. Other forms of land use are permissible but should not prejudice the wildlife populations and their proper utilisation. There are 163 CHAs which have been divided into various types of land use in Botswana. Some of them are for community management, while others are zoned for commercial management. Within both the community and commercial zones, there are further categories of CHAs with multiple use (e.g. hunting and/or photographic activities) and photographic areas (no hunting). KD 1 as a CHA has multiple uses.

There are three main settlements in the KD 1. These are Ukhwi, Ncaang and Ngwatle. The total population for the three settlements in 2001 was 834 (Botswana

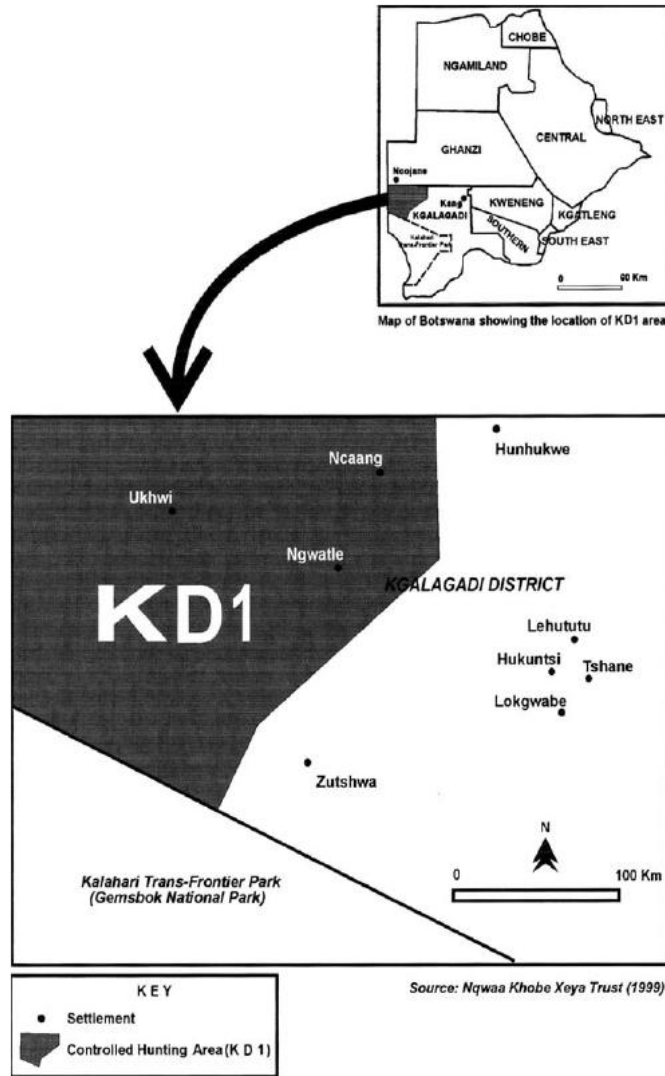


Fig. 1. Location map of the study area.

Government, 2002). Ukhwi is the largest settlement with 453 people, followed by Ngwatle with 206 people and Ncaang with 175 people. Approximately, 45% of the total population for the three settlements is younger than 16 years. Roughly, 49% of the population is male and 51% is female. About 38% of households are female-headed. Two ethnic groups, Basarwa¹ and Bakgalagadi² reside in the KD 1 area.

¹ Basarwa—a local word for the San.

² Bakgalagadi—a Bantu-speaking group co-living with Basarwa.

The Basarwa make up approximately 65–70% of the total population and Bakgalagadi 30–35%. In Ukhwi, 67% are Basarwa and 33% are Bakgalagadi. Ngwatle is a predominantly Basarwa settlement, whereas Ncaang is settled predominantly by Bakgalagadi (Nqwaa Khobee Xeya Trust, 1999).

Community-based natural resource management

The protectionist approach to wildlife conservation, where the state owns and protects wildlife, has proved inadequate to save it from poaching and other threats in rural areas. This approach tends to marginalise the local communities close to the wildlife areas. The communities therefore lose both the land and the right to hunt wild animals (Booth, Mc Cullan, Mpinga & Mukute, 1994). This situation leads to resource use conflicts between the communities and wildlife officers. The protectionist approach is sometimes described as the “fortress” style of conservation, CBNRM is therefore a reverse of this style (Taylor, 2000). It was against the conflict between wildlife and communities around it that a new paradigm in wildlife management evolved which is community-based wildlife management. Under this strategy, wildlife in and around rural areas is supposed to be managed with and utilised for the benefit of the residents.

Unlike in other countries, which have come up with localised names such as administrative design for game management areas (ADMADE) in Zambia, and communal areas management programme for indigenous resources (CAMP-FIRE) in Zimbabwe, community-based wildlife management in Botswana is simply known as CBNRM. It is defined as a development approach that supports natural resource conservation (Department of Wildlife and National Parks, 2000). CBNRM is designed to alleviate rural poverty by empowering communities to manage resources for long-term social, economic and ecological benefits. According to the CBNRM policy, it is founded upon the notion that all citizens share an interest in conserving Botswana’s environment, while most people who live closest to natural resources generally must absorb the greatest costs associated with conservation. They must also be given proper tools and incentives to successfully manage and benefit from natural resources utilisation.

Some of Botswana’s CBNRM policy objectives are to:

- Initiate conservation strategies that are ecosystem in perspective and local in approach, including natural resource monitoring and management programmes to ensure species and ecosystem health;
- Provide opportunities for community participation and capacity for natural resource management, including their role concerning the management of forest reserves, national parks and game reserves; and
- Enhance economic and social development in rural areas by providing opportunities to qualified communities to reap benefits from the natural resource conservation.

CBNRM in Botswana has been implemented mainly by the department of Wildlife and National Parks (DWNP) through the establishment of community-based organisations (CBOs) in wildlife management areas (Jansen, Madzwamuse & Roze-meijer, 2000). Community capacity, participation and active interest in natural resource management are strengthened through the establishment of CBOs and the leasing, tendering and sub-leasing of CHAs. The communities in WMAs are allowed to benefit from the wildlife resources in their vicinity. CBNRM was first implemented in KD 1 in September 1996. This followed a series of consultative and participatory meetings intended to mobilise the community. After the community showed their willingness to accept the wildlife management strategy, first CBNRM activities were carried out with the assistance of Non-Governmental Organisations (NGOs) and donor agencies. This study revealed that both consumptive (e.g. hunting for meat and trophies) and non-consumptive utilisation of wildlife resources (e.g. photographic safaris) are to be found in KD 1. The Nqwaa Khobee Xeya Trust (NKXT) is a CBO that coordinates all CBNRM activities in the KD 1 CHA.

Methodology

The study was based on secondary and primary data collected in December 2000 and January 2001. Secondary data involved information from published material, policy documents and grey literature. Some of the secondary data such as scientific ecology were used to determine whether there was some point of convergence between TEK and modern scientific knowledge (MSK). The primary data were collected through four ethnographic methods, namely focus group discussions, profile interviews, household survey and participant observation, as briefly outlined below.

Focus group discussions involved members of the KD 1 CBO, school children and knowledgeable men and women from the study settlements. Profile interviews involved people knowledgeable about different aspects of TEK, such as a Mosarwa traditional doctor, grapple plant harvester who had never undergone training in modern grapple plant harvesting methods, Basarwa and Bakgalagadi men and women (one man and one woman per ethnic group) and tribal leaders.

An overt participant observation, where the researchers declared their identity and purpose, was employed. The main reason for the choice of overt observation was the potential respondents' tendency to conceal traditional knowledge, especially when the researcher is an outsider. Quantitative data were elicited through a structured researcher-administered questionnaire comprising both close-ended and open-ended questions. A total of 48 respondents were interviewed. To ensure that the questionnaire was compatible with the actual situation in KD 1, a pre-test was conducted in one of the settlements.

Research sample size

The target households were randomly selected during the course of the survey. Prior arrangements had been made with some key respondents to reduce the possibility of absenteeism. The sampling unit for all the three settlements was the

household with the target respondent being the household head. A total of 13 households were interviewed in Ngwatle, 12 in Ncaang and 23 in Ukhwi. The respondents were either Bakgalagadi or Basarwa, the latter made up 60.4%, while Bakgalagadi constituted 39.6% of the sample. Both males and females were interviewed during the survey. Of the respondents, 45.8% were males, while 54.2% were females. Qualitative and quantitative data were generated. Quantitative data were coded and processed using the Statistical Package for Social Sciences (SPSS) software to generate frequencies of responses. Cross-tabulation of some variables was done to establish relationships between them.

Results and discussion

Below, we report and discuss the results of the study, highlighting the nature of TEK present, its utility, barriers against its use and the role of TEK in sustainable CBNRM.

Traditional ecological knowledge systems prevalent in KD 1

Environmental indicators

The condition of plants and weather prediction are quite useful for determining environmental quality for the KD 1 communities. According to the respondents factors such as the condition of plants are significant for marking the seasons (Table 1).

Table 1
Environmental indicators of seasons

Season	Environmental indicators
Summer	<ul style="list-style-type: none"> ● When camel thorn/mokala (<i>Acacia erioloba</i>) blossoms, it heralds the wet season and marks the end of winter season ● The Tsama melon/kgengwe (<i>Citrullus lenatus</i>) will also blossom ● When Wait-a-bit thorn/mongana (<i>Acacia mellifera</i>) blossoms, it is time for the first rains (<i>pula ya sephai</i>) and this is accompanied by seed germination
Winter	<ul style="list-style-type: none"> ● Umbrella thorn/mosu (<i>Acacia tortilis</i>) and Silver-leaf Terminalia/mogonono (<i>Terminalia sericea</i>) plant species are usually the first to shed their leaves ● Strong winter also indicated by the appearance of a star locally called <i>manake</i> in the south-east direction. During this time, crops will fail, wild animals will become lean and the scarcity of water will increase
Spring	<ul style="list-style-type: none"> ● Heralded by <i>Acacia erioloba</i> being the first to blossom and Umbrella thorn/mosu (<i>Acacia tortilis</i>) and Sherperd's tree/Mogonono (<i>Terminalia sericea</i>) being the last species to blossom
Autumn	<ul style="list-style-type: none"> ● Bumper harvest of veld products and abundance of wild animals predicted through abundance of tree gum/borokhu, especially on <i>Acacia erioloba</i> tree

Source: Phuthego (2001).

It is interesting to note that some of the local observations are in tandem with scientifically researched observations. One research work posits that the *Acacia erioloba* plant inflorescences a ball of bright golden-yellow flowers appearing before the rains from late August until January with new leaves, and that *Acacia mellifera* inflorescences a somewhat elongated ball of cream-coloured scented flowers. These appear before the rains from July to November. It is also one of the first trees to flower after the winter (Timberlake, 1980). These characteristics indicate that some of the scientific observations are similar to the TEK.

Traditional ecological knowledge in veld products utilisation and management

Table 2 presents the respondents' knowledge on location, uses and management of some of those veld products they consider important and ubiquitous in their area. Knowledge on veld products seems to be associated more with women than men. This is evidenced by grapple harvesting (for medicinal and commercial purposes) respondents who were mainly women. Men's knowledge appears scanty as

Table 2
Management and utilisation strategies for veld products

Veld product	Distribution, utilisation and management strategies
Truffles/mahupu (<i>Terfzii specie</i> s)	<ul style="list-style-type: none"> ● It is a tuber that grows mostly in a sandy (soft) and moist or lush area. The area is usually a depression ● They tend to grow in almost the same area and if therefore spotted in one area, it is a indication of their presence in the vicinity ● If it appears blackish inside when cut open, it is ready for harvesting and not ready if whitish. One respondent said the truffles are ready for harvesting one month after germination ● To ensure sustainability, young seedlings are not harvested ● Usually, in abundance following a lot of rains
Raisin bush: <i>Grewia flascens</i> /motsotsojane and <i>Grewia flava</i> /moretlwa	<ul style="list-style-type: none"> ● Best harvesting time is mid-summer, that is, between November and January ● Ripe for harvesting if reddish in colour. Unripe when yellowish in colour ● The <i>Grewia flava</i> could be dried and stored for future consumption. When needed later, it is pounded until in powder form and eaten ● Used for traditional beer brewing to enhance fermentation
Grapple plant/devils claw/sengaparile (<i>Harpagophytum procumbens</i>)	<ul style="list-style-type: none"> ● Easy to spot in summer when the fruit and the creeping plant are still green ● Harvested in winter when the fruit has dried and spontaneously breaks off the creeping plant. Local knowledge on the plant is therefore very critical at this stage because it might not be very easy to spot the plant ● It is a cure for ailments such as waist pains and kidney-related problems ● The following harvesting methods are employed– Only the secondary tubers are harvested– The parent tuber is left to regenerate. Soil is then poured over it after the secondary tubers are harvested

Source: Phuthego (2001).

more often women reminded them of veld products knowledge such as that on truffles. This quality was common to both Bakgalagadi and Basarwa.

Specific characteristics of some wildlife species

The respondents displayed tremendous knowledge about animal characteristics. This knowledge is associated more with men in Bakgalagadi and Basarwa communities. The main informants were hunters. Such a scenario is usual since the information is quite useful for hunters and hunting as a vocation for men in both ethnic groups. Table 3 is a presentation of characteristics of some wild game in KD 1.

Some of the local observations are in congruence with modern scientific knowledge such as observations indicating that some wild animals like the duiker dig up and feed on the grapple plant; and that this contributes to the plant's absence on the ground (Sekhwela, 1994). The locals' rejoinder to the claim is that the on-ground distribution has been acutely affected by commercialisation of the plant.

Animal behaviour and breeding periods for hunting purposes

The advent of CBNRM in KD 1 introduced a completely new paradigm in wildlife utilisation and management. The shift had a significant bearing on the hunting and survival methods of the local people especially the Basarwa. Before CBNRM,

Table 3
Characteristics of some game found in KD 1

Animal species	Characteristics
Kudu/Tholo (<i>Tragelaphus streliceros</i>)	<ul style="list-style-type: none"> • Likes resting and hiding behind umbrella thorn (<i>Acacia tortilis</i>) • Likes feeding on shepherd's tree leaves and some tubers such as eland's bean/mositsana or moshiri (<i>Elephantorrhiza elephantine</i>) for water • Likes bushy and sand-dune areas to evade potential hunters
Gemsbok/Kukama (<i>Oryx gazella</i>)	<ul style="list-style-type: none"> • Prefers hanging out around pans because it needs salt • Likes digging tubers, <i>Elephantorrhiza elephantine</i> and eats <i>Citrullus lenatus</i> for water • It has a tendency of coming back to its "toilet" that is, where it would have relieved itself earlier on. This is a good spot for hunters to snare it
Springbok/Tshepe (<i>Antidorcas marsupialis</i>)	<ul style="list-style-type: none"> • Prefers less grassy areas because it is always on the look-out for predators
Blue wildebeest/Kgokong (<i>Connochaetus taurinus</i>)	<ul style="list-style-type: none"> • Likes lurking in bushy areas during hot weather for shade • Highly migratory during wet season looking for water in the pans • Less migratory in dry season because of poor prospects of finding water. It now resorts to feeding on tubers for water
Common duiker/Phuti (<i>Sylvia grimmia</i>)	<ul style="list-style-type: none"> • Likes digging grapple plant for water. The plant is also its medicine. One respondent claimed that since the commercialisation of the grapple plant, the <i>Sylvicapra grimmia</i> population figures have dwindled because it is now more susceptible to different types of ailments

Source: Phuthego (2001).

Table 4
Breeding periods for some game

Animals	Breeding periods
<i>Oryx gazella</i>	Between September and January
<i>Connochaetus taurinus</i> Eland/Phohu (<i>Taurotragus oryx</i>)	
<i>Antidorcas marsupialis</i>	Around December and January
<i>Canis mesomelas</i>	

Source: Phuthago (2001).

Basarwa had exclusive access to wildlife through the special game licences dispensation (Van der Jagt, pers.comm.).³ Under this system, Basarwa have more access to wildlife because of the special game licences possessed. Before and during this dispensation, Basarwa men's main vocation was hunting. The respondents on this issue were mainly Basarwa and Bakgalagadi men who had hunted for their family groups. The hunters in KD 1 rely very much on the behaviour of the animals as well as their breeding periods and environmental conditions. Table 4 shows the breeding periods for some wild animals.

Basarwa also rely greatly on their knowledge of animal behaviour. One Mosarwa hunter noted:

“During rainy season, the big game are highly mobile. In reaction to this situation, Mosarwa would resort to killing small game such as caracal/thwane (*Felis caracal*), black-backed jackal/phokoje (*Canis mesomelas*) and bat-eared fox/mothose (*Otocyon megalottis*) and some big game which are easier to kill such as gemsbok”.

The main implication of the above statement is that Basarwa practised selective hunting which has positive conservation implications.

Tek utilisation in CBNRM

The respondents identified a number of aspects of CBNRM in which TEK plays a significant role. The information provided was also consolidated with information from an interview with the former natural resources advisor who had worked with the KD 1 communities. The local people's knowledge about animals' behaviour and their characteristics still plays a crucial role in modernised hunting expeditions. One striking aspect of local knowledge is the observation by the respondents that most wild animals prefer salty water found in the pans especially those located along their migration routes. One such animal is the blue wildebeest/kgokong (*Connochaetus taurinus*), which has Kang pan (about 10 km north of

Ngwatle village) on its migration route. Local observations indicate that it moves southwards of the pan during the wet season and northwards in the dry season. In addition, knowledge on animals' behaviour was also vital in the early days of CBNRM when the local people's knowledge was used in the siting of some campsites in the KD 1. One characteristic of campsites in KD 1 is that they are all located on top of sand dunes which overlook nearby pans. According to the respondents, such a choice is not by accident but informed by the knowledge that in traditional hunting methods the dunes are used for spotting wild animals in and around the pan. The same characteristic of dunes is indispensable to tourists to take sight of animals.

TEK also played a very vital role when the land use and management plan (LUMP) for KD 1 was made. Through participatory methods, the local people's knowledge on natural resources was quite crucial for the LUMP. The main data source for the map was indigenous knowledge on the area on aspects such as the best possible uses of natural resources found in specific areas of KD 1. The data from the map were sought from the three groups representing the sampled villages respectively. Each group indicated the possible uses of the land in and around the settlement on the basis of their knowledge on wildlife resources distribution as well as soil types. The groups' final work was merged into one land use map for the entire KD 1. The current land use types of KD 1 are still based on the map.

Though not acknowledged by the authorities such as the department of wildlife and national parks, TEK pertaining to hunting is also considered as having influence on the hunting season stipulated by the DWNP. The hunting season is from May to August, a non-hunting period. During the hunting season, the KD 1 community through the Nqwaa Khobee Xeya Trust and any safari company enter into a joint venture to kill the animals prescribed on the community quota. As discussed earlier on under TEK systems, the local people also had their own seasonal hunting schedule. The only shortcoming of the traditional hunting season was that the traditional institutions such as the elderly people are not legally empowered to monitor and enforce traditional practices in a way that is as effective as the present practice by the DWNP (Pers. Comm, Anonymous elderly Mosarwa hunter). The disempowerment is attributed to the relegation of TEK to an inferior position in the society with the advent of modern natural resource management practices.

The community's participation is also enhanced through community escort guides, locally known as *Badisa ba diphologolo* (herders of wildlife). The guides rely on their own ecological knowledge on the area to guide tourists as well as hunters. The department of wildlife and national parks is involved in a pilot project with the communities of KD 1 and NG 34 CHA's to involve community escort guides in the resource monitoring process. It is envisaged that after every hunting expedition, the guides make an inventory of aspects such as the state of the environment in which the animal was killed as well as its bodily condition. The guides are also supposed to collaborate with the research division of the DWNP to make transects for ground truthing or counts. The mainstay of the project is the locals' knowledge on animals' behaviour and characteristics (Monyadzwe, 2001

pers.comm.).⁴ Discussions with the DWNP staff indicated that this is a reaction to the locals' dissatisfaction with the extent of their involvement in the animal counts and lack of confidence in aerial surveys conducted by the DWNP. The local people's dissatisfaction can also be regarded as one of the consequences of ignoring TEK. The disparity between MSK employed by the DWNP and TEK of the local people may act as a recipe for conflict between the two parties which may arise from the local people's rejection of the DWNP methods of animal counts. This planned collaboration project represents a very vital opportunity through which TEK could be harnessed and ultimately made to contribute to the sustainable management of wildlife resources in KD 1.

The importance of traditional ecological knowledge in community-based conservation

TEK plays a very vital role in CBNRM and it is also clear that if well harnessed, it could play a role in other activities. A testimony to this is an ambitious project by Thusano Lefatsheng which is a local NGO that facilitates CBNRM in KD 1. The project was established as nurseries to raise herbal tea seedlings for trial domestication of the following selected veld products:

- Grapple plant/Sengaparile (*Harpogophytum procumbens*);
- African worm wood/Lengana (*Artemisia afra*);
- Mosukudu (*Lippia scaberrima*);
- Fever tea/Mosukujane (*Lippia javanica*);
- Truffles/Mahupu (*Terfezia pfielii*);
- Morama (*Tylosema esculentum*).

Two sites for the project were selected, one in Ukhwi and the other in Ncaang. The desolate state in which the Ukhwi project is in is an indication of its reduced efficacy as it has failed. A closer analysis of the factors that led to the failure of the project revealed lack of consideration of TEK during design and implementation. Though one person who does not originate in the area saw the cause of failure as emanating from factors such as paucity of water and very poor soils, a discussion with some respondents revealed otherwise. One experienced Mosarwa grapple harvester in Ukhwi emphasised inadequate involvement of the local experts in the project as a major factor. If this sentiment is projected to the rest of the community, the non-involvement of local ecological experts is to blame for the failure of the project. The situation is compounded by another related factor involving other veld products such as *Lippia javanica*, *Artemisia afra* and *Lippia scaberrima*. These plants are not found in KD 1 but attempts were made to adapt them but these were bound to fail, as both the ecological and social conditions in which they are

to grow are quite unfavourable. The project has obstructed the tenet of CBNRM which is to invoke the local participation and support if development is to succeed.

Barriers against TEK involvement in CBNRM projects

As indicated in the preceding section, the respondents emphasised the need for TEK involvement in CBNRM, and identified a number of barriers to its involvement. Most respondents (22.9%) identified modernisation as the main culprit for the non-utilisation of TEK. Modernisation is a rubric for a number of factors including:

- Formal education.
- New political dispensation (democracy) where a few people especially the vocal can, under the guise of democracy, decide for the majority.
- Christianity.

The respondents felt that the above factors have directly contributed to the decline of TEK because of their inherent proclivity to substitute TEK (MSK). Christianity for instance is believed to make the local people disregard their culture, an aspect on which TEK is rooted. This is because of the influence of western ideas and values upon which christianity is based. The effect this “missionary imperialism” was that by their settlement missionaries threatened independence, by their methods they eroded custom, integrity and authority; and by their connections they invited imperial replacement of resistant African (Dacus, 1976). The Lutheran and Roman Catholic churches have had an influence in KD 1 in both cultural and socio-economic activities of the people. Respondents cited the Lutheran and Catholic roles through their NGOs, the Lutheran World Federation and Tirisanyo Catholic Commission, respectively, as the main contributors to the shifts in their lives. The Lutheran World Federation in conjunction with the Rural Industries Innovation Centre (RIIC) trained some locals in many areas of self-employment and one such training that has a significant bearing on TEK is modern tannery. This displaced or relegated the traditional knowledge to an inferior position as some forms of knowledge such as the use of eland’s bean or tanning dye/mositsana (*Elephantorrhiza elephantine*) for tanning hides are subtly disregarded. This practice is known locally as *go basa*. Though the main motive of the churches’ involvement in KD 1 is economic and social upliftment, their impact on traditional knowledge might be construed as an unintended consequence. However, this does not exonerate them from bearing the blame. A lesson that consequently emanates from this experience might be that development efforts initiated and driven by external forces should consciously acknowledge the existence of local or traditional practices, beliefs, values and systems in natural resource utilisation and management.

Formal education was identified (by 14.6%) as another factor responsible for the non-involvement and usurpation of TEK. All respondents from both ethnic groups

felt that formal education is not doing enough to complement the informal one in promoting and sustaining the use of TEK. In their own observation, school children tend to disregard taboos. Primary school-going children who strongly believed that they are not overtly taught cultural values at school corroborated the elderly respondents' observation. This is bound to occur as formal education is rooted in western values that are often in disagreement with local culture.

With regard to the new political dispensation which is democracy, the respondents (22.9%) felt that there is a tendency, by a clique of the vocal people in the community, to make resolutions on behalf of the majority under the guise of democracy. Such a situation arises when the vocal people's sentiments are presumed to be representative of the entire affected community in any matter of discussion, under the name of mandate. A case in point is the defunct veld products domestication project which the respondents acknowledged was embarked on after only a few optimistic and influential locals approved it.

The influence of western values also extends to local institutions that help with propagation and enforcement of TEK which are, the elderly (men and women), traditional doctors and village elders or chieftaincy. The survey results revealed that the institutions do not perform their respective roles independently but there is rather a complementary type of enforcement. This is indicated by the 41.7% of the respondents who identified the three institutions as one unit enforcing TEK. Disempowerment of any one of these institutions will undoubtedly lead to weaknesses in the system of TEK propagation and enforcement. For instance, in Botswana there is no official or overt recognition of traditional medicine and this makes the trade to belong to the sphere of common knowledge. The gap that exists with traditional medicine therefore lessens the influence of traditional doctors in TEK involvement in activities and programmes such as CBNRM.

The abandonment of some cultural practices by the indigenous people has also had an effect on TEK involvement. Some respondents (4.2%) acknowledged that *Bogwera* and *Bojale*, which are initiation rites for males and females, respectively, have been abandoned. This is the case with almost all ethnic groups in Botswana and dates back to the missionary period when missionaries outlawed some cultural practices. This is a lamentable situation as the institution greatly helped in TEK propagation as young people were able to imbibe traditional practices, beliefs, values and even attitude towards natural resource utilisation and management.

Contrary to assertions in the literature (e.g. Matowanyika and Sibanda, 1998; Mc Cracken, 1988; Nietschmann, 1997; Omara-Ojungu, 1992), which blame TEK erosion on colonialism, the respondents especially Basarwa view the post-independence era as the turning point in the role of traditional institutions in natural resource management. They argue that during the colonial period (described as "*mamosadinyana*" era), the traditional institutions were intact and widely respected. When the country attained independence, the government of the day enacted some conservation laws which stifled and even eroded the powers of the traditional institutions, especially chieftaincy and elders. It should be noted that the effects on chieftainship are a legacy of colonialism when the administration drastically reduced the powers of traditional leaders. This was achieved through among other

means, the infamous 1934 Proclamations intended to reduce the powers of the *dikgosi* (by the British colonial government) popularly referred to as chiefs in English and this meant that the colonial administration stripped the chiefs of their autonomy (Samatar, 1999; Tlou & Campbell, 1997). An almost similar occurrence in Zimbabwe indicates that the post-independence government of Zimbabwe has failed to recognise local practice and rather, it has moved toward education and extension work as a resource management strategy without developing corresponding and compatible legal instruments that give due recognition to customary systems (Mohammed, 1998).

The study also revealed local people's pessimism about the effectiveness of the traditional institutions in the context of modern natural resource management and utilisation and hence acknowledge political forces as the main agent of change in institutional roles. For instance, the fact that village leaders or headmen receive salaries and are sometimes appointed makes them not wield any awesome influence among the villagers.

Traditional ecological knowledge, sustainable development and community-based natural resource management in KD 1

Since KD 1 CHA has a CBNRM project, there is supposedly decentralisation or devolution of power over wildlife management to the communities. In KD 1, the devolution manifests itself in subtle ways. The local people are involved in planning and decision-making processes through their representation in the Nqwa Khobee Xeya Trust management structure. Under this structure, the KD 1 residents in each settlement have formed family groups which are usually related families sharing the benefits of animals allotted to them in a particular hunting season. Two persons who in turn sit on the settlement committee represent each group. From each settlement committee, four persons represent their settlement on the Board of the Trust (NKXT Notarial Deed of Trust, 1998). The actual decision-making power concerning the use of natural resources and any income derived from the Trust lies with the family groups. The NKXT Board structure is one of the possible avenues through which TEK can be harnessed and promoted. The knowledge can be tapped at family group level. In essence, the structure provides people a say in their development, a characteristic that is vital to sustainable development. It also has a great potential to tap TEK from the local people. The greatest value of the structure is that it is a potential natural resource management strategy in KD 1.

However, one striking finding of the study is that there is no absolute devolution of power to the communities. This is reflected in the mechanism used by the Department of Wildlife and National Parks in determining animal off-takes for the study area. More power is vested with the DWNP and less with the communities. According to a DWNP officer, the mechanism used to determine the wildlife quota or off-take for any CBO is done thus: A tentative quota is sent out by the DWNP to the CBOs. The community is at liberty to either accept or reject the proposed

quota. Their decisions are usually informed by a number of factors such as animal sightings and spoors. The CBO's Trust then sends the community's "preferred" quota back to the DWNP which reserves the right to make the final decision on the quota. The DWNP decision on the other hand is usually informed by official and confirmed wildlife population figures for a given period. Such an arrangement is indicative of the fact that the TEK of the local population does not play any significant role in the quota allocation system. The fact that most of the DWNP animal population counts may at times be erroneous, because of not-always-accurate methods of aerial surveys, may influence the DWNP to underestimate some of the species population figures and consequently deny the communities the opportunity to utilise them. The DWNP has just embarked on a programme intended to facilitate ground counts by the local people to complement aerial surveys and help in generating wild animal statistics. This is an overdue venture which could act as a vehicle through which TEK may be tapped and ultimately put to use in wildlife management. In spite of the afore-mentioned gaps between the government (DWNP) and the local communities, the co-management set-up between the government and the community (NKXT, settlement committees and family groups) presents a collaboration of four institutions that enhances CBNRM in the KD 1 CHA (Fig. 2).

The DWNP practice notwithstanding the KD 1 presents a wealth of opportunities and avenues for sustainable development through community participation and it is through community participation that TEK may be utilised in the CBNRM approach. Other studies concur with this observation and argue that the CBNRM concept recognises the incorporation and importance of indigenous knowledge systems in natural resource management (Mbaiwa, 1999). It provides a window of opportunity through which TEK may be utilised. The combination may ultimately lead to sustainable development and management of natural resources

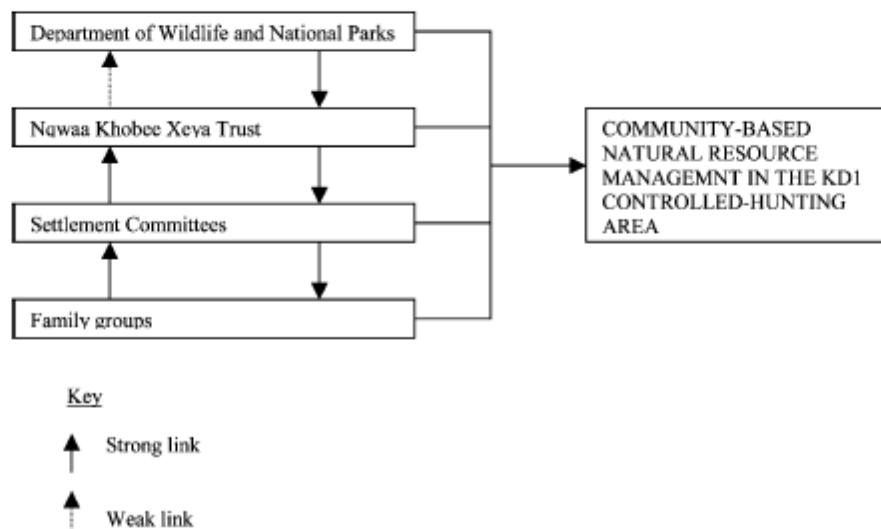


Fig. 2. Four-tier institutional structure for CBNRM in the KD 1 CHA. *Source:* Authors.

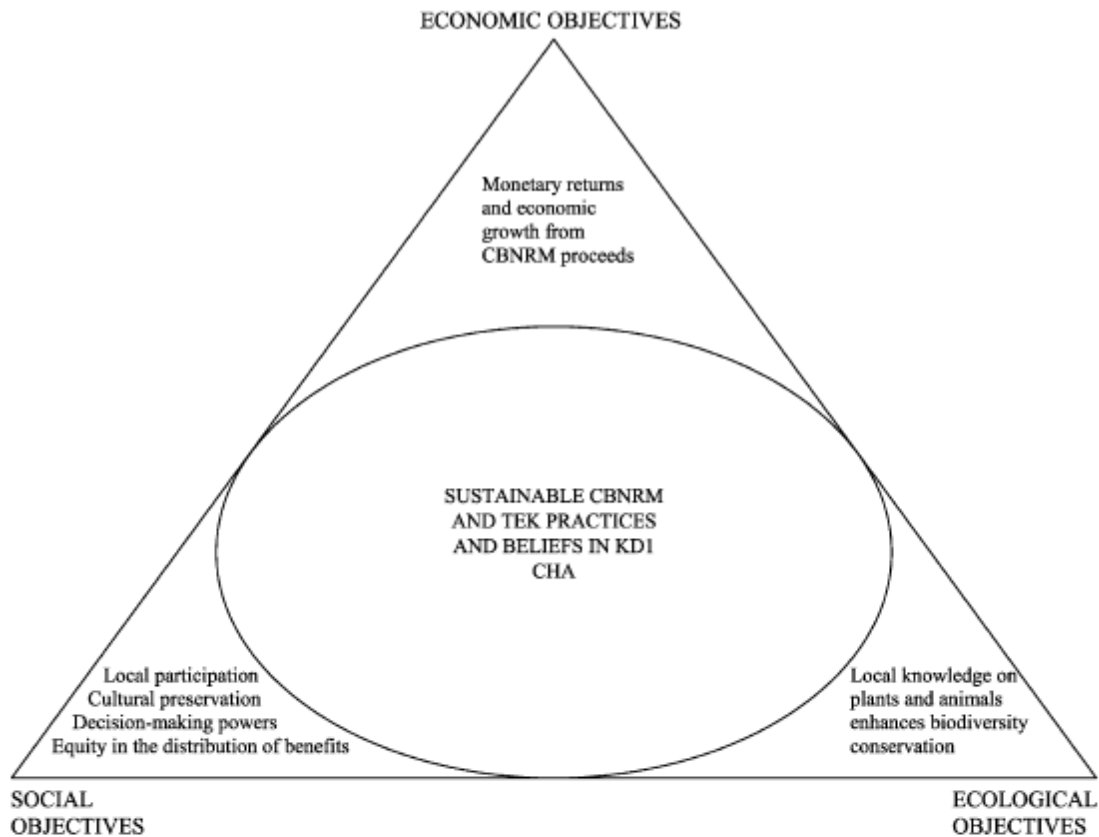


Fig. 3. How TEK promotes sustainable development. *Source:* Adapted from Serageldin (1993).

in KD 1. The relationship between the three vital aspects of natural resource management in KD 1 is depicted in Fig. 3.

It is clearly shown that with sustainable aspects of TEK the three objectives of sustainable development (the economic, social and ecological) can be achieved. In support of this, there is need for more information on this relationship and that successful cases of environment and natural resource management and conservation have a common approach which employs community participation, building on local needs, knowledge and initiatives (Sekhwela & Ntseane, 1994). People's empowerment through decentralisation is part and parcel of their participation as it enables effective achievement of their agenda. Consequent to this relationship, TEK used in CBNRM should represent the three systems and be able to meet the local people's needs as per the three objectives. TEK has the potential to help in achieving all the objectives with minimal impact on the local population and environment.

Conclusions

From the specific conclusions that emanate from the findings of the study, some main conclusions can be drawn. The points of convergence between TEK and

MSK are suggestive of the strengths that lie within TEK systems. This brings into perspective one quality that could be attached to TEK, such as thorough and careful analysis of TEK systems which is imperative before it is integrated into development plans. The on-going efforts by the Botswana Department of Wildlife and National Parks to integrate TEK into wildlife utilisation indicate that it has a significant and noteworthy role to play in the sustainable management of wildlife resources as well as any form of project planning and implementation. The gradual disappearance or erosion of TEK repositories remains the greatest threat to the survival of traditional institutions crucial to the sustenance of any resource management strategy. In essence, the paper concludes that TEK plays a significant role in wildlife resources management strategies in KD 1. This scenario qualifies CBNRM to be considered as a step in the right direction towards sustainable resource management. The fact that CBNRM is culture-dependent makes it one of the building blocks upon which sustainable development can be promoted. It is through the cultural practices of KD 1 residents and other communities that TEK may be tapped, harnessed and ultimately integrated into development initiatives. The paper also identifies a wealth of TEK systems and institutions that should serve as entry points into sustainable development of the natural resource utilisation and management. Further, the paper concludes that KD 1 does not represent a full local or indigenous natural resource management set-up. There is co-management involving the Department of Wildlife and National Parks and the local people through the Nqwaa Khobee Xeya Trust Board. This structure is appropriate in so far as a number of factors are concerned. The communities' inability to satisfy other requirements through CBNRM such as legal powers over natural resources is remedied by the DWNP, which may in turn find great help in the locals' knowledge of resources distribution and abundance. In essence, a co-management arrangement over natural resources in KD 1 is vital mainly because of its characteristic of facilitating complementarity in responsibilities over natural resources. The set-up combines the two property rights regimes of state and community. This participation may legitimise and support the decisions of the local institutions. The co-management set-up must therefore be maintained to ensure the success of CBNRM.

Since its introduction, CBNRM in Botswana has effectively been a rural development strategy, but it has manifested some notable strengths and weaknesses. To this end some noteworthy lessons consequently emanate from it. This is a very important aspect to explore as it is argued that developments in African CBNRM are providing insightful examples of approaches that might be replicated elsewhere (Hope, 1998; Taylor, 2001). Further, Botswana is considered a model case for development in sub-Saharan Africa in many ways (Hope, 1998). Among the strengths is the unique proceeds and benefit-sharing formula which gives the communities involved in CBNRM 100% of the proceeds. This is quite different from other countries' formulae such as the analysis of Administrative Design for Game Management Areas (ADMAGE) where the communities get 35% and the rest is for administrative matters by the central and local governments (Kiss, 1990). The

Botswana formula might be attributed to the country's sound economic position owing to its middle-income status.

With particular reference to TEK, Botswana's position on traditional knowledge is still worrisome and provides some loopholes for mostly profit-oriented individuals and corporations. Of specific concern is the issue of intellectual property rights regarding the activities and some veld products found in CBNRM areas. In spite of the existence of legal instruments such as the Patents and Designs Protection Act of 1955 and Copyright and Neighbouring Rights Act of 2000, some indigenous knowledge has effectively been sold to outsiders. A case in point is the grapple plant which is harvested for its medicinal value by the communities and bought and resold to the local and international markets by a local NGO, Thusano Lefatsheng. The medicinal value (active ingredients) of the plant has been patented in Germany. This arrangement has a historical link as the patents were appropriated during the colonial period when Namibia (Botswana's immediate neighbour with higher concentrations of the grapple plant) was under German rule. The patents on the processing of some active ingredients of the plant have undoubtedly deprived those communities that have used and known the medicinal value of the grapple plant a long time back an opportunity to reap benefits for their own traditional knowledge. Even though the arrangement appears irreversible as the knowledge on grapple medicinal value now belongs in the public domain, the challenge now is to embark on a rigorous public education on Intellectual Property Rights of the entire nation to avert similar occurrences in the future (Matlhare pers. Comm.).⁵ The public education must be accompanied and given credibility by genuine and effective commitment towards traditional knowledge. This paper therefore argues that with the advent of commercialisation of some veld products harvested by the CBNRM communities, in addition to public education, it is instructive for governments to act proactively and legally protect their indigenous knowledge. This represents a gap in institutional and capacity building in CBNRM in Botswana. This argument could be extended by noting that local communities are principal beneficiaries of traditional resource management regimes based on knowledge systems, whereas the formal, non-indigenous sectors, especially governments and private enterprises favour large economic and commercial institutions as principal beneficiaries. The formal systems control through market outlets and universal Intellectual Property Rights systems (Matowanyika & Sibanda, 1998).

In spite of the aforementioned gaps, Botswana's CBNRM involvement of TEK presents a valuable lesson to be learnt by other countries involved in or planning to start community-based conservation. This is supported by its notable success in its less than a decade of CBNRM existence, as in some areas such as the Chobe Enclave CBNRM project where the CBO, Chobe Enclave Conservation Trust has successfully initiated and realised tangible community projects through the CBNRM project proceeds derived mainly from wildlife utilisation.

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