Incorporating Traditional Natural Resource Management Techniques in Conventional Natural Resources Management Strategies:

A case of Mopane Worms (*Amacimbi*) Management and Harvesting in the Bulilimamangwe District, Zimbabwe

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Abstract

Strategies for poverty alleviation in much of Africa have been driven from outside in communities concerned. Potentials of natural resources under the jurisdiction of communities and their local level institutions have never been factored in these strategies. This paper explores the traditional natural resource management techniques by the Kalanga people of Bulilimamangwe District of Zimbabwe so that these could be incorporated in conventional management strategies by extension agencies. Currently, the level and extent of incorporating traditional management techniques in conventional resource management is low and restricted to Wildlife, yet management and harvesting of non-timber forest products such mopane worms could benefit from this research. The research reveals that certain specialized groups of families among the Kalanga people possess important knowledge in management and harvesting of the mopane worms which however has not been for incorporated into scientific resource management strategies by extension agencies. It is argued therefore that if such knowledge is factored into the scientific resource management techniques, the community, as well as the ecology of the area stand to benefit a lot.

Introduction

Strategies for poverty alleviation in much of Africa have been driven from outside the communities concerned. The potentials of the natural resources under the jurisdiction of the communities and their local-level institutions have never been factored into these strategies. Case studies emerging from southern Africa show otherwise. For close to a decade now communities with viable wildlife populations have benefited through community based natural resources management (CBNRM) approaches which allow such communities to receive tangible benefits for living with wildlife (Shaw et al 2003; Campbell and Shackleton 2002). Buoyed by successes in the wildlife sub-sector, where local communities receive substantial returns for their contribution towards wildlife management, NGOs and governments alike have been actively replicating this approach in other sub-sectors e.g., commercial timber (Forestry Commission

1998). The successes in the two sub-sectors have been driven by a state and high return quota or concession system linked to national and global markets. Recently, a shift has been observed towards non-timber forest products (NTFPs) e.g., crafts (Forestry Commission 1998), edible worms (Hobane 1995; SAFIRE 2002; Taylor 2003).

Two reasons can be advanced for the difference in the value between a given NTFP and some charismatic wildlife species. Firstly, the level and extent of use of conventional management techniques is limited to wildlife but less so, to NTFPs. Secondly, the market niche for NTFPs is limited to local and itinerant tourists while wildlife is linked to the global markets. For most NTFPs based enterprises located in the rural areas management techniques are largely based on traditional knowledge and to a lesser extent formal ones. Further, the commercialization of traditional knowledge centered on a key local resources is often vested in some specialist households and this often fragments communities, creates conflicts over the resource, and raises critical issues vis-à-vis resource access and use at commodity level.

In this paper, it is argued that the sustainability of harvesting of NTFPs at community level for commercial purposes is threatened by inter and intra-community conflicts generated by the enterprises. Often involving a specialized group of knowledgeable households who will be extracting common pool resource such initiatives of will market a resource also used by other members of the community to meet their livelihoods demands. While the benefits to the community of a given venture could be negotiated at community level, the management aspects may not be so easily resolved. The critical issue, which arises, is that management of the resource base as well as that of the key resource e.g., mopane worm is not geared for the market and is wholly based on traditional knowledge and experience. With no quantifiable database, monitoring system, or sound biological knowledge, traditional knowledge may not be able to support a sustainable harvesting regime. It is required to meld traditional knowledge with conventional formalistic knowledge.

Background

The livelihoods of the majority of rural people in Africa are based forests and woodlands as sources of agricultural land, firewood and charcoal, as well as non-timber forest products (NTFPs) such as food, fibre, and medicines (Dewees 1996; Gumbo 2002). In general, NTFPs are often referred to tangible goods of biological origin, other than timber and firewood, from forests or land under similar use that are harvested by communities for purposes of meeting their livelihood demands. Often undervalued and not included in national statistics NTFPs are gradually being recognized as a key component of rural livelihoods systems. Increasingly, the wide variety of flora and fauna species, which form the basis for livelihoods for rural societies in most of Southern African countries are now being exploited for economic gain (Gomez 1988, Wilson 1990 and McGregor 1991). In the past the exploitation of some natural resources in the rural areas in countries like Zimbabwe (e.g., wildlife) was strictly controlled by the state but the acceptance of community based natural resources management (CBNRM) approaches led to and enabled a shift towards community involvement (Murombedzi 2003). While the involvement of communities in the wildlife sub-sector under a CBNRM arrangement vis-à-vis benefits wildlife the shift towards the use of a similar construct for NTFP products has been fraught with difficulties. The harvesting of some of these NTFPs e.g., mopane worms which have not been placed within the basket of formally regulated and controlled resources is largely based on local knowledge, beliefs, and local-level institutional frameworks of control. There is often a very limited contribution from the conventional science as well as policy frameworks.

Among the many NTFPs that being exploited for commercial purposes is the mopane worm. The mopane worm, the edible larvae of the Saturnid moth *Imbrasis beilina* has become one of the most economically important forestry resource products of the mopane woodland in southern Zimbabwe, Botswana and the northern Transvaal (Taylor 2003; Timberlake 1996; Bradley and Dewees 1993). The distribution of the mopane worm in the Southern Africa follows closely on that of the primary host plant, the mopane tree *(Colophospernum mopane)*. The mopane tree occurs in a broad band extending from the northern parts of South Africa into southern parts of Zimbabwe and Botswana, extending west into Namibia. The mopane worm is now a basis of a multi-million dollar trade in edible insects, providing livelihoods for many harvesters, traders, and their families (Toms *et. el.,* 2003). Contributing largely to rural household economies through nutrition and health contributions and as an important household food security resource the mopane worms have assumed a new role as a commercial commodity in a number of countries in the region. In Zimbabwe, trade in mopane worms has become lucrative activity where some districts such as Gwanda, Chiredzi and Bulilimamangwe are attracting buyers and harvesters from right across the country (Hobane 1995; SAFIRE 2002). The increased levels of trading translate into high quantities harvested, which could be viewed as a leading to the overexploitation of the worm.

Alarm bells have started to ring in southern Africa over the potential overexploitation of the worm. For example, Roberts, (1988) noted that the abundance of the caterpillars was declining owing to increased exploitation coupled with a decline in selective harvesting and a general increase in pressure on the mopane woodlands. There have been reports of the disappearance of the worm in some parts of Botswana following heavy harvesting (Barlet 1996). Suggested threats range from over-harvesting, fire to deforestation of the woodlands (or loss of the host tree) during harvesting and processing of the worms. Research conducted by Toms (2003) on the mopane worm harvesting techniques in the Limpopo Province of South Africa indicated that the concept of sustainable harvesting was not practiced but rather traditional myths play a strong role in determining harvesting strategies used. For example, beliefs such as that if young worms are harvested, then the older individuals will leave the area are still rife in the Limpopo Province. Further, when the larvae leave the trees and burrow into the ground, they are going to die. What is known is that burrowing into the ground is part of the life cycle of the mopane worm and clearly there is a need to enrich traditional knowledge with some of the more formal biological information. At present, in spite of the importance of mopane worms to rural livelihoods there is currently no management information on the management of the worm in formal extension systems.

The purpose of this paper is to explore how some families of the Kalanga people of Bulilimamangwe District of Zimbabwe, through traditional knowledge have set out to manage and harvest the mopane worm *(amacimbi)* in an ecologically sustainable manner, given the increase in demand for the worm. These families have managed to commercialize this traditional knowledge at the expense of other community members. Reductions in the amounts of mopane worms per season have been noted while the host, the mopane tree is under pressure from agricultural expansion and the demand for construction timber at the local level. It can be postulated that as more mopane trees are lost and mopane worms gain in economic value local-level conflicts over access and use will begin to arise. These could be addressed by coupling traditional knowledge with conventional resource management techniques while at the same time investigating how benefits could be advanced to other community members.

Study Area

Bulilimamangwe Rural District, which is some 12,274 km2 in size lies in the Matabeleland South Province. The entire district consists of 31 wards with a total population of 172000. There are about 27146 households altogether with an average household of about 6.3. (CSO 2002) The area, whose mean annual rainfall lies between 400 mm and 600 mm, is considered dry according Zimbabwe's agro-climate zones. These conditions limit cropping to drought resistant crops such as sorghum while livestock rearing is encouraged. The region is best suited for livestock rearing and wildlife. Moaned woodlands dominate the district's vegetation. Moaned worms are available in two periods, December to January and March to April and some households are usually actively involved in the harvesting of these worms in these two periods. The worms are preserved through degutting, cleaning, and either drying or smoking. They can then be consumed as dry as a snack or cooked in water before they are fried with onion and tomato. They are normally served as relish with *sadza* (maize meal porridge) and are rich in protein.

In the BRDC two types of the worm *Genimbasia belina* and *Gynasamaia spp* are found*.* The former, a dark grey and black in color with protruding spine, which measures up to 6-8 cm in length when fully grown and is found in the northern parts of the district spreading from Maitengwe to Brunapeg and Sanzukwi in the south. The spineless and vivid green *Gynasamaia,* which occurs in the mopane woodlands to the north and mainly Makhulela ward is easier to harvest and is often targeted by harvesters coming into the district from outside.

As with most districts in Zimbabwe, increased competition for the mopane worm in the BRDC is leading to a decline in the resource, both quantitatively and qualitatively. Increased harvesting pressure has wider adverse effects on the mopane ecosystem itself. While harvesting has in part been controlled by BRDC in terms of the exclusion of foreigners, local harvesters have not been actively controlled in their designated areas. These harvesters have not received any form of education or advice on how best to harvest and in some instances; trees have been felled as part of the harvesting.

Materials and Methods

The study was informed by literature search that included key documents such as the report of the participatory rural appraisal exercise carried out by the District Strategy Team of the *Amacimbi* Harvesting and Management Project and the Bulilimamangwe Rural Master Plan among others. By and large, the study's findings lie in our contact with the harvesters and other community members. From the start, we noted that non-timber forest products harvesters though generally active in natural resources management are generally marginalized and as such developing an understanding of the basis of their activities is crucial (Emery 1998). Thus our idea was to let the harvesters be heard while at the same time expanding the base of information, which could be used to influence decision makers and policy makers. In order to achieve such an objectives there was a need to engage with the mopane worm harvesters in the BRDC in their communities and the areas where they harvest.

Settlements in the BRDC are dispersed while woodlands are truncated and as such, the snowball sampling approach was used to locate the harvesters. Snowball sampling is defined as identifying one or more key individuals and then asking them to identify others who would be appropriate to contact for the study (Bernard 2000). Harvesters were identified through the Project Officer in the BRDC, District's Campfire Manager, Ward Councilors, and Government Extension personnel on the ground. Additional information came from harvesters about other harvesters. In addition, participant observation was also used to deepen our understanding of the relationships between mopane worm harvesters, the resource and the communities they lived in. Cursory and at times derogatory comments about harvesters showed some elements of disdain for the harvesters while in some instances they were thought to be responsible for mopane woodland loss. Participant observation is exactly what it implies-the researcher participates in and observes the lives and activities of the people they are studying. It entails "establishing rapport in a new community; learning to act so that people go about their business as usual when you show up" (Bernard 2000).

Since a selective process was used rather than random sampling design, we do not in this paper generalize the findings to all the mopane worm harvesters in the BRDC. Notwithstanding, the data that were collected provided a good basis for our understanding of the dynamics of mopane worm harvesting in the BRDC. More importantly, a better understanding of the complex socio-cultural and ecological systems, which the mopane worm harvesters have to negotiate before they can market this resource was developed.

Discussions with the broad spectrum of people were also complemented by a rapid resource assessment on the ground. Unfortunately, the study was carried out during the off-season for mopane worms and only the status of the host tree was analyzed. To do this two types of plots were laid on seven (7) selected sites within the two selected areas of the district for the purpose of determining the state and distribution of the mopane trees in the study area. These sites were selected in such a manner that woodland types occurring within the district would be sampled. The first type of plot was100 m^2 plot where an absolute count and measurement of diameters of stumps (stools) occurring in the plot as well as the number of coppice re-growths per stump were recorded. The second plot was 50 m^2 and was located inside the first. This second plot was used to establish regeneration rates and therefore only stems below 30 cm in height and a diameter of two cm were recorded. The combined coppice re-growths and woodlands growths from seedlings in the 50 m2 were meant to show how well the woodland was sustaining its growth.

Findings and Discussions

The mopane worm has become a major source of income for some households in the BRDC. The commercialization of mopane worms in the BRDC translates into the commercialization of indigenous knowledge through the setting up of locally based enterprises. The sales and marketing of mopane worms outside the area of origin invariably leads to increased rates of extraction, improper harvesting methods, use of inferior materials, and above all privatizes a set of common pool resources. Increasingly, while increased sales may lead to increased incomes to specialist households, such as mopane worm harvesters, management of the resource may suffer in the long run unless the local level institutions of resource allocation and control play their key roles. In the case of the BRDC the Mopane Worm Harvesting Management Project has been doing just that but has not been incorporated into the main frame of the RDC’s natural resources management structures. Of late there have been calls in the BRDC for better management of such resources through more efficient mechanisms of harvesting without damaging the resource base while at the same time ensuring that the whole community benefits.

Lately, the BRDC has tried to promote the commercialization of mopane worms through the Community Based Natural Resources Management (CBNRM) approach. No matter how defined CBNRM by its very nature requires that certain key natural resources in a given area, e.g., woodlands or woodlands products be partially or fully commercialized. In the BRDC resource extraction is leading to both quantitative and qualitative changes in the resource base. Furthermore, the added value to the mopane worm is accentuating latent community differences over access to these resources, which may in turn lead to a breakdown in the local resource management strategies. The effectiveness is based on the knowledge of the resource extraction rates and methods and how these are likely to impact on the resource.

The development of natural resources based enterprises such as mopane worm harvesting must be based on a full appreciation and understanding of the quantity and quality of the resources. Central to such initiatives must be an understanding of the roles and functions and services such resources play within and between interacting ecological and social systems. Knowledge of the roles and functions will enable would-be programs to pre-determine, to an extent possible, the impact of the harvesting of such resources will have on the ecological system to be exploited. The effect on the ecological system will invariably cascade to the social system as well. Thus, it is pertinent that management-use strategies as well as the guiding rules of resource allocation and control that are in place are well understood.

This paper adopts IK definition from Berkes (1999: 8):

> *a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with the environment*.

Indigenous knowledge, no matter how defined influences resource use strategies of most rural societies the world over. Viewed as a type of knowledge that has evolved within a given locale the general assumption is that it has been passed on from one generation to another (Warren 1992; Berkes 1999). This knowledge is vital to the livelihoods of the people but must be seen through the institutions that safeguard it. Indigenous institutions represent established local systems of authority and other phenomena derived from the socio-cultural and historical processes of a given society. These institutions originate from local cultures, have firm roots in the past, and are variously referred to as informal, pre-existing, or native institutions (Matowanyinka 1991). They are often found at the local or community level, reflecting the knowledge and experiences of the local people.

In a given locale, the common frontline knowledge is indigenous but differences due to age, gender, occupation, and literacy levels may lead to levels of overall use. For example, the old will tend to know more than the young while the educated may use less of it. Further, indigenous knowledge can be viewed as shared knowledge as held by most but some community members may have specialized indigenous knowledge and most cases these are in the minority. Few community members are healers, midwives, and weavers having obtained that extra training through training. Originally, these specialists made crafts and artifacts for ritual, spiritual, and utilitarian purposes but of late they are manufacturing them for market. The greatest demand for such products within southern Africa has been for wooden crafts and artifacts. The commercialization of these indigenous knowledge based skills are raising serious questions over their implications on the natural resources base as well as the local level institutions of resource allocation and control.

The commercialization of indigenous knowledge in the BRDC for mopane worm harvesting raises a major concern in that the outputs are wholly based on local natural resources used to meet day-to-day livelihood demands. Use by a small group of people for their own ends amounts to the privatization of common pool resources and as such can be linked to three overarching questions confronting development practitioners viz.

In the BRDC, the mopane resource base is perceived as well demarcated, finite and sensitive to the resource-use patterns. Thus attempts have been made to cultivate strategies for the sustainable harvesting of mopane worms and the related resources. Rural communities which typically dominate the BRDC have developed sustainable traditional resource harvesting and use techniques which co-evolved with them for millennia (Noorgaard 1984; Gleismann *et. al*., 1981). Community-based resource management systems work because of the presence of appropriate common property *institutions*, not merely because of a superabundance of resources (McCay and Acheson, 1987; Berkes, ed., 1989). The point, however, is that the diversity of traditional resource use practices represents a pool of human experience spanning many millennia and many cultures.

The natural host of the edible mopane worms found in the district is the colophospermum mopane and this invariably means that before one promotes the commercialization of this product, one must understand the pattern and distribution of the mopane tree.

Three relatively dry woodlands types were noted in the area. These are *colophospermum mopane, Terminali-comretum and Baikiaea plurijuga. Baikiaea plurijuga* is least extensive in the study area and where it is found, it is associated with *Pierocarpus angolensis.* The *termina-combretum* association is widespread in the northern part of the district and the main characteristic species are *Terminalia seriea and Burkea Africana* and a range of other tree and shrub spices also occur in the woodland. The most dominant woodland type across the district is the colosphospermum mopane, which occurs on jesse sands, sandstone and clayveld.

Results on the tree species densities from the selected plots indicated that a total of five species which are *colospermum mopane, acacia karoo, Grewia momticola, Dichrostachys cinerea* and *terminalia sericea* were recorded in all plots. The five species yielded a total of 321 stems in the 7 diameter classes. The most dominant tree was mopane with 304 stems (93.5%), followed by *Dichrostachys cinerea* .The density of the trees were calculated to be 0.46/m2 or 4600 stems/ha. The mopane alone had densities of 43/m2 or 4300 stems/ha. Of the 304 mopane stems, 84.9% were in the 5cm stem diameter class and these are stems where most of the harvesting is taking place as reflected by the discussion with the local people.

Life Cycle of the Mopane Worm

It is important to understand the life cycle of the worm so as to make a complete understanding of the vulnerable point in the life cycle which may result in the collapsing of the entire ecosystem.

The mopane moths(amavevane) appear and lay eggs(amaqanda) on leaves at the beginning of the rainy season from late October to mid- November when the mopane trees break into new leaf. These eggs will hatch after a few weeks into small caterpillars called ubiro. These small caterpillars are not colleted for consumption are sometimes translocated to areas near homesteads were people would want to harvest amacimbi later. This is important in that locals realize that there is no total coverage of mopane worms in a single season and as much the movement of young caterpillars can be adversely affected by non-availability of food. The young caterpillars or larvae feed on leaves of the tree where they hatch. As the larvae grow, they molt four times before they reach their maximum size (Oberprieler, 1995). The caterpillars grow to a diameter of 2 cm (approximately the size of a human thumb) with a length of 6 to 8 cm after 6 weeks, a period when harvesting begins. The worms will then move down the tree to burrow themselves into the ground. The worms, which are left to get onto the ground, are called incumbent and pupate to become izigogoro, which become moths in the next amacimbi season. The pupa is a very important stage because it is at this stage that the mopane worm over winters and spends 6 to 7 months. The San people in the area sometimes do dig up *izigogoro* to eat, a habit generally shunned by the local people. This culturally conservation measure coupled selective harvesting of the mature amacimbi have been carried from traditional management approaches. The latter conservation measure is enhanced by the inaccessibility of tall trees (>30cm in diameter and in excess of 1.8 m in height) It was again observed that riverine areas can effectively be considered as seeding areas as these are inaccessible in the wet season especially in the Maitengwe (Mabhongana) area.

Harvesting Methods (Management Strategies)

Amacimbi are "plucked" from reachable tree branches that are between 1.5 – 1.8 meters above the ground or are picked from the ground six weeks after the eggs hatch (Hobane 1998). The common yardstick of maturity is that mopane worms which are ready for harvesting should be human thump size (about 2cm diameter) and subject to the local leadership signaling the start of the harvesting period. Amacimbi, which the harvesters pick from the ground, are these that will be preparing to pupate which will be therefore in a good condition. Time is of essence if mopane worms have to be picked from the ground since they burrow themselves only after 12 hours (Mrs. Moyo, Resident of Madlambuzi Ward, Personal Communication) The locals claim that there is an over abundance of amacimbi in their areas and a serous shortage of harvesters. It is estimated that only 20% of amacimbi in an average year are actually harvested (Mr. Ndebele, Resident, personal communication) The people who are most closely involved are women and children (Hobane 1988), Huchu-Udero1999, BMRDC 2000). Elderly women are usually involved with disembowing and cleaning stages.

The extraction rate of amacimbi by harvesters was estimated by asking local harvesters to indicate the size of woodland that is required to fill a 20-litre bucket of unprocessed amacimbi. The area was then demarcated and the diameters of the stems of the stems of all the mopane trees within this plot were measured and from which tree densities were calculated. The size of the first plot indicated as being adequate to fill a 20-litre bucket of mopane worms had an area of 770m2. This plot had a total of 127 stems of mopane trees of which 91.3 % had a stem diameter not greater than 5cm, and the rest fell in the 5.1 – 10cm diameter class. The tree density was found to be 0.16 stem/m2 or 1600 stem/ha. It should be borne in mind that these stems are sufficient to fill a 20-litre bucket with raw amacimbi, which in turn fill a 10-litre bucket of the finished product. Therefore in order to fill a20-litre bucket of amacimbi, a tree density of about 3200 stems/ha is required, which is equivalent to about 2 hectares of mopane woodlands at such tree densities. The second plot measured 840m2 and had a total of 105 stems of which 70.1 % were in the greater than 5 cm diameters, 12.3% in the 5.1 10.0 cm class and the rest in the 10.1 – 15.0 cm stem diameter class. The stem density was calculated to be 0.13 stems/m2 or 1300 stems/ha. In this respect a density of 2600 stems per hectare is required to fill a 20-litre bucket of dried amacimbi. It is therefore estimated on the basis of these two plots that on average, a stem density of 2900/ha is required to fill a 20-litre bucket with processed amacimbi.

The average stem densities of woodland in most parts of Bulilimamangwe Rural District Council where amacimbi harvesting is taking place is 4300 stems/ha, which is well in excess of the 2900 stems/ha. It is therefore not surprising that the locals claim that they do not have capacity to harvest all the amacimbi in a good season. Besides not everybody in the area is a specialist when it comes to the harvesting of amacimbi.

Conclusions

The sale of mopane worms as is the case with most community owned and managed edible products is meant to make money available to households. In the case of the BRDC specialist households harvest and market *amacimbi* with minimum damage to the resource. However, with limited institutional support the harvesting of mopane worms may lead to the plunder of the resource, given the influx of non-specialized groups in harvesting following increased demands from urban markets. The paper has shown how selected groups of the Kalanga people of Bulilimamangwe District manage and sustainably harvest the mopane worm using purely traditional knowledge and techniques. While this knowledge can be acknowledged, it important to have it documented, incorporated into conventional resource management methods for the benefit of other members of the community.

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