Management of Mopane in Southern Africa

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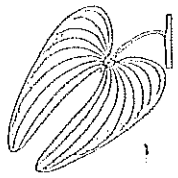
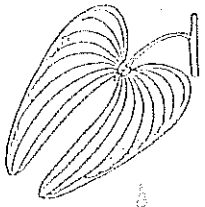
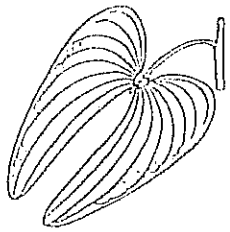




CHAPTER ELEVEN

WOODLAND MANAGEMENT STRATEGIES FOR COMMUNALLY-OWNED MOPANE WOODLAND IN THE ZAMBEZI VALLEY, ZIMBABWE: AN ALTERNATIVE TO COMMERCIAL LOGGING.



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ABSTRACT

Faced with ever-decreasing standards of living, rural communities in Zimbabwe are turning increasingly to the commercialization of natural resources as a means to augment their annual household incomes. In this paper the potential of a *Colophospermum mopane* (mopane) woodland area in northern Zimbabwe to provide resources which can be used to generate income for the surrounding villagers is assessed. Large-scale logging operations are not considered to be viable in the area. Ten alternative options are considered. Low-key harvesting on a rotational basis to supply wood products locally, honey production, *Hyphaene petersiana* (ilala palm) cultivation and *Sclerocarya birrea* (marula) fruit production are the most effective and sustainable options. However, conflict resolution will be required in the community to improve the chances of success of any community initiative. Options and recommendations for income generation requiring further investigation are provided.

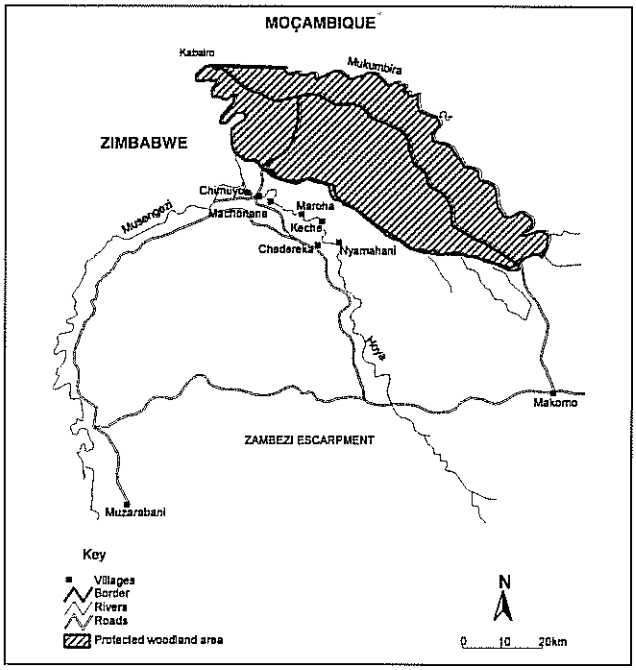
Keywords; *Colophospermum mopane,* indigenous woodland management, community based natural resource management, income generation.

INTRODUCTION

In Zimbabwe, all natural resources in Communal Farming Areas are owned by the State and managed on its behalf by the Rural District Councils. In the mid-1980s a local initiative emerged which promoted the empowerment of rural communities to manage their own communal natural resources. This initiative, called CAMPFIRE (Communal Areas Management Programme for Indigenous Resources), conceptually included all natural resources, although in practice the focus to date has been on wildlife management (Martin 1986). Independent of CAMPFIRE, timber extraction involving agreements between District Councils and timber concessionaires and monitored by the Forestry Commission has been on going in communal areas for nearly a decade (Katerere *et al.* 1993). Such large-scale extraction of timber resources from communal areas has resulted in numerous problems, often with far-reaching implications for the sustainable management and use of the resource by local people (Bird *et al.* 1995).

Chadereka Ward, in Muzarabani District in the eastern Zambezi Valley on the northern border of Zimbabwe, is endowed with a large reserve of officially state owned, but communally managed, mopane woodland (Fig. 11.1). Following moderate success with wildlife management programmes in the District, both the local community and the District Council are keen to extend the income-generating possibilities to natural resources other than wildlife (R. Diggle[1], pers. comm., 1996). The aim of this study was to assess the possibilities for income generation from the protected mopane woodland in Chadereka Ward.

Fig. 11.1: Map of project area (Chadereka Ward, Zimbabwe), indicating protected woodland area.



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[1] Richard Diggle, Former Natural Resource Management Advisor, Muzarabani Rural District Council, 1996

METHODS

The study area is located in Chadereka Ward at the most northern point of Mashonaland Central Province, Zimbabwe, on the border with Moçambique (Fig. 11.1). The woodland area covers approximately 355 km², approximately 105 km² of which may still be mined following the Liberation war. The area has a mean annual rainfall of less than 670 mm. The soils of the woodland area fall into two types, colluvium and jesse sands, and the vegetation varies accordingly.

At the inception of the resettlement programme in the eastern Zambezi Valley, the whole area north-east of the Hoya River, including this woodland area, had been set aside for wildlife management. There are no perennial rivers and it was considered unsuitable for human habitation. When the influx of settlers during the resettlement programme was larger than anticipated, however, the Council allocated land to settlers within the designated game area. These settlers have been there for at least the past three years. In May 1996, it was decided that the designated area would be reduced in size in order to accommodate the new settlers. A new boundary would be drawn up, so that the land between the Muwamba and the Mukumbura Rivers was reserved as the new game area. This study concentrates on the newly designated game area. The woodland under consideration is bounded to the west by the Musengezi River, to the south by the Muwamba River, to the north by the border road which goes from Kabaira to Mukumbura and to the east by the Bhinya road, which turns southwards off the border road towards Mukoma Village.

Using 1981 aerial photographs, the woodland area was divided into units, based on tree cover. The area can be divided into three main vegetation types; 1) *Colophospermum mopane* (Kirk ex Benth.) Kirk ex J. Léonard, woodland on colluvial soils, 2) *Combretum apiculatum / C. mopane* woodland on jesse sands and 3) riverine vegetation. Sample areas of each type were marked on topographical maps for closer inspection. In the field, plots were laid out randomly within the sample units. The diameter (cm) at 30 cm and height (m) from base to tip of each tree within an area of 30 m x 30 m were measured and the species noted. Twenty-three plots were enumerated in all, 17 of which were in the more heavily wooded areas. The riverine areas were not included, since they contained few mopane trees and would be unsuitable for timber exploitation because of the role the trees play in protecting the riverbanks.

Biomass estimations of each woodland type were calculated using Guy's (1981) equations developed for mopane woodland in Sengwe. Estimates of biomass per hectare for each vegetation unit were then determined. The extent of each unit type was estimated from the aerial photographs, using a planimeter. A sample of 20 cut mopane stems, which were being used for granary construction, was measured and the number of annual rings estimated by eye to give an approximate growth rate for the species.

The views of local householders were investigated in two ways. In the first, individual interviews were held in each of the seven villages that border the woodland area. Approximately one fifth of the inhabitants of each village were interviewed and an attempt was made to hear the opinions of both men and women. Villagers were randomly selected from village lists. In the second, a team of PRA specialists held participatory group meetings. One man and one woman from each household were invited to attend a day workshop in their village. Options for income generation, including those elicited from the villagers, were considered and the feasibility of marketing the products was investigated. This included interviews with craftspeople working in wood, as well as marketers of woodland products.

RESULTS

The woodland resource

The total area of the woodland was calculated to be approximately 250 km², of which 165 km² (i.e. 66 %) is estimated

Table 11.1: Descriptive statistics for the sample plots in the two vegetation types in northern Zimbabwe.

	Vegetation Type	
	***C. mopane* on colluvium**	***C. apiculatum / C. mopane* on jesse sands**
Dominants	C. *mopane* (*up* to 98 %)	C. *apiculatum / C. mopane*
Other species (in order of abundance)	*Terminalia stuhlmannii* *Commiphora glandulosa* *Dalbergia melanoxylon* *Acacia nigrescens* *Kirkia acuminata* *Terminalia pruniodes* (rare)	*Terminalia stuhlmannii* *Combretum mossambicensis* *Kirkia acuminata* *Acacia nigrescens* *Acacia nilotica* *Mundelea sericea*
Mean height (m) (range)	7.5 (2.6 to 15.5)	5.2 (2.0 to 13.3)
Mean diam. (cm) (range)	16.9 (3.2 to 42.1)	11.0 (4.7 to 42.0)
Mean biomass per plot (t/ha) (range)	74.6 (14.3 to 138.0)	45.1 (26.0 to 84.0)
Mean biomass (t/km²)	7,460	4,510

to be mopane woodland (Fig. 11.1). In most plots less than 10 % of the trees measured more than 30 cm in diameter. The majority of the larger mopane trees were hollow, possibly as a result of frequent fires. Mopane coppices well after disturbance as do many of the other species found in both the woodland types including *Terminalia stuhlmannia*. In the *C. apiculatum* woodland, which is the sparser of the two types, the largest mopane trees are shorter but not necessarily thinner than those in the woodland dominated by mopane. Using mean biomass figures, there are an estimated 1,230,900 tons of dry wood in the mopane woodland, and an estimated 383,350 tons in the *C. apiculatum* woodland.

Field observations suggest that it takes 10 - 15 years for a coppice shoot to reach 5 cm diameter, 25 - 30 years to reach 10 cm, 55 - 60 years to reach 15 cm, 80 - 100 years to reach 20 cm, 120 - 140 years to reach 30 cm and 160 - 180 years to reach 40 cm. When asked how long they thought a mopane coppice shoot would take to grow into a useful medium-sized pole (between 12 and 15 cm in diameter), many villagers were uncertain, particularly those who had been settled in the area relatively recently. Some older inhabitants said the trees took a 'very long time' but few said it would take more than 15 years. A pole was estimated to last for between 5 and 15 years before it needed to be replaced.

At present the area provides a number of products for household use. Villagers extract poles, wild fruit, edible roots, fuelwood, grazing, thatching, honey, wild game, rope from baobab trees, ilala palm, wood for furniture and doors and reeds for making mats. Many people know of the availability of the resources, but do not as yet harvest any products from this particular woodland area. The most important resource at present is poles. At the time of the survey, villagers were constructing new granaries to accommodate the large maize harvest, and approximately 60 mopane trees of varying sizes were used in each structure. Many of the trees larger than 7 cm in diameter were hollow. Grazing in the game area is only important for the villages close to the southern limit of the woodland area. For others it is only utilized in dry years. In these years, the dry mopane leaves would provide an important protein source.

Income generation from the woodland resource

Villagers mentioned several ways to utilize their woodland area for income generation. The most common method was to sell poles, fuelwood and thatching grass to outside buyers, who could be neighbouring villagers. Local villagers would take the orders and harvest the goods for a fee. In this way the local people would gain employment and still have control over the cutting in their woodland. They also suggested selling the existing wild animals, or stocking the area with game and selling it. People who suggested this thought there would be no problem in controlling access to the game area by outsiders. It is officially illegal to harvest game meat and is therefore little discussed.

The selling of masawu, a wild fruit, was considered an option. *Ziziphus mauritiania*, from which masawu come, are only found on alluvial soils, most commonly on the river terraces of the large rivers. Such sites are few in the game area, but do exist along the Muwamba River. Many of the women in the seven villages currently gain a seasonal income from collecting and selling masawu. The fruit is sold or bartered by the bucket to buyers who come mostly from Harare. Prices vary and are usually low compared to the selling price in Harare markets. If the sellers were to collaborate and adhere to agreed prices, their income would increase. However, not all families have an income from masawu. Many of the settler families professed to have no interest in this business, saying they collected them for eating only. This may be in response to their being excluded from the resource by the KoreKore families, but was not made clear. Some women keep a proportion (sometimes up to half of what they collect) of the fruit for their own consumption and may dry some to have reserves to make beer once the crop is over. In a good year, some families collect up to 150 bags of fruit, each weighing 90 kg. Each bag may be sold for up to Z$502[2]. In a bad year, collection may be reduced to 20 bags. Masawu "beer" sales also provide a substantial income for some households throughout the year.

Some people mentioned selling honey. Honey production is sporadic and is dependent on rainfall. In good years, many people, mainly young boys and men, collect large quantities. Some householders said they collected up to 40 litres of honeycomb in a year. Most of the market is local, but sometimes honey is sold to bus drivers for Z$6 a jar. The retail price in Harare varies between Z$20 and Z$35 per jar.

Pegging the land for resettlement, or conserving the trees as a future source of poles for all the villagers surrounding the area were also suggested. Some had no suggestions, saying they needed advice from outside as to how to utilize the resources.

Most villagers argued against the District Council granting logging concessions to outside logging companies given the fact that the resource belonged to the people and that they believed they should have a say in how it was managed. They also believed that the concessionaires would bring in their own labour force and so the locally unemployed would see no benefits from their operations. In addition, there were fears that all the best trees would be cut, leaving few for local consumption. Some thought the Council should liaise with the villagers in granting concessions, while a few others thought that logging concessions were only a good idea if local people were employed in the operation.

Management of the woodland resource

The concept of ownership of trees seems to vary between

[2]At the time this presentation was made, the Z$ was equivalent to US$0.5.

villagers. Most villagers consider that the trees in their fields belong to them, as do the fruit. Only a few people said that anyone from the village could have access to the fruit. Most people also said that the trees in the communal woodlands and even those in the riverbeds, could be used by all villagers. Some said, however, that certain indigenous fruit trees in the riverbeds are "owned" and sweeping beneath the trees indicates this ownership. The presence of *Ziziphus* trees in the riverbeds is as a result of the ancient KoreKore agricultural practice of cultivation of the alluvial terraces at the edges of the rivers.

Sacred woodlands do exist in this area, although the rules governing the use of them are unclear. Some people said that people could enter them, some said entry was prohibited. In some cases, rules such as no wearing of red clothes or using perfumed soap were cited, while others said there should be no cutting in these areas. There are also certain indigenous tree species which are protected species, these being mostly fruit trees such as *Ficus* species, *Tamarindus indica*, *Sclerocarya birrea* and *Adansonia digitata*, as well as *Kigelia africana*, among others. Several householders were not aware of any sacred woodland areas or protected tree species within the vicinity of their villages.

Traditional leadership in the area is strong and local chiefs must be party to any important decision-making in the area. Before any new practice or work is undertaken, the ancestors must also be consulted, through the traditional spirit mediums and gifts of tobacco must be presented for appeasement. Settlers complain that as a result, a system of "apartheid" exists in their Ward, with KoreKore villagers having better access to resources, particularly in the case of drought relief and masawu trees.

Most local people said that the woodland should be managed at the Ward level, with institutional and technical assistance from the Council. There is a general belief that the Council's development priorities are not the same as those of the villagers and for this reason, the villagers believed they were best placed to manage their own natural resources. In the past the woodland area had been designated a game management area. Thus, many farmers were concerned with their personal safety and with crop protection in the presence of large wild animals, or with being evicted from their lands, rather than the prospect of income generation from the game. In general people said they would be interested in income-generating projects in the Ward, on condition that they brought employment to local inhabitants.

Most people said there was no conflict of interests when sharing resources between the resident KoreKore people and the immigrants who had been settled there in recent years. Many mentioned that as they were all Zimbabwean, they should be able to get along together. There were, however, other indications that this was their vision, but not always reality. One villager had complained that, as a settler from another District, he was not allowed access to masawu trees in fruit, being told that they were the property of KoreKore families because they were growing in what used to be their ancestors' fields. Many settlers in the seven villages had also experienced this exclusion. Others foresaw problems if communal income generation projects were introduced, saying that already there is difficulty in getting families to work together in developing their schools.

Villagers were almost unanimous in citing development projects as having priority if funds were to accrue from income generating projects. Many complained of the lack of basic facilities compared to areas from which they had been resettled. The Ward is large and underdeveloped. The roads are in extremely poor condition, being seldom maintained and in some cases, non-existent. Many farmers take their crops to collection points along bush tracks that are impassable in the wet weather. Even the main roads become impassable in the rainy season. Schools are poorly developed and in wet weather children living north of the Hoya River are often unable to attend because they cannot cross the flooded river. Most of the villages to the north of the Hoya have no clean drinking water, being reliant on holes dug in the riverbed. As a result water-borne diseases are common. Many people died of malaria in the 1995/96 wet season, often being too far from the clinic to get treatment. There is one poorly-stocked shop which serves the seven villages and apart from one at the "business centre" of Chadereka and one to the north of the Muwamba River on the Kabaira road, the villagers have no access to grinding mills. Other suggestions as to how project money should be spent include training for school-leavers so that they are equipped with more practical skills with which to earn a living, as well as funding further small enterprise schemes that would employ local people. Unemployment in the area is high and many young school-leavers are forced to leave the Ward if they wish to earn a living.

When asked who should decide how money from any income-generating projects would be spent, villagers were divided over whether they should manage the funds themselves, or whether the Council should give advice. Most people were adamant that the Council should not decide without consulting the villagers. As for other areas of Zimbabwe, it is the men who cut poles for building, collect honey and most often plant trees. Women are involved in fuelwood, thatching and fruit collection and also in making alcohol from masawu. The income that the women obtain from the masawu trade belongs to them.

In general the findings of the group meetings confirmed those of the individual interviews and reinforced the main issues which need to be addressed before any woodland management programme can be initiated.

DISCUSSION

Woodland regeneration

Guy (1981) gives an equation for annual wood production of mopane trees in Sengwa, but since growth is dependent on soil type and depth, as well as rainfall and the frequency

of fire, this equation was not used to estimate annual wood production in Muzarabani. Even within the study area, growth rates would vary considerably, depending on the proximity of water and whether the trees were growing on clays or sands. The drier, more remote areas to the north of the study area are subject to more frequent fires, often set by hunters. Many of the trees in these areas are old, gnarled, and hollow and therefore the growth rates are extremely slow. Harvesting may have the beneficial effect of rejuvenating the trees, as new coppice shoots are produced, but may alternatively cause the death of the rootstocks. This should be tested experimentally.

Little is known about the long-term coppicing potential of this type of indigenous woodland. The vigour of the coppice shoots would depend on the size of the original stump, access to water and possibly the age of the root stock (Grundy 1995, Mushove and Muchichwa 1996). Coppice shoots in woodlands grow relatively fast for the first ten or so years, after which the growth rate slows down considerably (Strang 1965). Thus the woodland is likely to lend itself well to coppice management, particularly where the desired products are small poles. A coppice-with-standards system, where the best stems are selected and left on a longer rotation to provide large poles and timber trees, would give a wider variety of products (Grundy 1995). This system is used in European oak woods on a 180-year cycle (Rackham 1993). Mopane is extremely slow growing, hence its dense heartwood, and therefore any management scheme would represent a long-term investment for local people. Small poles from coppice stools would give short-term benefits as roofing cross-lathes and small firewood, but for all larger wood, villagers would need to understand that they would perhaps not live to see the final products.

Lynam (1997) calculated a growth rate for mopane coppice, using Guy's (1981) growth functions. His estimates are higher than those in this work, however, particularly for the larger trees. He calculates that villagers would need at least 7.5 ha of mopane woodland from which to extract their building and firewood needs in a sustainable manner. Fire would slow down the growth rate of the trees considerably and therefore should be excluded where possible from the woodland. This would require close co-operation from local game and honey hunters.

Harvesting strategies

The woodland area to be managed would need to be carefully divided into logging "coupes" (harvesting zones) and the rotational period calculated according to the required products. There could be an initial high rate of harvesting from the whole area, to gain a one-off income, but it would be more prudent to spread the benefits and the impact of logging by felling one block per year. It is not possible to give a detailed account here of biomass off-takes from each coupe, because of the variability in both the woodland types and in their tree ages and densities and therefore of the final off-take. In a coppice-with-standards system, there will be stiff competition for resources between the standards and the new coppice shoots. An experiment in southern Zimbabwe (Mushove and Makoni 1993) showed that the growth of the standards was restricted by the removal of neighbouring trees which then produced numerous coppice shoots. A balance must be found therefore, between maximum growth of all products and soil conservation.

Since such formal management of mopane would be the first of its kind in Zimbabwe, it may be necessary to learn from the experience of projects outside the country. Experimental plots with three levels of harvesting should be set up (25, 50 and 75 % canopy removed) and the growth and soil erosion rates carefully monitored in the initial growing period. In Malawi, it was found that, due to greater competition from grass, coppice shoots in clear-felled plots fared worse than those where 50 % of the canopy cover had been left (Lowore and Abbot 1995). Cutting height may affect the growth rate too and should be investigated further. Cutting at one metre above ground level in southern Zimbabwe was found to enhance coppice regrowth compared to cutting at 10 cm from the ground (Mushove and Muchichwa 1996). Coppices from shorter stumps are more likely to originate on the root collar, and give stronger, straighter stems, however (Grundy 1990). The trees are best felled in the winter, to encourage vigorous new coppice regrowth at the beginning of the rainy season, but this does not coincide with the demand for poles and a compromise may have to be sought. Growth is likely to be slower in the drier areas and on sandier soils, and where possible these areas should be avoided, or managed less intensively. Core samples (taken with an increment borer) or stem cross-sections could be used to locate the fastest growing woodland for commercial production. Other areas could be used for local pole production. The method of dividing up the woodland so that all villagers have some kind of stake in the benefits would have to be negotiated at village level.

Because of the slow growth rates of the trees, it is suggested that felling for commercial purposes be kept to a minimum, concentrating only in the areas of highest growth (which are usually nearer water courses). Instead, alternative sources of income from non-timber products should be emphasised. In this way the damage to the soil as a result of logging operations would be kept to a minimum, while local people would still derive benefits from the woodland. A large-scale logging operation in the woodland was considered not to be viable because of the lack of sound, large trees for milling, the lack of access to the woodland for large logging trucks, the long transport distances and the high environmental damage as a result of logging operations.

Income generation from the woodland

There are two levels of markets for products from the woodland, local level and national or international level. Whichever level of market is targeted, decision-making and production must be done at the local level. Villagers could harvest local level products such as poles, thatching and ilala palm *(Hyphaene petersiana),* once buyers have been identified. Thus products could be harvested and sold to neighbouring communities who are not so well endowed

with resources. This requires little investment in transport, but the products sold have a relatively low value. Poles (both mopane and *Combretum apiculatum*) could be harvested under a carefully monitored system of coppice management as described above. Thatching grass, bamboo and ilala palm could be harvested under a resource-sharing scheme where the buyers provide the labour and pay in extra bundles of the product, which can then be sold for the benefit of the local community. A tight quota system would need to be introduced.

The easiest way of generating income from the woodland would be to sell poles and firewood in some of the closer, deforested communal farming areas, such as other wards in Muzarabani, or in the nearest Communal Areas. However, the low selling price of these items is not high enough to adequately cover the cost of transporting them out of the Valley.

Another level of market is to produce high-value products that have a national or international market, where the income would offset the production and heavy transport costs. A high quality of product would be demanded in this case, which would require strict product control. Mopane wood is extremely dense and durable. In the past it has been ideal for uses such as mine props or railway sleepers (Goldsmith and Carter 1981), which require little machining. However, there is currently no market for this type of product. Indigenous hardwoods cannot be exported from Zimbabwe in their raw state and therefore some sort of processing would have to be done first if an export market were to be targeted. Mopane wood turns easily when wet (Goldsmith and Carter 1981) and one of its traditional uses has been for bowls, candlesticks and bracelets. Because much of the wood is of small dimensions, turned products may be more appropriate than planks.

Marula *(S. birrea)* has a soft wood which is easy to mill, but which is unsuitable for plank and furniture making. The wood has a high sugar content, which renders it susceptible to borers and fungi (and therefore staining) and can result in fermentation. In addition, the timber, although pleasing to the eye, is difficult to match. Planks need to be carefully cured, which can take up to three years (T. Kilner[3], pers. comm.). The pod mahogany *(Afzelia quanzensis)* found in this part of the Valley is "flecked" as a result of the high salt content of the ground water and is therefore not suitable for milling. It is only found in riverine woodland, in small quantities and should therefore not be exploited. Other timber species are scattered irregularly through the woodland and most appear to be unsuitable for any large-scale timber production.

Commercial sawmillers in the past have not been able to run a successful business based on the wood resources in Muzarabani District (T. Kilner[3], pers. comm.), but a number of smaller operations, with lower overheads, may be able to succeed where the larger ones failed. Since there has been so little work done on income generation for local people from woodland products, however, further market research would be necessary.

Several non-timber woodland products are seasonal and therefore may only give a seasonal income. The size of the income may vary greatly from year to year, depending on the amount of the product available for harvest. Options for income generation from non-timber woodland products include wildlife production. However, the lack of perennial water sources, limited game and problems created by fencing limits this option. Despite this, the villagers of the area are interested in a game project to generate income. One solution to the problem of poaching and lack of water could be to introduce an experimental game farm in a small section of the woodland, where antelope are farmed together with cattle. Ostrich farming could be another option, since there are already communally managed ostrich farms elsewhere.

Exploiting bamboo and reeds may be feasible as they grow along the river courses especially on the Nzhoumvunda. They can be used to make walking sticks, ethnic bathroom attachments, furniture and mats. Further research is required on the growth and reproductive rates of these species and the effect of harvesting on their viability.

Ilala palm grows along the watercourses, but is not very abundant in the woodland area. It is, however, possible to cultivate this plant and sell the fronds for hat and mat making in the towns. Alternatively, the already existing local small cottage industry of basket and hat making could be enhanced using cultivated plants. A local farmer who has successfully cultivated these plants estimates that it would take three to four years before the fronds were ready for harvesting (Murota[4], pers. comm., 1996). Palm wine could possibly be made at the same time, since the leaves are removed from the stem in the process of tapping the sap.

Indigenous fruit can be used in a number of ways. *Strychnos* fruits can be collected and sold to outside buyers who produce penholders, hair clips and other trinkets from them. Alternatively, these fruits could be decorated locally, with pokerwork and made into salt and pepper pots, marakas, ornaments etc. Marula sweets and jam can be made from marula fruit. A delicious paste similar to marzipan can be made from the nut kernels and a jam from the fruit (A. Spion[5], pers. comm., 1996). Both alcoholic and non-alcoholic drinks can be made from the flesh. In other areas in Zimbabwe, this drink is extremely popular, although in some cases, because the tree is sacred, the produce cannot be sold (Clarke *et al.* 1996). Marula fruit are also used to make a popular commercial liqueur. The local KoreKore people make an extremely alcoholic distilled drink from

[3] T. Kilner, former owner, Mopane Sawmills, Muzarabani, Zimbabwe
[4] Headman Murota, Murota Village, Chadereka Ward, Muzarabani, Zimbabwe, May 1996.
[5] A. Spion, AXTREC, Masvingo, Zimbabwe, June 1996.

masawu - masawu "beer". This sells for Z$12 for a 750 ml bottle. If a licence could be obtained for the production of this drink, it would bring a huge income to local people. At present there is a law prohibiting the production of such alcohol, but efforts could be made to alter the situation so that the Council could be licenced to produce it. Alternatively, a contract could be drawn up with a local distillery to buy the whole masawu crop annually, but this would result in a much lower income for the community. Masawu grow very easily from seed and within three years are producing fruit. These trees could be planted in orchards to augment the wild crop. *Kigelia africana* (sausage tree) fruit are being used to make a cure for skin cancer, providing a potential to expand this market.

The opportunity for charcoal production is limited and the main charcoal makers in Zimbabwe have had to reduce their output. Ecotourism is also rather limited because of the difficulties of access and limited game viewing or bird watching opportunities. Apiculture may have little potential for income generation in this area because neither mopane nor *Combretum* species are good for honey production (M. Schmolke[6], pers. comm., 1996). In addition, honey production depends on rainfall and can vary greatly (even ten fold) from year to year. Other options which require more research include the culture of mopane "worms", indigenous tree seed production and the collection of butterfly eggs.

The best option for sustained management of the woodland appears to be low-key harvesting on a rotational basis to provide poles to be sold to neighbouring areas as well as timber for furniture making and turning. The best stems could be kept for the latter two uses, as hollow stems still make strong household poles. Honey production, ilala palm cultivation and marula fruit products (if culturally acceptable) may also be appropriate. All of these projects could be initiated within a short time period with the minimum of capital investment and if successful, would give impetus to any of the other options if they were introduced at a later stage. The harvesting of mopane could be introduced at a Ward level, while the other options could involve individuals or small groups in income generating projects.

There are two areas of potential conflict. These are between resource users, e.g. disputes relating to resource use between locals, settlers and / or the Council and between the potential beneficiaries of any income generating activities based on resource use, e.g. between locals and the Council relating to income distribution. If sustainable management is to be pursued, both need to be addressed. Much has been written on the mid-Zambezi Development Scheme and any new resource management initiative should learn from these observations. There is also a wealth of literature on the various CAMPFIRE type programmes around the country and elsewhere.

In order to avoid conflicts between locals and settlers, it will be important to promote full integration of settlers into local communities. It is imperative that land is allocated to settlers only with the agreement of the chief for the area and on condition that the settlers agree to their full incorporation into existing traditional administrative authorities. Under these circumstances, both locals and settlers will be beholden to the same traditional authority and to the same rules and regulations governing resource use. Thus any conflicts arising can be dealt with through the traditional courts. Prevention of conflicts between the Council and the local communities regarding distribution of revenue is primarily dependent upon adherence to the normal CAMPFIRE principles with regard to the income distribution. These stipulate that a maximum of 20 % should be retained by Councils to cover administrative costs. The remaining 80 % should be spent in accordance with the wishes of the producer communities (whether through the realization of household dividends, or through expenditure on community projects for which there is the support of the majority of producer households in the community (Martin 1986)).

As in so many other Resettlement Areas across Zimbabwe, there is little evidence of forestry extension work being carried out in the Ward (see Grundy 1995). Chadereka is particularly remote and therefore is probably more neglected than most areas. Yet it is in exactly such areas that forestry extension is crucial. There are plentiful wood resources at present, but the current rate of mopane felling for poles does not match the production rate of the trees and therefore, in the not-too-distant future, these trees will become a scarce resource. This is already evident in some of the more densely populated areas of the District, closer to Muzarabani. If this resource is to be managed for long-term sustainability and as an income source for local people, then alternative sources of wood will have to be established to alleviate the local demand for wood products.

Eucalyptus species are not suitable for this area. Instead, fast-growing species such as exotic *Cassias* or *Gmelina* could be introduced. Both these are multi-purpose trees, are suited to the growing conditions in the Valley and could also be grown as a commercial timber crop. Additional species, particularly suitable indigenous types, should be researched and introduced. People are interested in tree planting, particularly the settlers who have come from other areas where planting is common and would be willing to experiment with new species. The development of a cheap tree-guard that does not use large quantities of indigenous wood would go a long way to ensuring the success of any tree-planting programme. Millions of dollars have been spent on tree planting in the past, most of which have been wasted because the trees have been eaten by livestock. Pole preservation and other ways of decreasing the demand for indigenous wood should also be investigated.

[6] M. Schmolke, formerly bee expert at AGRITEX, Harare, 1996

CONCLUSIONS

In view of the unsuitability of the area for either commercial timber extraction or commercialized community wildlife management, the experimental income-generating projects suggested above provide the best options for development in Chadereka, as they could be initiated immediately, at the same time as research into other activities which can be introduced at a later stage. Concurrently, experimental coppicing systems could be set up. The viability of establishing a marketing association that incorporates the Council and the Chadereka producer communities in a joint venture could also be examined.

Greater emphasis should be placed on forestry in the District. Forestry issues in communal and resettlement areas have always received scant attention in the past and yet are central to the livelihoods of the local people. Decisions on natural resource management in the District in general and on forestry issues in particular, must involve community members in the decision-making process. An equal flow of information from Council to villagers and back, with a transparency of actions, should be facilitated at all times. Efforts must be made to develop local decision-making bodies which are representative of the community as a whole. These institutions will be essential for the success of any development scheme in the Ward.

The broad CAMPFIRE principle (that income generated from community resource management activities should be devolved back to those communities) must be adhered to. Thus dividends from income generating projects should revert to the household level and dividends from wider community projects should be distributed in full consultation with all community members. It is anticipated that community development priorities will include basic infrastuctural developments in the area, specifically the provision of decent roads and their proper and effective maintenance, boreholes, schools, clinics, grinding mills and business centres, as well as the construction of Blair toilets. Although there may be specific cases where income-generating activities are contracted to outsiders, the local communities must retain ownership of all such initiatives, based on their ownership of the resources being used. Where activities are contracted out, local labour should be used where possible and emphasis placed on developing local capacity to assume management responsibility. This would ensure that they were eventually self-sustaining.

Financial support provided for income generation projects should be supported through assistance with access to loan finance rather than through direct subsidy. Exceptions may be made in specific cases where the enterprise involves an element of technology development whose success may be uncertain. The aim is to encourage the sustainability of such activities. Women and other disadvantaged groups, should be involved as much as possible in any woodland management initiatives.

Alternatives to mopane poles and firewood should be investigated so that in future there is less pressure on the conserved area to provide these products. Fast-growing species, both for sale and for household use should be investigated. Wood-saving strategies, such as improved fire management and pole preservation should also be introduced.

Investment should also be made in the establishment of conflict management and resolution mechanisms in natural resource management. A difficult relationship already exists between the people and the Council, and between the different ethnic groups in the Ward. Addressing and attempting to resolve the issues of conflict is essential to the success of any new project in the area.

Any woodland management strategies should be seen as experimental and adaptive, because of the present dearth of information on different management techniques. Research in this field should aim to build on existing knowledge and methodologies, so that the results can be fed into the greater body of knowledge of woodland management. In the past, fragmentation of the research effort has hindered progress in this field. Any new initiatives should draw on existing expertise.

In view of the already existing threats to the viability of the woodland area in Chadereka Ward as a resource base for long-term sustainable use, there should be no further reduction in the size of the demarcated game area. New settlement within this area should be prevented. Woodland is already not being used sustainably and an increase in the population will seriously hinder any efforts to maintain the resource. This is an urgent issue. It is estimated that every household needs approximately 7.5 ha of mopane woodland to satisfy its building and fuelwood requirements on a sustainable basis and this should be taken into account in any future land use planning.

Further market research needs to be done on turned wood products and furniture made from mopane wood. With the decrease in the availability of local indigenous woods, furniture producers are anxious to find alternative woods. Mopane is ideal for these uses, except that it is difficult to work. Experiments need to be carried out in conjunction with local craftspeople to develop new products that can then be fed into the existing market. Research into the appropriate machinery and equipment needed for processing mopane wood should be initiated. For some products, the wood may need to be seasoned before use, for others it may be used green.

Further research into the effects of harvesting ilala palm, bamboo and reeds is required to ensure that any schemes based on these natural resources will be sustainable. The possibility of setting up a distillery producing masawu alcohol should also be investigated. Existing regulations may prohibit this at present, but, as for the management of wildlife resources by Councils, it may be possible to revise these regulations in future.

Based on experiences of income generating projects using communally owned resources elsewhere, there should be on going research and monitoring of income distribution and equity amongst the local community members.

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ISSUES RAISED DURING PARTICIPANTS' DISCUSSION

You have highlighted the commercial potential of the area as far as the community is concerned. This appears to be a traditional approach, forgetting the community needs for forest products. Are you suggesting that to have sustainable forest management you have to have commercial extraction?

No. Up until now the woodland has been managed sustainably. There's a low population and a huge area of 250 km^2. This is mainly protected by its isolation. The principle behind CAMPFIRE is that if people see the value in the woodland, then they will manage it better. They do already value it for the subsistence products, but it is often argued that if an economic value can also be seen then it will be managed even better.

Commercial management should be focused on basic needs, and any commercialization should be additional. However, what do we mean by basic needs? For many people and in particular we can see this in northern Namibia, subsistence farming is not enough to keep people going. They need additional income generation projects just to meet their basic needs.

There are many issues involved. Many people see the resource as their own and there are some conflicts within that. Some people also see it as a source of potential agricultural land.

You quote the figure 7.5 ha woodland required per family to meet household needs; how was this calculated - did you calculate increment/ha and consumption per household?

This figure came from Lynam; he looked at growth rates and carried out household surveys to estimate demand.

The growth rates of the trees are very slow; how did you estimate them?
This was a guestimate. It was assumed that the trees did make annual rings and rings were counted on the mopane products in use. The impression was that trees grow much faster and taller along the water 'courses'. In the northern areas where fires were more frequent, the trees were old and gnarled and smaller; it was assumed that their growth rates would be slower. This is the main area under CAMPFIRE management.

It is difficult to compare the situation described in the presentation with that of northern Namibia; due to cultural differences it seems that in Namibia a great deal more wood is used in constructing homesteads than in Zimbabwe. In the area described, where an area of 7.5 ha woodland would supply all family needs, the population density is low, although obviously increasing. Is this one of the areas targeted by DTZ logging activities?
Yes, this firm has applied for a concession in Zambezi valley. However it is highly likely that the economics of commercial extraction in this area will be too poor to make it an attractive venture. Two logging firms have been there and removed a lot of trees already, but neither could make it pay. Two other surveys have been done in the area that have both found that there is no potential for large scale extraction. There is a concern though that the companies might ignore this, start up and then take out smaller trees to attempt to make up their quota because there are not enough big trees. The local people are worried about it and do not want the concessions to be granted; however, the District Council makes the decision and they need money to supply local services.

You said that the mopane in that area does not bear mopane worms; are they the same type of trees as we find here?
In that area the trees are bigger and grow more densely, but it seems from other people's work that the reason for there being no worms could be in the soil type.

What made you go into that area? If the community are looking for alternative sources of income and there seems little potential from the woodland, why don't they research other options, e.g. poultry farming?
Commercialization is a popular approach in Zimbabwe and has been the underlying principle of CAMPFIRE. Through commercialization, the value attached to the woodland by the community will be increased and therefore the woodland will be better managed and protected.

You estimated the age of 20 cm poles as 100 years. Charcoal production is usually very viable in areas of rainfall more than 600 mm per year; why did you dismiss charcoal production as an option for commercialization?
The recommendations that were made were to start a process. The problem with charcoal is that there is no local market. If an export market could be found for high value charcoal (for example for water filters, because mopane can produce a very good quality charcoal) then maybe production would be a possibility.