

Managing the Miombo Woodlands of Southern Africa

Policies, incentives and options
for the rural poor

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Technical Annexes

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Abbreviations and Acronyms

PRSP	Poverty Reduction Strategy Paper
PRS	Poverty Reduction Strategy
NFP	National Forest Programme
MDG	Millennium Development Goal
SWAp	Sector Wide Approach
DFID	Department for International Development
HIPC	Highly Indebted Poor Country
GBS	General Budget Support
NGO	Non-Governmental Organisation
ODI	Overseas Development Institute
PBA	Programme Based Approach
DPL	Development Policy Loan
SIL	Sector Investment Loan
IMF	International Monetary Fund
SFM	Sustainable Forest Management
UNDP	United Nations Development Programme
PES	Payments for Environmental Services
FDI	Foreign Direct Investment
DFI	Development Financing Institution
MTEF	Medium Term Expenditure Framework
CAS	Country Assistance Strategy
PFM	Participatory Forest Management
CBNRM	Community-based natural resource management

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Annex 1: Contribution of dry forests to rural livelihoods and the national economy in Zambia

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ABSTRACT

This Annex analyses the extent to which dry forests contribute to rural livelihoods and the national economy in Zambia. We used case studies drawn from literature, data collected from a household survey conducted in eight sites in three of the nine provinces, and secondary data from the Central Statistical Office and the Forestry Department and. Forest products contribute on average 20.6 percent of total household income (subsistence and cash) in the eight sites, and are the second or first ranked source of income in five of the eight sites. There are large differences among poor and not so poor in total income and in forest income share. Several products contribute significantly to rural livelihood and the national economy. Most notably, charcoal and firewood provide 70 percent of the country's energy needs. There are possibly a quarter of a million honey producers in the country deriving an income from forests. A wide range of wild foods are common in rural diets, providing essential vitamins and minerals; more than ten leafy vegetable species, twenty-five mushrooms and thirty-five edible caterpillars. Forests provide revenue for the government from taxes, fees, royalties and other charges levied on forest-based activities although the relative importance is small given that the majority of forest users extract low-value products from forests mainly for subsistence uses and only a small part of the trade is recorded. From our analysis, we find that forests are recognized to have an important poverty mitigation function but are not a means alone to get people out of poverty.

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1 Introduction

In Sub-Saharan Africa, forest goods and services are extremely important for rural livelihoods, providing food, medicine, shelter, fuel and cash income (Kaimowitz, 2003). It is estimated that more than 15 million people in Sub-Saharan Africa earn their cash income from forest-related enterprises such as fuelwood and charcoal sales, small-scale saw-milling, commercial hunting and handicraft. In addition, between 200,000 and 300,000 people are directly employed in the commercial timber industry (Oksanen and Mersmann, 2003). For some countries, the forestry sector is an important foreign exchange earner. For example, between 1993 and 2002, the value of net exports of various wood-based products from countries in sub-Saharan Africa amounted to more than US\$2 billion (FAO, 2003). However, the national statistics on the contribution of forest products to the countries economies are extremely poor (Mabugu and Chitiga, 2002; FAO, 2004; Vincent, 1998) and only in a few countries are there comprehensive government programs of environmental accounting where forestry contributions to the national accounts are captured, e.g. South Africa (FAO, 2004; World Bank, 2006).

The values of goods and services have been partially documented in the extensive miombo woodland region in south central Africa (Clarke *et al.*, 1996), but the statistics are poor and largely based on a few case studies (e.g. Cavendish, 2000; Campbell *et al.* 2002). The Zambian setting differs from those in other countries in the miombo region in several ways (see Table 1). Zambia is endowed with abundant forest resources and with a relatively small population. It has approximately 3.5 hectares of forest land available per capita, compared to 0.2 in Malawi, 1.7 in Zimbabwe and 1.6 in Mozambique. Furthermore, a quick and massive closing and privatisation of state controlled industries followed the initiation of a series of structural adjustment programmes in 1986. This resulted in massive retrenchments and large numbers of urban unemployed returned to rural areas in recent years. In a rural economy based on natural resources, this implies an increased dependency on forest resources (Mupimpila *et al.* 1996). The economic liberalisation process has also resulted in a decline in government subsidies for fertilisers. This loss of fertiliser has forced rural households to find alternative sources of income including returning to their traditional shifting cultivation practices (Sprague and Oyama, 1998; Holden, 1993) and selling forest products (Puustjärvy *et al.* 2005,). Annual rates of deforestation are tenfold higher compared to most of the other miombo countries.

This Annex examines whether or not the dry forest resources are important engines for growth and poverty reduction in Zambia. The work draws on a literature review of specific forest products used in Zambia and a sample of households from eight villages in three provinces to determine the relative contribution on forest products to rural households in various environmental and socio-economic settings. The rest of the chapter is organized as follows: in the next section, we lay out the methods. In section 3, we briefly describe forest resources in Zambia. Section 4 examines some household forest use patterns, using the literature review and survey data. Section 5 explores the role of the forestry sector in the Zambian economy. The main conclusions are presented in Section 6.

Table 1: Characteristics of six miombo countries

Country	Total population, 1999 (x 1000)	Rural 2000 (%)	Rural, 2003 (%)	Total forest area, 2000 (x1000)	% of total land area	Forest area per capita, 2000 (ha)	Annual rate of change 1999-2000 (%)
Angola	12,479	66.5	64.3	69,756	56.0	5.6	-0.2
Malawi	10,640	85.1	83.7	2,562	27.2	0.2	-2.4
Mozambique	19,286	61.1	64.4	30,601	39.0	1.6	-0.2
Tanzania	32,793	72.9	64.6	38,811	43.9	1.2	-0.2
Zambia	8,976	55.8	64.3	31,246	42.0	3.5	-2.4
Zimbabwe	11,529	65.4	65.1	19,040	49.2	1.7	-1.5

Source: FAO, 2000; 2005

2 Methods

2.1 Review

This work included a literature review to identify some key products that could be used to illustrate the role of forests and forestry in livelihoods and the national economy. Unfortunately, there are no comprehensive national datasets for examining the role of forests for subsistence and cash income, but we used case studies and data from CSO and the Forestry Department.

2.2 Household survey

The main source of data to gain an overview of the contribution of forest products to rural livelihoods was a household survey conducted in 2005. A total of 435 households in eight rural villages were sampled. The villages were selected from four rural districts in three of the nine provinces of Zambia (Table 2). To ensure that the most visible and important forests products were captured and analyzed, we first itemized the key forest products harvested by households in different parts of the country and then selected three of the nine provinces to study. The villages surveyed in each of the sampled provinces were purposefully selected to capture diversity, varying abundance and varying levels of use of forest products. Different forests and woodland conditions, and different levels of maturity, host different non-wood forests products. To record this, we included communities that have access to disturbed and those that have access to relatively undisturbed forests. In the Northern Province, we surveyed two villages in Kasama, namely Paul Kalemba and Nseluka. The first is an important charcoal producing area, whereas the second was previously important for caterpillar harvesting, but now the caterpillars are scarce due to land-use changes. In the same province, two other villages in Chief Kopa's area in Mpika district were sampled, where caterpillar trade is a huge source of income. Markets and access to markets influence the value and utilization of forest products for commercial purposes. Thus we also included households living around the Katanino Local Forest Reserve, in a more urban province (Copperbelt). The households supply most of the charcoal and mushrooms in the Ndola urban markets. In Mumbwa district in Central Province, three villages were surveyed (Lutale, Chibuluma, Nalusanga), mainly to capture information on small-scale timber operations (pit-sawing).

Table 2: Study area and sample distribution

Province	Districts/town	Study areas	No. of households interviewed	Percent
Northern	Kasama	Paul Kalemba	80	18.4
		Nseluka	71	16.3
	Mpika	Kopa Main	73	16.8
		Lwitikila	37	8.5
Copperbelt	Ndola Rural	Katanino area	41	9.4
Central	Mumbwa	Lutale	38	8.7
		Nalusanga	55	12.6
		Chibuluma	40	9.2
Total			435	100

The survey captured information on all sources of income, both cash and subsistence in all areas of activity: forestry, subsistence agriculture, cottage industries, formal and informal wage employment, transfers and remittances. Enumerators were undergraduate students from the University of Zambia. They were selected based on their fluency in local languages, knowledge and prior experience with research on rural livelihoods. In addition to conducting the face-to-face interviews with local communities, focus group discussions with district forests extension officers and local communities, and a snapshot survey of local forest prices were conducted. The surveys conducted are limited by their single household visit (as compared to the PEN methodology – Angelsen *et al.*, in prep), but were deemed suitable given the wide geographic coverage that was desirable. Medicinal plants could not be captured in the survey, given the secretive nature of much of their use.

We compute forest dependency as the ratio of total forest income to total household income, as in Fisher (2004). Total household income comprises the sum of cash income (part of which is from forests), net gifts/transfers and subsistence consumption (from both agriculture and forests). Total forest income here includes the value of forest products consumed or used by households and cash income from sales of forest products. Although consumption is often preferred to income as a welfare measure in household studies (Deaton 1980), we follow Cavendish (1999, 2000) by using total household income.

3 Forest resources in Zambia

Zambia's forest resources – woodlands and dry forests – cover about 42 percent of the total land area (FAO 2005). About 9.0 percent of the forests in Zambia are gazetted as protected forest areas or local forest reserves, although encroachments in forest reserves are a major problem (GRZ 2006b). The rest of the forests are ungazetted, mainly found on traditional or state land and within the municipalities for human settlement, farming and infrastructural development. These ungazetted areas fall under the jurisdiction of the Commissioner of Lands, Councils or Traditional rulers. The country has about 50,000 hectares of plantation forests that are being managed by ZAFFICO in the Copperbelt Province, as well as about 10,000 hectares of local and regional forest plantations in most provinces, established to meet the local demands for soft wood, timber and other forest products (GRZ 2006b). The country's vegetation can be classified into three main categories: closed forests in south-western Zambia; dry woodlands of the large

valleys; and the extensive miombo woodlands dominated by *Brachystegia* and *Isoberlinia* found on the plateaus throughout the rest of the country.

The indigenous forests in Zambia are rich in biodiversity and are home to approximately 5,500 species of flowering plants, 88 species of mosses and 146 species of ferns. These forests are not rich in commercial timber species, with the exception of a few hardwoods (i.e. *Baikiaea plurijuga*, *Tectona grandis* and *Pterocarpus angolensis*) at stocking rates of 0.5 to 2.0 tons per hectare (GRZ, 1997). Other forest products, such as woodfuels and foods, however, are abundant and contribute significantly to local livelihoods.

Estimates of the rate of deforestation are alarmingly high (851,000 ha/year: FAO, 2001; 900,000 ha/year: GRZ, 2006a). The FAO study concludes that the losses in Zambia amount to almost 50% of the total deforestation in the Southern African region. The Government has acknowledged deforestation to be the country's major environmental problem, and attributes it mainly to clearing land for agricultural expansion and settlements (GRZ, 2006b). Due to poverty and lack of agricultural inputs, shifting cultivation remains a dominant form of agriculture across the country. The *chitemene* system (see 4.1.5 below), practiced in Northern, Luapula and Central Provinces, has been labeled as particularly responsible for deforestation (Holden, 1993). The harvest of forest products for domestic use and sale, woodfuels and timber in particular, as well as forest fires, also contribute to deforestation. However, lack of proper management regimes and limited institutional capacity in the Forestry Department have been identified as important factors for the destructive extraction levels (Shitima, 2005; GRZ, 1997).

4 Contributions to households

4.1 Some major forest products

Forests play an important role in rural livelihoods, providing a wide range of products and services for both subsistence use and cash income. Using data from baseline studies of the Forest Resource Management Project, Puustjärvi *et al.* (2005) calculated cash incomes derived from a number of forest products in Luapula and Northwestern provinces (Table 3). The average total annual cash income in Luapula province was ZMK389,848 and Northwestern province ZMK390,326 (Puustjärvi *et al.* 2005). Livelihoods are based on a combination of activities, and forest-based activities such as carpentry, beekeeping and timber and rattan sales may provide

Table 3: Range of forest-based income in user households in Luapula and Northwestern provinces in 2002⁴

Economic activity	Luapula province		Northwestern province	
	Average cash income (Zambian Kwacha)	Active households (%)	Average cash income (Zambian Kwacha)	Active households (%)
<i>Forest-based cash income</i>				
Bamboo sales	118,111	3.1	90,000	0.2
Beekeeping	82,160	4.3	226,634	9.0
Carpentry	287,083	2.1	351,810	6.4
Medicinal plant sales	156,0911	2	33,200	0.8
Munkoyo sales	65,217	14.4	110,162	5.7
Rattan sales	225,000	0.2	65,200	0.8
Timber sales	334,000	3.5	101,550	3.1
<i>Other cash income</i>				
Beer sales	155,587	19	95,660	7
Crop sales	201,701	59	220,232	48
Fish sales	169,314	9	152,463	6.1
Piece work	143,736	9	391,656	10
Livestock sales	147,788	7	140,365	8
Trading	319,179	9	412,083	2

Source: Puustjärvi *et al.* 2005

more than 50% of the average household income. The main forest products contributing to household incomes vary between the two areas. In Luapula province cash incomes from carpentry, rattan and timber sales exceed those of crop production, although less than 4% of the total households are involved in these forest activities. In Northwestern province beekeeping is an important source of income, as well as carpentry.

Most forest product harvesting and sale is seasonal, providing cash income at different times of the year, and few households use only one product. Furthermore, within households men and women often harvest and sell different products. We discuss some specific forest products in more detail, drawing on those for which there are significant sources of data.

⁴ US\$1.00 = Zambian Kwacha (ZMK) 4,399 as of 2002

4.1.1 Charcoal and firewood

In many areas, charcoal production is an important source of cash income. In 1997, the Government estimated that 41,000 rural households were full-time employed in charcoal production and an additional 4500 people involved in transportation, marketing and distribution (GRZ, 1997). Few rural households specialize in one full-time activity and it is therefore likely that the total number of households benefiting financially from the charcoal industry is much higher. Approximately 9000 households, in Chongwe district alone in 2000, were involved in charcoal production, supplying the product to Lusaka (Chidumayo, 2001). Most became charcoal producers during the previous decade, because of low profitability of crop production and lack of capital for farm inputs and machinery. The average per capita income from charcoal production was 4.8 times higher than that from farming (Chidumayo, 2001).

4.1.2 Honey

Northwestern Province is the main beekeeping area in Zambia with an estimated 70 percent of the country's beekeepers living in this province (ITC/DTCC, 2007). They produce between 90 and 95 percent of locally traded and 100 percent of the exported honey. Nearly all beekeepers are male farmers, who earn approximately US\$100 per year per household from this activity (Mickels-Kokwe, 2006). There are two main seasons for harvesting honey in miombo woodlands. The flowering of *Brachystegia* species contributes to the flow of honey between October and December across the country. This provides farmers with cash at the start of the planting season to pay for agricultural inputs, and school fees. A second honey flow occurs in May-June in areas with plenty of *Julbernardia* and *Marquesia*.

4.1.3 Wild foods

Mushrooms, fruits, leafy vegetables, tubers and insects collected from miombo woodlands are widely consumed by rural households and enrich their starch-based diets with important vitamins and minerals. These foods are often available at the start of the rainy season and thereby serve as an important gap-filler when food stocks are low (Packham, 1993; Chileshe, 2005). Furthermore, for many rural women, trade in forest foods is an important source of cash. More than fifty trees bearing edible fruits are found in the miombo woodlands. Farmers often acknowledge the value of indigenous fruit trees and retain and protect the trees on their fields (Akkinnifesi, 2006). However, wild fruits are less important for income generation due to the distance to markets and their short shelf life.

Approximately 25 different edible mushroom species have been documented in Zambia (Pegler and Pearce, 1980). In Chiulukire local forest, Eastern Province, eleven species are commonly collected during the rainy season. Women are responsible for collecting mushrooms and they usually do this when returning from their maize fields. Only a small proportion is consumed fresh. Ninety percent is dried, after which they are wrapped in leaves of *Uapaca kirkiana* and tied with fiber for later use (Mutale and Haamukwanza, 2000). The trade of mushrooms is visibly substantial, though volumes traded at national level are unknown. Fresh mushrooms are popular during the rainy season with substantial value addition along the market chain: they fetch approximately ZMK10,000/kg in rural areas and three to four times that amount in urban

markets (Husselman, *pers. obs.* 2007). One company in Lusaka packages dried *ubowa* mushrooms for sale in grocery shops and supermarkets.

Roots of various species (including *Rychnosia*, *Eminia* and *Vigna*) are harvested to make munkoyo, a fermented non-alcoholic beverage (Zulu *et al.*, 1997). Munkoyo is a popular local soft drink, in particular amongst women and children, and also used during traditional ceremonies (Malungo, 2001). The roots are sold fresh or dried.

A variety of insects is consumed in Zambia and these provide an important source of protein and household income (Illgner and Nel, 2000). More than 60 species of insects in at least 15 families and 6 orders have been reported as food in Zambia (DeFoliart, 1999). Silow (in DeFoliart, 1999) explains termites (*Macrotermes* species) were considered better than the meat of mammals and birds. Caterpillars were rated second best. The most popular edible insects, in terms of total consumption and trade, are caterpillars of which the majority belongs to the giant silk moth family *Saturniidae*. The most well known species in the Southern African region is *Gonimbrasia belina*, locally known as *mopane* worm. Thirty-one species of edible caterpillars are found in Zambia, of which seven are marketed (DeFoliart, 1999). Mbata *et al.* (2002) describe the use of caterpillars among the Bisa people in Northern Province. The majority of people in that area prefer *Gynanisa maja*, locally known as *chipumi*. It is large, thornless, and tasty, and fetches the highest price on the market. In November and December people collect the caterpillars mostly from regenerating woodlands that had previously been cleared and then left to fallow. The market for these edible insects is very large in all Zambian cities and even extends to Zimbabwe and the Democratic Republic of Congo. In 2000, the farm gate price for one *meda* (or gallon) was more than US\$4 (Mbata *et al.*, 2002). When the bush is rich with caterpillars, a person can collect up to 20 liters a day, and seven days of collecting can earn the equivalent of a month's salary for a general worker (DeFoliart, 1999). Traders may travel nearly one thousand kilometers to buy caterpillars. In Kasanka National Park, Northern Province, trade in caterpillars has always been a main source of income, and local chiefs receive a handsome share of this income, which encourages them to promote caterpillar breeding. Nevertheless, villagers reported a decrease in availability during the past decades due to a decline in overall tree cover (Eriksen, 2007). Sometimes trees are cut to facilitate the harvesting of caterpillars, but caterpillars may also provide an incentive for people to regulate bush fires, thereby protecting caterpillars and enhancing woodland regeneration (DeFoliart, 1995).

A study in 2001 recorded the amounts of wild foods collected and consumed during a period of 12 months in Kamena Village, Northern Province (Chileshe, 2005). Collection of wild vegetables and mushrooms is done by women and coincides with their *chitemene* tasks of sowing, planting and weeding. Bartering wild foods for staples is common between wealthier households with bigger plots, and poorer households. Some households act as middlemen purchasing caterpillars from fellow households for sale in urban markets. Poor households collect these foods more frequently than wealthier households and as a result the direct-use value of these foods is considerably higher for poorer households. Moreover, whereas collection and trade of other commercialized forest products, such as honey and charcoal, is controlled by men, mushrooms, fruits, vegetables and insects are considered activities for women and children. The value of the caterpillars collected and consumed by individual households was calculated using local market prices (Table 4).

Table 4: Average values of wild foods for individual households in Kamena Village (Zambian Kwacha)

	Leafy vegetables	Mushrooms	Caterpillars
Number of species commonly consumed	10	9	7
Number of meals per year	94	127	122
Direct-use value of consumed product	K47,225	K312,250	K350,250
Value of sales	K103,500	K247,500	K440,000
Total value of collected product (values in brackets are for wealthiest and poorest households, respectively)	K98,975 (K15,600- K172,800)	K559,750 (K161,100- K1,063,800)	K790,250 (K531,500- K1,071,500)

Source: Chileshe, 2005

4.1.4 Medicinal plants

Roots, shoots, leaves and bark of many plants, as well as animal products, are used for healing and protective purposes. Plant-derived medicines are used in self-treatment of common ailments, such as coughs, headaches and stomach problems, but for more serious diseases people consult traditional healers. There are about 30-50 plants used for medicinal purposes and there is a flourishing market in urban areas, where traditional healers sell both plant extracts and remedies (Puustjärvy *et al.* 2005). On average a healer earns a monthly income of US\$147 (Nswana, 1998). In Chiawa chiefdom, a total of 19 different indigenous plant species are used to treat sexually transmitted diseases, including *Strychnos cocculoides*, *Musa* species, *Solanum delagoense*, *Ximenia caffra*, *Diplorhynchus condylocarpon* and *Croton megalobotrys*. All these species were found within easy reach of the villages (Ndubani and Höjer, 1999). There is almost no quantitative data on medicinal plant use and trade.

4.1.5 Chitemene agriculture

Miombo woodland provides a crucial environmental service to agriculture in parts of Zambia, through the so-called *chitemene* system. *Chitemene* (meaning to cut) is practiced by the Bemba people of Northern, Central and Luapula Provinces. Burning woody biomass from forests forms the basis of this farming system and is intended to fertilize the acid, nutrient poor soils in the region. Compared to other forms of shifting cultivation, the *chitemene* is unique in several ways. Trees and branches are cut on an area 2-20 times the size of the cultivated garden (Stromgaard, 1985, 1989). These are piled on a central field where they are burnt. There is thus a transfer of fertilizing material from a larger surrounding forest area to a central field. Burning may increase soil NH₃-N content by 40-50%, as well as increase the content of other major nutrients such as P, K, Ca, Mg and Na (Chidumayo, 1987). Farmers cultivate crops on the ash circles for 3-4 years and then move to a new field. Although, theoretically there is enough forest land for rotations of sustainable duration, people only use a fraction of the available land; ninety percent of the *chitemene* fields are found within about 5-6 km of roads (Sprague and Oyama, 1998). Increasing population pressure is causing more and smaller trees felled, less area left to fallow, and less woodland available as a potential source of ash (Stromgaard, 1987). Nevertheless Sprague and Oyama (1998) suggest that *chitemene* is probably less destructive than other forms of shifting cultivation, because often branches are cut from the wider area, instead of whole trees, and only a relatively small field is burnt. In the area west of Mpika, Northern Province, the total area

under *chitemene* decreased between 1984 and 1992, due to an increase in the use of fertilizers. However, the average distance from *chitemene* fields to roads had increased. This was likely the result of more farmers using bicycles, which enables them to move to more distant places and select better quality woodlands for clearing (Sprague and Oyama, 1998). Farmers are obviously well aware of the value of these woodlands for crop production. In areas with abundant woodlands, farmers deliberately choose to continue with the traditional *chitemene* rather than the modern, capital intensive fertilizer and hybrid maize technology (Holden, 1993). As agricultural inputs become more expensive, it is likely that more farmers are returning to cultivating *chitemene*.

4.2 Household use of forest resources – survey results

4.2.1 Livelihood income sources in rural areas

The household survey shows the variability in livelihood income sources across the study sites (Figure 1). On average, agriculture production is the main source of income accounting for 45 percent of total household income, followed by forest income (c. 20%) and trading (c. 20%). Formal and informal wage income together account for nearly 10 percent and the rest comes from remittances, gifts and transfers including food-for-work programs. Forest income is the dominant source of income in Ndola Rural accounting for 47.6 percent of the total household income, but agriculture is the main source of income in six study sites, with trading as the most important source of income in one site (and in this site, it is a forest-derived product – honey beer - that is a main source of trading). Forest income is the first or second most important income source in five of the eight study sites. Our results are comparable with those obtained from case studies in some neighboring countries by Cavendish (1999), Campbell *et al.* (2001) and Fisher (2004), who reported forest incomes of about 20 percent of the total household income.

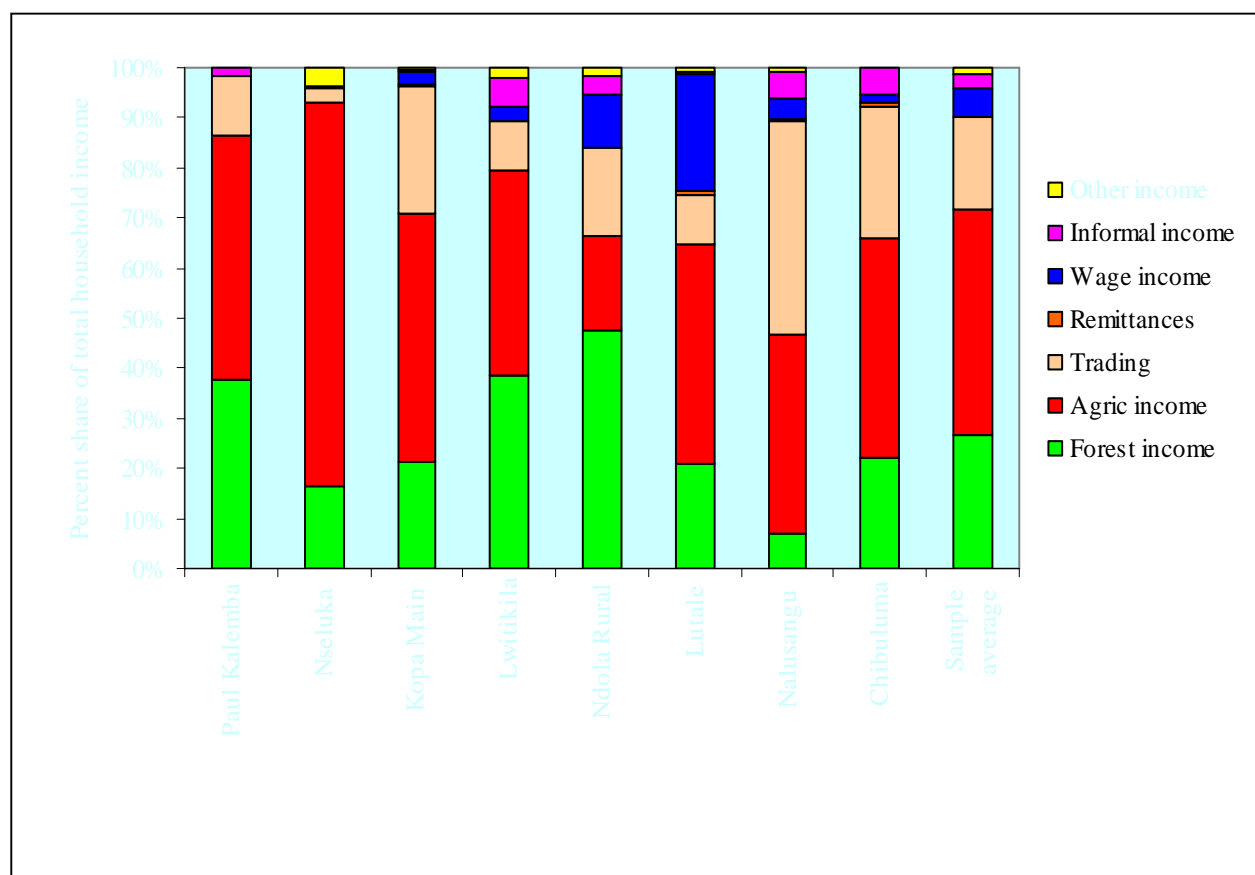


Figure 1: Source of total household income (including cash income and consumption) for eight sites in three provinces of Zambia

4.2.2 Main forest products

Table 5 gives the average values of forest production of user households in the eight study sites, as well as the percentage of households producing or harvesting each product. Table 6 gives the percentages of households selling each product and the value of these sales.

As expected, there is little variation across sites for firewood, with the majority of households collecting in all villages, except Lwitikila (Table 5), and few households selling firewood (Table 6). In communities where forests are in good condition, households collect deadwood, whereas when firewood is scarce, household cut down trees for firewood and markets for firewood are slowly emerging. The latter may explain why the average percentage of households collecting firewood in our survey (73.3%) is slightly lower than the reported percentage of rural households using firewood in the National Census in 2000 (87.7%), though it could also reflect the particular villages that we sampled. The average household consumes 100 kg of dry wood per month.

Charcoal is a source of cash income for almost half of the households in Katanino, which is near large urban centers such as Ndola and Kitwe (Table 6). In Paul Kalemba only 10% of the households sell charcoal, but on average they earn ZMK1,889,250 with this activity, which is 77% of the average total household income in that area. In the other areas, less than about 10% of households produce charcoal for sale and the farm-gate prices are lower due to the distance to urban markets. About 20% of all the households interviewed use charcoal, mainly for space heating, cooking and baking of snacks.

Following wood-fuels, construction materials (i.e. thatching grass and poles) are the most popular forest products, collected by more than 40% of the households in all the sites (Table 5). However, these are collected mainly for subsistence use (>90%). Timber is collected by few or no households in most sites. Lutale is the main commercial timber area and 16% of the households earn on average ZMK606,250 per year from these sales. However, households in Paul Kalemba and Nseluka make even better money with timber production: ZMK4.5 million and ZMK1.4 million respectively, though only a few households are involved.

Wild foods, which are common in different vegetation types, such as tubers, fruits and mushrooms are also collected by many households in all the villages. Selling wild fruits is not very common in all the villages (<10%), although in Nseluka households earn on average ZMK108,000 from the sale of fruits (Table 6). Mushrooms are collected by more than half of the households in all the areas, but very few households sell them (<10%). Selling mushrooms is most profitable in Katanino, where they fetch ZMK30,000 per 25 kg bag and selling households earn on average ZMK300,000. This is likely to be related to the access to urban markets in Ndola and Kitwe. The prices of tubers were higher in village markets around Kasama and Mpika than

in Ndola Rural and Mumbwa. This variation is mostly related to differences in tuber species harvested and sold by households in these areas. Whereas *chikanda* (see above) is the most commercially valuable tuber harvested by rural households in Kasama and Mpika, households in Mumbwa harvest *busala* (eaten as a snack) for own consumption and for sale in local and district markets. Because of the high demand and over-exploitation, populations of *chikanda* have been depleted in most wetlands where they occur. As a result, the local and urban price of *chikanda* has increased significantly over the last decade and this trend is expected to continue to increase until households domesticate the tuber.

Caterpillars, on the other hand, are limited to certain areas, being most commonly collected in Kopa and Lwitikila, where more than three quarters of the households collect *chipumi* caterpillars (Table 5). Moreover, *chipumi* caterpillars (popular and high priced in urban markets) provide cash income for 58% and 62% of the households in Kopa and Lwitikila, respectively (Table 6). Caterpillars are very seasonal and are only collected in November and December, providing households on average more than ZMK300,000 per season in cash. In the other villages few or no households collect caterpillars, rarely *chipumi* and mostly for own consumption.

Table 5: Average value of gross production of forest products for user households in eight villages (Zambian Kwacha. Values in brackets are the percentages of user households in total population)⁵

Forest product	Paul Kalemba (Kasama)	Nseluka (Kasama)	Kopa (Mpika)	Lwitikila (Mpika)	Katanino (Ndola)	Lutale (Mumbwa)	Nalusanga (Mumbwa)	Chibuluma (Mumbwa)
Timber	1,957,500 (4%)	980,000 (4%)	77,813 (11%)	0	0	565,313 (21%)	562,667 (11%)	145,000 (8%)
Poles	103,654 (49%)	77,063 (34%)	79,107 (58%)	65,906 (43%)	69,250 (59%)	53,109 (84%)	55,134 (75%)	69,362 (73%)
Charcoal	835,890 (25%)	42,000 (15%)	119,813 (38%)	21,375 (11%)	713,045 (54%)	259,286 (37%)	314,500 (18%)	192,000 (13%)
Grass	95,673 (69%)	176,962 (73%)	78,576 (90%)	52,121 (89%)	68,414 (71%)	55,781 (84%)	58,435 (84%)	85,406 (80%)
Mushroom	56,485 (71%)	93,840 (65%)	38,986 (71%)	19,266 (51%)	135,509 (56%)	14,619 (68%)	16,482 (62%)	13,559 (70%)
Firewood	194,043 (86%)	283,903 (87%)	225,600 (89%)	166,121 (33%)	370,800 (85%)	189,000 (95%)	231,176 (93%)	248,788 (83%)
Tubers	45,540 (26%)	79,380 (14%)	45,190 (51%)	52,500 (76%)	71,360 (15%)	46,240 (63%)	51,985 (60%)	29,593 (58%)
<i>Mumpa</i> caterpillars	721,950 (15%)	45,000 (1%)	144,205 (30%)	136,688 (22%)	54,000 (5%)	0	0	0
<i>Chipumi</i> caterpillars	102,000 (14%)	150,000 (1%)	349,552 (79%)	299,893 (76%)	750,000 (2%)	0	0	0
Other caterpillars	76,075 (29%)	32,676 (28%)	12,460 (4%)	31,500 (5%)	64,960 (7%)	0	12,852 (9%)	17,080 (8%)
Fruits	282,633 (54%)	34,278 (42%)	53,108 (63%)	54,766 (57%)	39,086 (39%)	59,675 (63%)	44,940 (67%)	48,235 (65%)
Woodcarving	14,400 (13%)	75,000 (6%)	11,250 (5%)	24,000 (5%)	93,000 (5%)	43,500 (21%)	24,000 (2%)	58,500 (5%)
Reed	16,500 (4%)	14,625 (6%)	139,500 (8%)	36,750 (16%)	0	0	929,250 (4%)	9,000 (3%)
Honey	73,333 (8%)	200,000 (1%)	82,813 (11%)	62,143 (19%)	204,091 (27%)	415,833 (47%)	216,667 (38%)	292,500 (40%)

⁵ US\$1.00 = Zambian Kwacha (ZMK) 4200 as of 2005

Table 6: Average value of sales of forest products for user households in eight villages (Zambian Kwacha⁶. Values in brackets are the percentage households trading each product, in total population)

Forest product	Paul Kalembe (Kasama)	Nseluka (Kasama)	Kopa (Mpika)	Lwitikila (Mpika)	Katanino (Ndola)	Lutale (Mumbwa)	Nalusanga (Mumbwa)	Chibuluma (Mumbwa)
Timber	4,500,000 (1%)	1,432,500 (3%)	105,000 (3%)	0	0	606,250 (16%)	600,000 (9%)	300,000 (3%)
Poles	0	0	69,000 (3%)	0	0	61,875 (11%)	237,000 (4%)	52,000 (8%)
Charcoal	1,889,250 (10%)	62,400 (7%)	293,850 (7%)	18,000 (3%)	743,921 (46%)	103,750 (11%)	806,667 (5%)	30,000 (3%)
Grass	80,000 (1%)	20,000 (1%)	66,000 (5%)	40,000 (3%)	60,000 (5%)	32,500 (8%)	85,125 (7%)	16,500 (5%)
Mushroom	166,320 (4%)	38,640 (6%)	47,568 (7%)	19,080 (8%)	300,000 (7%)	3,600 (3%)	0	14,400 (3%)
Firewood	0	0	360,000 (1%)	12,000 (3%)	92,000 (5%)	10,000 (3%)	0	25,000 (3%)
Tubers	54,852 (6%)	33,600 (4%)	99,840 (10%)	51,660 (11%)	168,000 (5%)	79,360 (8%)	7,200 (4%)	14,880 (5%)
<i>Mumpa</i> caterpillars	No data	0	119,040 (21%)	170,400 (8%)	0	0	0	0
<i>Chipumi</i> caterpillars	103,875 (5%)	0	328,429 (58%)	309,522 (62%)	0	0	0	0
Other caterpillars	27,216 (6%)	0	0	42,000 (3%)	78,960 (2%)	0	0	0
Fruits	55,800 (5%)	108,000 (1%)	40,000 (8%)	67,520 (8%)	74,480 (7%)	0	0	0
Woodcarving	0	150,000 (1%)	0	30,000 (3%)	0	41,400 (13%)		105,000 (3%)
Reed	0	18,000 (1%)	450,000 (1%)	22,500 (3%)	0	0	913,500 (4%)	0
Honey	63,333 (4%)	200,000 (1%)	77,917 (8%)	31,250 (5%)	356,000 (12%)	438,462 (34%)	324,750 (18%)	334,889 (23%)

⁶ US\$1.00 = Zambian Kwacha (ZMK) 4200 as of 2005

Collecting wild honey or keeping bees is practiced by on average about 20% of the rural households, with most honey produced in Mumbwa district, where up to half of the households are involved (Table 5). This study did not include Northwestern province where an estimated 70% of the countries beekeepers live. Revenues from honey sales at household level are highest in Mumbwa district and Katanino: between ZMK325,000 and ZMK450,000 per year (Table 6).

Selling reed mats is the most profitable forest-based activity in Nalusanga and Kopa, where selling households earn on average ZMK913,000 and ZMK450,000 per year, respectively, although very few households are involved (Table 6). Similarly, woodcarving may be quite profitable (i.e. in Nseluka and Chibuluma) but it is not practiced on a large scale anywhere.

4.2.3 Who benefits from dry forests?

In this section, we analyze how dry forests benefit the poor and the not-so-poor, and the determinants of forest income. It is clear that income earned by households in the top wealth quartile from forest gathering is three times higher than that earned by poorer household (Table 7). The top quartile also stands out in terms of much higher values for agriculture, wage employment and trading than the three lower quartiles. It is particularly important that 64.5 percent of income is forest income for the poorest quartile but only about 12.1 percent for the richest quartile. The share of income from employment and remittances to total household income was relatively small for all quartiles.

Table 7: Livelihood sources by income quartiles (Zambian Kwacha)⁷

	Income source per income quartiles*			
	0-25%	25-50%	50-75%	above 75%
Total income per capita	113,750	262,832	462,828	2,021,277
Total forest income per capita	73,362 (64.5)	125,768 (47.8)	147,730 (31.9)	245,302 (12.1)
Total agric. income per capita	32,444 (28.5)	96,967 (36.9)	250,379 (54.0)	1,035,985 (51.3)
Total employ. income per capita	2,047 (1.8)	10,642 (4.0)	16,109 (3.5)	146,471 (7.2)
Total trading income per capita	5,242 (4.6)	28,140 (10.7)	46,929 (10.1)	588,843 (29.1)
Total remit. income per capita	655 (0.6)	1,315 (0.5)	1,681 (0.4)	4,676 (0.23)

* Values in brackets are percentages of total income

We further examined how non-forest income and differences in household socioeconomic and demographic variables affect forest income. We did this by using the Tobit model and regressing total value of forest products harvested on a set of household and market variables. The regression results in Table 8 indicate that age of household head and household size are significantly and negatively correlated with forest income (P-values 0.07 and 0.0002, respectively). This suggests that the elderly and households with larger families depend less on forests as their primary source of income. The coefficient of non-forest income is positive and statistically significant and the square of non-forest income is negative and statistically significant. These results suggest that as non-forest income increases a household will initially increase harvests of forest products, but further increase in non-forest income reduce household's dependence on forests. These results have implications for policy makers, as programs that lead to increased household income outside forests are likely to reduce pressure on forests.

⁷ US\$1.00 = Zambian Kwacha (ZMK) 4200 as of 2005

Table 8: Determinants of the value of total forest income

Variable	Coefficient	Standard Error	P-value
Constant	-4.4569	3.4899	.2016
Age of household head	-.2112	.1166	.0701
Household size	-1.9913	.5279	.0002
Education level of household head	-.05339	.0664	.4211
Marital status of household head	-.08460	.1039	.4155
Gender of household head (1=male, 0= female)	.08669	.0869	.3184
Land holding size (acre)	.05139	.0365	.1591
Distance to markets (km)	.00960	.0655	.8836
Distance from homestead	.03115	.0871	.7206
Non-forest income (ZMK)	2.4601	.5270	.0000
Square of non-forest income (ZMK)	-.0839	.02034	.0000

Log likelihood function: -546.434, Sample: 431

We examined factors that influence household dependence on forest resources (Table 9). We obtained a negative relationship between forest dependence and non-forest income. Although the coefficient on the squared term has a negative sign, it is not significant. This implies that increases in household income lead to a substantial reduction in household dependence on forest resources. These findings correspond with results from Chileshe (2005) in Northern Province who found that poorer households consumed wild foods more frequently, and also collected them to trade with wealthier households for agricultural crops.

Table 9: Determinants of forest dependence measured as a ratio of total forest income to total household income

	Variable	Coefficient	P-value
Constant	2.9177	.2820	.0000
Age of household head	-.0656	.0347	.167
Distance to markets (km)	.0118	.0194	.5437
Non-forest income (ZMK)	-.1521	.0255	.0000
Square of non-forest income (ZMK)	-.00063	.0009	.4822
Sigma	.2620	.0089	.0000

Log likelihood function: -34.29272, Sample: 431

5 Contribution of forests to the national economy

5.1 Forest products contributing to the national economy

Perhaps most important in Zambia is the contribution of forests to the nations energy needs, with dry forests providing about 70 percent of the energy needs (Ministry of Finance and Planning, 2002). Woodfuels (firewood and charcoal) are by far the largest energy source in Zambia and the major commercial forest product from indigenous forests. Annual consumption of woodfuel was more than 7.2 million tons in 2002 (FAO, 2005). Two thirds of this woodfuel is consumed in rural areas where almost all households depend on firewood for domestic use. Chongwe district alone, for example, supplied an estimated 61,000 tons of charcoal to Lusaka markets in 2000, with a total value of US\$ 2.1 million (Chidumayo, 2001). Approximately 72 percent of households in Lusaka use charcoal for cooking and heating while 10 percent use firewood (Kalumiana, 1997). Charcoal consumption increased from 174,000 tons in 1990 to 245,000 tons in 2000 and is projected to reach more than 500,000 tons by 2020 (Chidumayo, 2001; Frey and

Neubauer, 2001). Most charcoal comes from Lusaka, Central and Copperbelt Provinces and is sold at municipal markets, by the roadside or at homesteads (Kalumiana, 1997).

Another important product is honey. Beekeeping first became a commercial activity in Zambia when Portuguese traders from Angola came searching for beeswax in the 1890s (Clauss, 1992). The beekeeping sector was recorded as the third largest employer in Kabompo district, Northwestern Province, in 2004 (Kaitisha, 2007). Two large companies export approximately 400 metric tons of certified organic honey per year, mainly to the UK (55%) and Germany (35%) (ITC/DTCC, 2007). Official export earnings from honey and beeswax have increased significantly since 2001, as more players become involved in the sector with the growing global demand for organic honey (Figure 2).

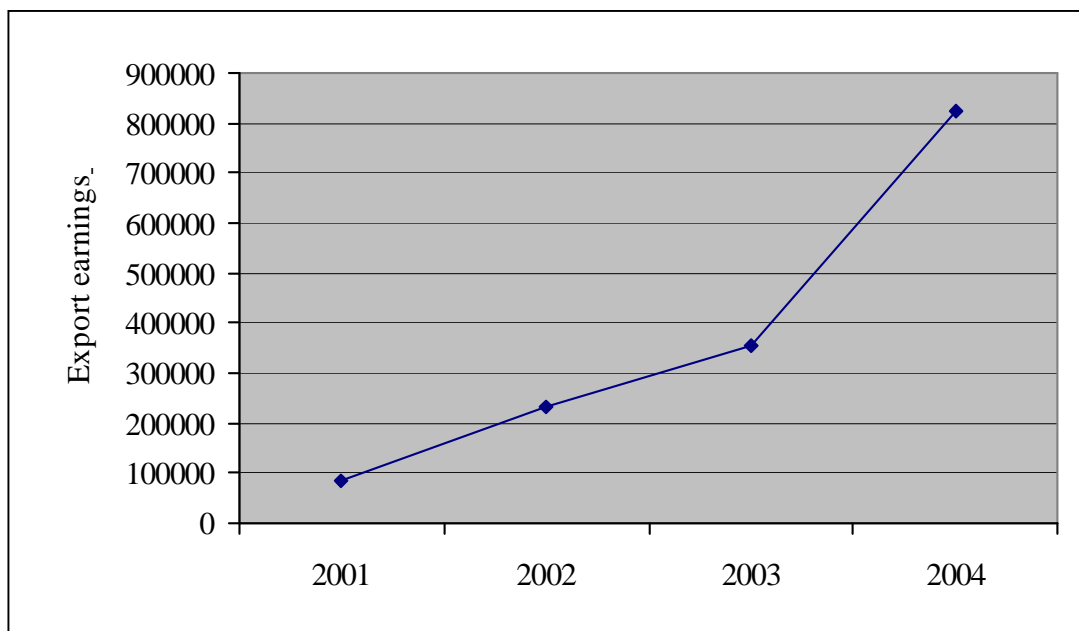


Figure 2: Export earnings from honey and beeswax, in US\$ (Kaitisha, 2007)

A significant amount of the beeswax is bought by informal Tanzanian traders to supply the cosmetics industry in Eastern Africa (Mickels-Kokwe, 2006). The local market is dominated by informal traders. Mulenga and Chizuka (in Mickels-Kokwe, 2006) estimate that each year 600-700 metric tons of the honey is transformed into honey beer and sold by homestead traders in rural and urban areas. Two other large companies target the national market and process and pack honey to supply retailers in urban areas. Additionally, the number of registered and unregistered smaller companies and individuals processing and packaging honey is increasing. Value addition for table honey is significant: farm gate prices range between US\$0.5 and US\$0.8 per kg (depending on the buyer) and retail prices in urban areas are approximately US\$3.80 and US\$5 per kg, for hawkers and shops, respectively (Husselman, unpublished data 2007). Production and processing technologies for honey and beeswax are still very basic in Zambia and there is a huge potential for improving production levels and value addition. Moreover, honey has the reputation of being a health food both locally and abroad and the demand is expected to continue growing in both markets (SNV, 2005; ITC/DTCC, 2007).

The total volumes of different forest foods collected and traded in Zambia are unknown, but the literature suggests that the size and impact on the natural resource, and the contribution to the national economy could be significant. The Zambian market also influences neighbouring countries. For example, Davenport and Ndangalasi (2003) estimated that between 2.2 and 4.1 million orchid plants consumed in Zambia come from Tanzania. The roots of orchids from the genera *Disa*, *Habenaria* and *Satyrium* form the main ingredient for a favourite snack called chikanda. The pounded roots are mixed with peanuts and boiled to represent a meat-like cake, which is eaten in a sandwich or as a relish with maize, sorghum or cassava (Bingham, 2004). Based on a survey at the Soweto wholesale market in Lusaka in 2000, Puustjärvy *et al.* (2005) estimate that the total volume of chikanda traded in urban markets across the country exceeded 214 tons. The added value from chikanda trade at retail level was estimated at about ZMK1 billion. Further, taking into account the processing of chikanda tubers into “polony” (assuming at least 50% is sold as “polony”), the added value from chikanda trading would be in the range of ZMK1.36 billion or US\$375,000 per annum (at 2001 prices) (Puustjärvy *et al.* 2005). The large urban demand and declining wild stocks in Zambia, related increase in market prices and lack of institutional capacity to manage the resource, have all caused the quantities harvested in Tanzania, where the use of chikanda is minimal, to reach unsustainable levels (Davenport and Ndangalasi, 2003).

Fresh mushrooms are another forest product for which urban demand exceeds local supplies, particularly during the dry season. In 2001 25.5 tons were imported from South Africa (Puustjärvy *et al.* 2005). There have been several attempts at exporting wild harvested mushrooms. In 1995, Amanita Zambiana Ltd. exported 31.5 tons of chantarelles to Europe. The company has since closed its mushroom operations. More recent figures are from The Miombo Project in Mpongwe, which exported 1.5 tons of dried wild mushroom in 2002 from an organically certified forest of 185,000 ha (Puustjärvy *et al.* 2005).

It is expected that medicinal plants make a major contribution to the Zambian economy, but data is generally lacking. Approximately 40,000 traditional healers, known as *n’ganga* in most Zambian languages, are active in Zambia. They may account for 35 to 60 percent of total household expenditure on healthcare (Phiri and Tien, 2004). Due to the holistic belief system on which healthcare is based in African cultures, traditional medicines are often considered to be irreplaceable by modern medicine. Certain types of epilepsy, for example, are believed to be caused by witchcraft and can only be cured by a *n’ganga* who is able to divine the ingredients used to inflict this witchcraft. The same ingredients are thereafter used as an antidote. This concoction consists of parts of insects or animals which have conversions themselves, mixed with plant parts (Baskind and Birbeck, 2005). Traditional treatments are also believed necessary for problems related to fertility and potency (Spring 1980). Commercial markets for medicinal plants are dominated by herbal material that is dried (roots and bark) or has a long shelf-life (bulbs and seeds). Aphrodisiacs derived from plants are sold as bottled preparations and a common sight in urban markets (Cunningham, 1993). Nevertheless, the trade in medicinal plants and animals in Zambia is small compared to those of other countries with larger urban centres, e.g. South Africa (Williams, 2000; Dold and Cocks, 2001). As a result, overexploitation due to commercial harvesting is rare. Other activities, such as logging, however, have been reported to threaten populations of medicinal plant species such as *Pericopsis angolensis* (Cunningham, 1993). Conversion to Christianity seems to influence people’s perceptions on modern medicine,

but,
to the

**Table 10: Contribution of natural resources to the
Zambian economy in 2005**

due
HIV

Sector	Contribution to GDP (%)
Forestry	5.2
Fishing	2.4
Agriculture	6.5
Mining & quarrying	8.6
Electricity & water	2.6
Manufacturing	10.6
Subtotal	35.9
Other	64.1
Total	100.0

Source: CSO (2006)

pandemic and lack of available, affordable modern pharmaceuticals, it is likely that traditional plant and animal-based medicine will continue to play a significant, and perhaps even increasing, role in Zambian healthcare (Ngubane and Höjer, 1999; Baskind and Birbeck, 2005).

Forests can contribute directly to income generation by providing formal and informal employment. The timber industry is a prime example of this: in the late nineties, roughly 2000 people found employment harvesting, transporting or processing saw-logs for timber (Puustjärvy *et al.* 2005). Between 1993 and 2003 the Zambia Investment Centre recorded 63 companies trading wood and wood products during the period (FSP, 2004). Most of the sawn-timber traded in Zambia is sold the furniture and mining industries, which consume approximately 15,000 m³ and 6000 m³ per year, respectively (Puustjärvy *et al.* 2005). Export earnings for wood and wood-based products increased from U\$ 0.9 million in 1994 to U\$3.3 million in 1997. However it has been estimated that the recorded commercial timber harvest from native hardwood forests (0.2 million m³/annum) and from plantation forests (1 million m³/annum) accounts for only 14% of Zambia's total wood harvest (9 million m³/annum). 86% of wood harvested is unrecorded fuel-wood and commercial wood (Kokwe 2004).

According to the official figures for Zambia, the forestry sector as a whole contributed 5.2% to total GDP in 2005 (Table 10). This is close to the estimated contribution of 6 percent for Africa (Oksanen and Mersmann, 2003).

Similar to agriculture, the contribution of forestry to GDP is low compared to mining and manufacturing. Given that GDP estimates capture traded products and not subsistence products, forests may be under-appreciated in national planning. Our household data shows that forest product use and sale contribute significantly to household economies and these may even exceed those derived from agriculture, which is commonly considered the most important livelihood strategy for rural households (Figure 1).

5.2 Contribution of forests to government revenue

In Zambia, forests contribute to government revenue through taxes, charges, fees and extraction royalties levied on forest operations. Table 11 shows revenue collection from forest operations by the Forestry Department between 1996 and 2003 by region/province. The sources of forest

revenue are mainly from major commercial forest products, such as timber, poles and woodfuels. Revenue from other forest products is minimal, and may be captured through income tax from registered traders, municipal market fees, or in the case of honey, for example, through export tax (see above for description of the honey market). However, such revenues will not be attributed to the forestry sector.

Table 11: National Annual returns from sale of Forest products and services (Inflation adjusted, Zambian Kwacha 2003)⁸

Province	1996	1997	1999	2000	2003
Central	Na	155,649,402	332,330,893	619,946,624	181,671,922
Copperbelt	557,432,328	1,071,409,818	734,448,003	981,059,942	178,541,505
Eastern	210,848,807	412,469,892	253,702,743	188,618,827	81,358,801
Luapula	-	61,494,262	196,257,863	85,470,291	48,589,732
Lusaka	144,587,197	423,016,120	435,161,357	386,660,843	144,809,605
Northern	505,128,284	82,487,724	522,560,297	93,941,596	56,770,501
N/western	111,548,606	313,804,642	275,374,991	250,202,377	73,700,522
Southern	503,907,948	415,934,053	391,794,053	353,414,824	165,903,549
Western	2,999,368	549,845,408	1,023,298,958	1,240,200,529	404,992,433
Divisions (Research, Nurseries, etc)	1,347,581,927	35,664,600	57,899,977	22,557,042	2,470,000
TOTAL	3,384,034,465	3,521,775,920	4222829,136	4,222,072,896	1,338,808,570

Source: Forest Department, (Various Years). Ministry of Tourism, Environment and Natural Resources, Lusaka

In general, low staffing levels in the relevant government departments have led to unsupervised logging and poor forest revenue collection (Ministry of Finance and Planning, 2002). In addition, the price of license fees discourages many producers to report their activities to the Forestry Department. Kokwe (2004) argues that increases in taxes on forest products, which have been introduced by the government during the past eleven years have directly contributed to the decrease in collected revenues. The introduction of Value Added Tax (17.5%) and a 2500% increase in forest tree licence fees in 1996, have forced reputable timber organisations out of business. Selling registered timber became a loss-making business as the price of raw materials did not match the market price of finished products. The increase in license fees did not, however, reduce the demand for timber and as a result the illegal trade increased. A change in the units of measure for licensing was introduced a few years later, which led to a second increase of license fees and a related rapid increase in illegal logging. An officer quoted by Kokwe (2004) stated “I don’t think Lusaka is getting the monies they envisaged. People have stopped paying, they are just cutting illegally.” A study in 2000 estimated that only 35 percent of the potential revenues of the stated traded volumes are collected. Moreover, this may even be reduced to 3.4 percent, taking into account the assumption that actual volumes produced and traded are likely to be much higher (Ng’andwe *et al.* 2006). It was estimated that the US\$103,858 collected through production and conveyance fees and penalties in 2000 captured less than 20 percent of the total collectable revenue from charcoal and firewood (Ng’andwe *et al.* 2006, Bwalya 2004). Furthermore, it has been suggested that as little as 1% of the revenue due from licence fees from the harvest and processing of round wood was being paid and the

⁸ US\$1.00 = Zambian Kwacha (ZMK) 4800 as of 2003

indications are that the revenue collection system has weakened further since then (FSP, 2004). As a third illustration of under-accounting of forestry resources, we take honey production. Only the 400 metric tons of exported honey will be recognised in the official accounts, while the estimated 600-700 metric tons of informally traded honey used for traditional beer will not be accounted for.

6 Discussion and conclusions

Forests provide important sources of livelihood income for rural people, and provide safety nets in times of need (Angelsen and Wunder, 2003; Coomes *et al.*, 2004; Takasaki *et al.*, 2004). In particular, rural households depend on forest and woodland resources to meet their energy needs, for construction and roofing materials, fodder for livestock, wild foods that support a healthy diet, and medicine. Moreover, forest product trade can be an important source of income (Oksanen and Mersmann, 2003). The situation in Zambia is no different, where forest income accounts for between 20 and 60 percent of the total household income (subsistence and cash) in the different study sites. Single forest products such as caterpillars, charcoal and honey may even provide more cash income than agriculture, although commercial forest production is determined by various conditions, including vegetation type and access to markets. Within communities some households are more forest-dependent than others due to a number of factors such as age, household size and level of non-forest income. The value of forest production is generally higher for richer households, but the value in relation to total household production is highest for poor households.

This raises important considerations for assessing the role of forests to poverty alleviation. Sunderlin *et al.* (2005) specify two types of poverty alleviation, applied at the household level, in association with forest resources. These are:

- Poverty avoidance or mitigation: forests resources serve a safety net function, or as a gap filler, including as a source of petty cash; and
- Poverty elimination: forest resources help lift the household out of poverty by functioning as a source of savings, investment, accumulation, asset building, and permanent increases in income and welfare.

This distinction appears important in the Zambia context, where it is the poorest of the poor who are most reliant on forest resources. The dry forests do not appear to function as a means to poverty elimination, by themselves, but are crucial to poverty mitigation, supplying huge inputs to the poorest of the poor. The key issue is how to preserve the role of forests as safety nets in locations where other forms of social insurance cannot take place. Two interrelated problems need to be solved: lack of security of access to the woodlands for the poor, and issues related to unsustainable harvests.

Urban demand for certain forest products (e.g. charcoal, caterpillars and honey) has created a vibrant trade, which provides cash income to thousands of rural households, often exceeding that from agriculture. This cash is often used to support other income generating activities, such as crop production. The data suggests that households may use forests to increase their investments in other activities and thereby their total income. As non-farm income increases, dependence on forest production decreases, but rich households continue to derive significant incomes from

forest products. Cash income from a single product, such as timber in one of our study areas (Paul Kalemba), may be more than double that of the average total annual income. Forests could thus also be seen as having a function of lifting people out of poverty, although not as a means alone. Increasing incomes at national level by increasing volumes produced is not a desirable solution, due to issues of sustainability and existing barriers such as accessibility of the forest resources and markets. Most forest products are traded as raw materials and value-addition could have the potential to increase incomes at household and national level. However, barriers that constrain rural enterprise development in general (e.g. poor infrastructure and market linkages) will need to be overcome. Private investment and access to financial services are thereby necessary. Moreover, a conducive policy environment could support forest-based enterprises as well as increase direct government income at national level, although raising the collected revenue will, in essence, be a direct tax on the poor.

Official statistics suggest that forestry contributes 5.2 percent to the GDP. However, this figure underestimates the contribution of forests to Zambian households, given that subsistence use and much informal trade is not captured in GDP calculations. A number of forest products are very important at national level, most notably charcoal and fuelwood. Dry forests are the primary source of household energy for more than 70% of the population. But there is also degradation and deforestation, as a result, for example, of charcoal production. Harvest needs to be placed on a sustainable footing, but one of the only solutions may be the substitution of woodfuel with other sources of energy.

In summary, the high level of dependence on forest resources should be important in driving policy processes related to forestry and poverty alleviation. This has not generally been the case, with perhaps honey being the exception. The importance of honey to both household and national income has been shown above. The Zambian government acknowledges the importance of beekeeping and is now formulating a policy for the sector.

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Annex 2: Farming or Foraging? Rural livelihoods in Mafulira and Kabompo districts of Zambia

M. Mutamba⁹

ABSTRACT

This study compares the income contribution of forest products with that of farm related activities such as cropping and livestock rearing. Quarterly income data collected over a period of one year are used to compile income profiles for households in two contrasting districts, Mufulira and Kabompo districts in Zambia. Villages in Mufulira are located within easy access to bustling mining towns in the province which provide lucrative markets for most products including those collected from the forest. Kabompo is located in a remote province with poor infrastructure and generally limited linkages with the urban sector. The results show an exceptionally high dependency on non-farm sectors such as forest collection and off-farm activities, compared to conventional farming sectors. Income from forest products and other non-farm activities cannot be regarded as ‘complementary’. These sectors should be recognized as a central part of local economies, needing financial, technical and institutional support to reach their full potential. Remote communities remain relatively poor compared to those in more accessible locations. In Mufulira, the ever-growing demand for charcoal as urban populations continue to grow present a major threat to sustainable forest management. Community consultations in Kabompo revealed numerous marketing problems due to poor infrastructure.

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⁹ Center for International Forestry Research and Rhodes University

1 Introduction

Making ends meet for rural dwellers across the developing world is a daily struggle. In sub-Saharan Africa, rural households typically pursue diverse livelihood portfolios, not because they have plenty of economic opportunities, but as a response to a range of constraints and risks. Foremost among these are the often marginal agro-ecological conditions for most forms of agriculture, low levels of asset endowment, and a generally unfavorable external environment (Mortimore 1998; Frost and Mandondo 1999; Frost et al., 2007). Frequent droughts, infertile soils, a declining forest resource base, lack of access to credit, difficulties in accessing vibrant markets for most products, and the deplorable state of most infrastructure and services are some of the key constraints to achieving a better life (Campbell et al., 2002; Frost et al., 2007). The interaction of all these factors over time has resulted in unacceptably high incidences of poverty among rural populations. A number of studies have concluded that as much as 80% of rural households are poor, while up to 70% of these are living in extreme poverty (Campbell et al., 2002; Nair 2004; Zambia CSO, 1998). Not only are these populations deprived materially, they are also severely disempowered by low levels of education, poor health, and a lack of adequate information and space to participate in making decisions that affect their lives.

While understanding how rural households manage to cope with this suit of constraints and still sustain a means of living remains a daunting challenge, crafting viable intervention strategies to transform rural livelihoods is even more elusive. For example, a lack of good empirical studies demonstrating the links between key facets of rural livelihood systems such as forests and other natural resources, and poverty alleviation efforts has led to these aspects being underestimated or completely ignored in local and national development strategies such as Poverty Reduction Strategy Papers (PRSPs) (Oksanen *et al.*, 2003). Although it is now widely acknowledged that forests and other natural resources play a central role in local and national economies (Kaimowitz, 2003; Angelsen and Wunder, 2003, Sunderlin *et al.*, 2003), compelling proposals for policy reform and investment options to support poverty alleviation efforts are hard to come by.

Because of this complexity and the associated lack of clear understanding of rural systems, successful development initiatives to transform livelihoods remain few and far between. Often, aspects of people's lives that have been targeted as being the most limiting and needing support have tended to yield little or no improvements (Sayer and Campbell 2004; McNeely and Sheer, 2001). Given the complex and multifaceted nature of rural livelihoods, it's hardly surprising that simplistic and sectoral approaches to solving rural poverty have largely failed (Campbell et al., 2002; Sayer and Campbell, 2004). Achieving ambitious targets such as those envisaged in the Millennium Development Goals will definitely require much more dramatic solutions, across many sectors, tackling a suit of constraints at various scales (Campbell et al., 2002). A number of studies have now demonstrated that in many cases less recognized aspects of rural economies such as foraging for forest products, undertaking off-farm employment and reliance on remittances can be just as important, if not more important to household livelihood than conventional activities like agriculture (Byron and Arnold, 1999; Shackleton et al., 2006; Vedeld et al., 2004, Monela, 1999). As a result of such work leading development agencies such as the World Bank and other practitioners now believe that forest resources need to play a major role in strategies for fighting rural poverty (World Bank, 2001).

Despite studies showing that rural households collect a wide range of goods and services from forested landscapes, demonstrating the links between this central role of forests in rural livelihoods and efforts to reduce rural poverty has been a missing piece in for many such studies. Without this vital piece most studies have been forced to conclude that benefits from forest resources remains limited to subsistence and safety net functions, offering few or no opportunities for local people to lift themselves out of poverty (Campbell, 2002; Angelsen and Wunder, 2003). Arnold and Townson (1999), Kaimowitz (2003) and Shackleton (2006), emphasized the way income from forests complements other income sources, helping fill gaps in annual flows although they hardly present viable options for poverty reduction. Sayer and Campbell (2004) make a vital point that lack of poverty alleviation potential is not unique to forest resources as this effort will require multifaceted actions, addressing constraints at various scales in the full range of sectors that make up rural economies.

In trying to explaining the same paradox, Angelsen and Wunder (2003) argued that the very same characteristics of most forest products that make them important and widely accessible to the poor also often limit their potential to lift people out of poverty. Key among the weaknesses of forest product based development that has been identified by various studies include the lack of well-developed markets on which these products can be traded, resulting in these products often fetching low values (Campbell et al., 2002; Angelsen and Wunder 2003; Kaimowitz, 2003). The generally dispersed population patterns and low buying power of rural households often limit the size of rural markets for forest products (Angelsen and Wunder 2003). Besides it is often cheaper for rural households to collect their own forest products, only buying those they can't access due to scarcity or labour constraints. Whilst urban centers have the potential to generate significant demand for forest products due to the dense populations and relatively higher buying power of households, improved access to more modern substitutes limit the demand for forest products. Many of the forest products are often 'inferior' goods which are often replaced in the household consumption basket by more preferred substitutes as income increases. The remoteness of most locations where forest products are found also makes access to urban markets more complicated and costly, especially for individual households operating with small volumes (Frost and Mandondo, 1999; Frost et al., 2007). The seasonal nature of most forest products also makes market development more difficult and income flows inconsistent due to supply fluctuations. All these factors limit the potential of forest based enterprises to grow into sustained sources of household income and capital accumulation that would allow households to escape poverty.

The challenge of embracing complexity and unraveling the vital pieces that drive rural systems comes with the need for new approaches and methods for understanding the 'less conventional sectors' of these economies (Sayer and Campbell, 2004). Available data collection instruments such as those used by most countries in Living Cost Monitoring Surveys (LCMS) hardly capture incomes from forests and other natural resources. These simplistic approaches have resulted in data hardly reflecting the reality of rural economies as households are broadly treated as 'farmers', resulting in the neglect of vital non-farm facets of rural livelihoods. A few studies already show that as much as a third of rural household income comes from forests and other environmental resources (Cavendish 1997; Shackleton and Shackleton 2000; Campbell et al., 2002; Vedeld et al., 2004).

Using an innovative approach for capturing the contribution of forests and other less conventional income sources to rural livelihoods, this study compares the income contribution of forest products with that of farm related activities such as cropping and livestock rearing. Quarterly income data collected over a period of one year is used to compile income profiles for households in two contrasting districts, Mufulira and Kabompo districts in Zambia. Villages in Mufulira are located within easy access to bustling mining towns in the province which provide lucrative markets for most products including those collected from the forest. Kabompo is located in a remote province with poor infrastructure and generally limited linkages with the urban sector. The overall hypothesis for the study is that under both scenarios, income from forests is central rather than just complementary to household livelihood. It is also the assertion of the study that in many circumstances, less conventional aspects of local livelihoods such as collection of forest products and other non-farm activities are increasingly more important sources of income than farm-related activities such as cropping and livestock rearing.

Section 2 provides a detailed account of the methods used in the study, including a description of the study area, the survey instruments used and sampling and income accounting methods. The structure of local livelihoods is described in Section 3 where key household assets and activities are summarized. Section 4 dwells on the composition of household income from the suite of activities they undertake and also compares the structure of household income across the two study sites. Section 5 concludes with a discussion of the results, emerging trends in the study areas and their implications on the contribution of forests towards local livelihoods.

2 Methods

2.1 The study sites

The study was conducted in villages from the districts of Mufulira and Kabompo in Zambia's Copperbelt and Northwestern provinces, respectively (Table 1). The selected villages in Mufulira district (Sosala and Village No. 14) are situated within easy access (10-70 km) of a network of mining towns of Kitwe, Mufulira and Chingola, and Zambia's second largest city of Ndola. Both villages are located not more than 5 km from a tarred road connecting them with urban centers. The border post into the Democratic Republic of Congo (DRC) is less than 5 km from Sosala village, allowing vibrant cross-border trading in various commodities. In sharp contrast to Mufulira, Kabompo district is located towards the Angolan border and remains largely remote from urban centres, only connected by a gravel road to the provincial centre Solwezi, some 370 km away. The selected villages in Kabompo - Nkhulwashi and Maveve - are located 23 km and 69 km, respectively, from the district centre.

Historical background and institutional systems

The people of Mufulira and Kabompo share their origins in the Congo from where they are said to have migrated during the early part of the 19th century. While other groups came directly and settled in the northern part of the country, some groups settled briefly in Angola before civil strife forced them to proceed further south to settle in northwestern Zambia. Despite the common history these communities now exhibit significant differences in their livelihood systems, largely shaped by broader development trends in the country. The lure of copper mining in the Copperbelt province led to rapid economic growth, improved infrastructure, higher population pressure, higher rates of urbanization and generally more diverse livelihood

opportunities. In contrast much of Northwestern province remains geographically remote from urban centers, with poor access roads and other infrastructure, resulting in limited livelihood opportunities.

Traditional governance arrangements still form the core of the institutional system in Kabompo district, with all land held by the chiefs in trust for their people. Land allocation decisions are the jurisdiction of the chief in consultation with local village headmen. These traditional structures are largely regarded as legitimate and highly effective in enforcing a range of local rules that govern resource use and conflict resolution although pressure from outsiders over access to key resources constantly expose the system and bring about suspicion of corrupt practices. Although parallel state governance structures exist in the district, they work closely with the traditional system as they often lack the resources and capacity to independently enforce rules especially at the local level.

A markedly different institutional landscape is in place in Mufulira district where the traditional system is almost non-existent and state structures control all facets of local governance. Although the study sites are regarded as rural, much of the land is either state land or held by local councils. Villages have mostly been established through contestation with the state especially over state forests. Cases of illegal settlements and encroachment onto state or council land are rampant and often political pressure results in state forests being degazetted to legalize such occupation. High population pressure and economic expansion in the district means that pressure on resources, especially land, will continue into the foreseeable future.

More recently development oriented institutional systems have also appeared in both districts as is the case elsewhere across the country, often driven by NGOs and other development agencies. These have largely aimed at improving local organization for resource utilization and empowering resource users to deal with various challenges such as productivity enhancement and marketing of products. Discussions with locals reveal that effectiveness of these institutions often depends on the level of outside facilitation and cases of collapse are common once outside help is withdrawn.

Population and Poverty Status

During the last census in 2000, Zambia was estimated to have a population of about 10.5 million with about 65 percent of the population living in the rural areas. Due to high economic activity associated with the mining industry, Copperbelt province had the highest population (1.6m) and the highest proportion (75%) of urban population, while Northwestern province had the lowest population (580 000) and also the lowest urban proportion (12%). Copperbelt province also exhibits some of the highest population densities in the country, estimated at about 50 persons per square kilometer, while Northwestern province is the lowest with just 5 persons per square kilometer although this is increasing fast, almost doubling between 1980 and 2000 (Govt Zambia CSO, 2000).

In Zambia, chronic poverty is widespread. According to a 1998 Central Statistical Office (CSO) survey report (CSO Living Conditions Monitoring Survey, LCMS, 1998), 73% of the population is classified as poor, of this 50% is extremely poor¹⁰. The acute levels of poverty are more concentrated in rural areas where up to 83% of the population is classified as poor (compared with 56% in urban), while 71% of these are extremely poor. Provincial patterns are more or less the same, with the less developed provinces exhibiting higher incidences of poverty. As is the case in other countries in sub-Saharan Africa, female-headed households are highly vulnerable due to low asset endowment and the generally disempowering socio-economic circumstances (Campbell et al., 2002). About 19.5% of households in Zambia's rural areas are female-head

Table 1. Summary of characteristics of study districts

<i>Characteristic</i>	<i>Mufulira –Copperbelt Province</i>	<i>Kabompo – Northwestern Province</i>
<i>Type of forest</i>	<i>Miombo, mostly degraded, except on some state forests</i>	<i>Pristine miombo, little signs of deforestation</i>
<i>Important forest products</i>	<i>Firewood, Charcoal, mushroom, fruits, caterpillars</i>	<i>Firewood, timber, honey, fruits, mushroom, caterpillars, bushmeat, thatching grass</i>
<i>Traded forest products</i>	<i>Charcoal, mushroom, fruits, caterpillars</i>	<i>Honey, timber, thatching grass</i>
<i>Distance to nearest town</i>	<i>21 km</i>	<i>365 km</i>
<i>Access road</i>	<i>Villages less than 5 km from tarred road</i>	<i>Gravel road, in deplorable state during rains</i>
<i>Pressure on resources</i>	<i>High population density, 50ppkm² high incidence of encroachment on forest reserves</i>	<i>Low population density, 5 ppkm², little apparent competition for resources</i>
<i>Agro-ecological conditions</i>	<i>High rainfall, (>1200mm), acidic sandy soils</i>	<i>High rainfall, (>1500mm), Kalahari sands</i>
<i>Institutional setup</i>	<i>State structures allocate resources, externally-driven development related formations, no traditional structures</i>	<i>Traditional structures dominate, chief makes key decisions in resource allocation, externally-driven development related formations, parallel state structures but hardly influence resource allocation.</i>

(17.6% in urban) and of these 93% are poor and 85% are extremely poor (Govt of Zambia CSO, 1998).

Agro-ecology and natural resources

Both study sites are located on Zambia's Northern Zone III high rainfall ecological belt covering Northern Luapula, Copperbelt and Northwestern provinces. This region is part of the Central African plateau which is characterized by high average annual precipitation of 1200 mm and above and has a growing season of up to 190 days. The high rainfall has resulted in considerable leaching, resulting in highly acidic sandy soils which limit crops that can be grown in this area. The main vegetation type is miombo woodland with *Brachystegia* and *Julbernardia* as the dominant species. A wide range of timber and non-timber products from these woodlands provide households with energy for heating and cooking, food, medicines and structural materials for construction.

¹⁰ The poverty line is determined as the amount of monthly income that is required to purchase basic food to meet minimum caloric requirement for a family of six (PRSP 2002)

2.2 Sampling and data collection

The central objective of the study is to understand how differences in market access due to remoteness and infrastructural differences influences the contribution of forest products to livelihoods of rural households. To enable this comparison two study sites (Mufulira and Kabompo) were chosen as they provide contrasting attributes with respect to market access (see Table 1). In each study site two villages were selected and 50 households from each village were randomly selected for the household survey (Table 2). The four villages in the two study sites have a combined population of 532 households. In each of the four selected villages, a complete household list was compiled and a random sample was taken to select the 50 households, giving a total sample of 200 households.

Table 2 Sampling of households

<i>Characteristic</i>	<i>Kabompo</i>			<i>Mufulira</i>			<i>All households</i>
	<i>Maveve</i>	<i>Nkhulwashi</i>	<i>Total</i>	<i>Sosala</i>	<i>No.14 miles</i>	<i>Total</i>	
<i>Total number of households</i>	104	148	252	97	173	270	522
<i>Number of selected households</i>	50	50	100	50	50	100	200

Survey Instruments

The two main instruments for collection of data for this study were a household questionnaire and extensive community consultations. The survey was conducted as a quarterly household income survey over a 12 month period starting late November 2005. The survey instrument paid particular attention to the need to ask questions that do not require long-term, detailed memory, and therefore are answerable with a high degree of accuracy. To achieve this, highly disaggregated data was collected, and then aggregated at the data analysis stage.

The focus of the survey was on tracking the quantities and values of various outputs households obtain from their various livelihoods activities, and the costs associated with these activities. As the focus of the study is on understanding the role of forest resources in local livelihoods, special attention was given to collection of forest products. Because of the seasonal fluctuations in availability of most forest products, data was collected quarterly. The short recall period also ensures a higher likelihood of accurate responses from respondents.

Community consultations were also conducted throughout the survey year, initially to mobilize community members to participate in the survey, and subsequently to gain an understanding about more subtle aspects of life in the study sites. A total of 10 small group¹¹ meetings and 2 large meetings were held in each village during the survey year. Various key informant in-depth interviews were held as follow-up to group discussions and also to investigate interesting individual or household activities. Participation in various village and household activities such as school meetings, funerals, weddings, traditional ceremonies, fishing and honey hunting revealed numerous aspects of people’s lives that could not be captured through formal data collection.

¹¹ Small group meetings comprised about 10-15 participants although 5-7 participants were preferred for specific issues requiring expert opinion. Large meetings usually involved most people in the village, sometime numbering more than 50 participants.

Income accounting procedures

Total household income is calculated as the value of products produced or collected by households from the various activities they undertake. Household labour is not accounted for in household production activities although payments for labour for activities undertaken outside the household are recorded as household income. Prices that are used for valuing products are based on the average of actual market prices reported but in cases where such prices were not available, these were derived using local household’s willingness to pay for such products.

3 Structure of local livelihoods: The assets

3.1 Human capital

Perhaps the most important resource for rural households is the capabilities of its members in transforming other assets into livelihood benefits. Aspects such as demographic composition, health and education levels of members are often related to household’s wellbeing (Mortimore 1998). Average household size is slightly higher in Kabompo than Mufulira (Table 3) perhaps because households in Kabompo are less integrated with the wider economy due to remoteness and so there are limited opportunities for family members to leave home. Lack of easily accessible health facilities in Kabompo may also affect household ability to plan families.

Most households have 2 to 3 members who are in the productive age group and are responsible for much of household activities. Household heads as young as 21 years are not uncommon due to various reasons that include HIV/AIDS and early school dropouts which were noted as major problems during community consultations. During most school days dozens of kids could be seen wondering about with no intention of going to school. An average of just over 5 years of schooling for heads of households in both sites suggests a history of little emphasis on education in these communities. The dilapidated state of most schools especially in Kabompo confirms the level of neglect in the education sector.

Table 3: Household characteristics by district and village¹²

<i>Characteristics</i>	<i>Kabompo</i>			<i>Mufulira</i>			<i>All households</i>
	<i>Maveve</i>	<i>Nkhulwashi</i>	<i>Total</i>	<i>Sosala</i>	<i>14 miles</i>	<i>Total</i>	
<i>Household size</i>	6.6 (2.75)	6 (2.95)	6.3 (2.85)	5.2 (2.47)	4.5 (2.48)	4.9 (2.49)	5.6 (2.77)
<i>Number of productive members</i>	3.2 (1.57)	3 (1.74)	3.1 (1.65)	2.6 (1.39)	2.4 (1.47)	2.5 (1.43)	2.8 (1.57)
<i>Age of household head</i>	45.1 (14.12)	47.9 (17.78)	46.5 (16.04)	48.6 (15.37)	45.6 (14.44)	47.1 (14.91)	46.8 (15.44)
<i>Household head years in school</i>	5.2 (3.07)	5.2 (3.46)	5.2 (3.25)	5.9 (3.26)	5.8 (3.75)	5.8 (3.50)	5.5 (3.39)
<i>Percentage of female-headed households</i>	8	24	16	14	28	21	18.5

3.2 Natural resource base

The dominant feature of the landscape in both study sites are the vast tracks of miombo woodland, punctuated by stretches of open grassland on the plains. Forest resources play a

¹² Figures in parenthesis are standard deviations

central role in people's livelihoods. Firewood and charcoal provides energy to all the households in the study areas while a wide range of non-timber products that include honey, mushrooms, fruits, medicinal plants, thatching grass and game meat are extracted for subsistence use and sale. Close to 75% of the sampled households in Mufulira reported some of their highest cash income from charcoal sold in nearby towns and on the roadside. In Kabompo the woodlands remain largely intact due to low population pressure and limited influence from outside. More than 95% of the households walk less than 5 minutes to the edge of the nearest forest where they collect most products. Kabompo district is renowned as the source of the high quality organic honey which fetches good prices on the export market. The district is also a source of high value hardwood timber that is sold locally and also exported to South Africa. However, only 4% of the households in the sample reported income from timber harvesting due to the high start-up costs associated with getting timber to the markets.

Cropland is a highly valuable resource in both study sites and 97% of the households in the sample own cropland, averaging 3.7 hectares. Maize was ranked as the major crop by about 64% of the households. Other important crops include cassava, groundnuts, beans, sweet potato and a variety of vegetables.

3.3 Physical assets

Infrastructure such as roads, water sources, schools and clinics are in relatively good state in Mufulira compared to Kabompo. All the villages in the sample in Mufulira are located less than 5 km from a tarred road that links them with an urban centre. Kabompo is linked to the nearest urban centre Solwezi, 370 km away, by a gravel road that is often in a deplorable state. During the rainy season a bus ride to town can easily take two days as the condition of the road further deteriorates, with some sections becoming almost impassable by most cars. The poor connection with other parts of the country has limited trade of locally produced goods to mainly local transactions within the district. Access to other facilities like clinics and schools is also severely limited in Kabompo with most households having to travel as much as 60 km to the nearest service centre.

Ownership of productive assets among households in both sites is very low, compromising ability to undertake key activities such as land preparation and transportation of goods. For example only about 2% of households reported owning a plough. Perhaps an indicator of the importance of forests in local livelihoods is the significant number of households owning ripping saws (5%) The most popular asset is a radio which was reported in about 54% of the households. Bicycles are also very important as a means of transport and are widely owned (40%).

3.4 Financial resources

For most households in the study sites access to cash is severely limited. As this paper reveals in subsequent sections, a large proportion of household productive activities are just sufficient to support subsistence requirements. Opportunities for marketed surplus are few and irregular during the year. Meeting household cash needs for expenses such as school fees, buying inputs and other family requirements is a constant challenge for most households. In Mufulira where households are in good contact with urban markets, collection of various forest products for sale makes a real difference. Although households in Kabompo also reported sale of various forest

products, viable trade is limited to a few high value products like honey and timber, as well as opportunistic local sales.

Livestock in addition to the various other functions provide a means of saving for households. Around 65% of the households reported sales of various types of livestock, from cattle to chickens as a way of raising cash to cover various expenses. Unfortunately the numbers of livestock are very low in both study sites. The most common class of livestock is chickens which were reported by 70% of the households. Only 9% of the households owned cattle by the end of the survey period and among them they reported an average of 2 animals per household. Goats were much more widely reported (20%). Deaths of livestock are also very high due to various reasons that include poor husbandry practices and lack of Government veterinary support.

Other forms of financial support such as loans are hardly accessible to any of the households in the study sites. A government fertilizer program has been operating in the areas but the beneficiaries complained that the program is erratic and some people are left out. Only 2% of the households indicated receiving financial support from government or NGOs during the survey year.

Remittances which have been widely reported as providing vital support for rural households (Campbell et al., 2002; Cavendish, 1997) don't seem to benefit that many people in the study areas. Less than 5% of the households reported receiving remittances ranging from about K10 000 to K100 000¹³ per household per annum during the survey period.

Casual labour also provides vital cash income for most households in both study sites. Up to 40% of the households had at least one member who had been paid for casual labour during the survey period. Earning an average daily wage of K5000 for jobs on commercial farms, timber logging concessions or mining operations, some household members specialize in this form of income generation and work as much as 25 days each month.

4 Composition of household income

Households in the two study sites undertake four main livelihood activities to meet their own subsistence needs and to generate cash income (Table 4; Figure 1). Although rural households are often regarded as farmers, it's clear that cropping and livestock rearing are not the highest income earning sectors for these households. Rather, foraging for forest products make up the biggest share of household income. Subsistence and cash income from unprocessed forest products such as firewood, poles, timber, fruits, mushroom, insects, honey and medicinal plants alone constitute 30% of total household income while processed products like charcoal, crafts, tools and mats contribute an addition 20%. The livestock sector, which often plays a complementary role to cropping as a source of draught power, manure and sometimes finance, is visibly small (5%) among these households. Households also earn wages from off-farm casual jobs on commercial farms, with logging and mining companies as well as from their neighbours. These off-farm activities contribute significantly (15%) to household income, reinforcing the idea that rural households often depend more on these less conventional sources of income than widely acknowledge. Although this study also evaluated other sources of income such as fishing,

¹³ At the time of the survey the exchange rate between the Zambian Kwacha and the US dollar was around K4000 : 1 USD

operating small businesses and remittances from family members staying away from home, these are very small and do not warrant individual treatment (here grouped together as 'Other income sources').

Table 4: Annual Household Income from main sectors (Zambian Kwacha)

	<i>Cropping</i>	<i>Unprocessed forest products</i>	<i>Processed forest products</i>	<i>Livestock</i>	<i>Wage/Casual Jobs</i>	<i>Other Income sources</i>	<i>Total</i>
<i>Total Income</i>	1551718	1983267	1325240	352162	946466	363318	6522171
<i>Annual Cash Income</i>	489505	1077406	1123778	106648	946466	363318	4107121
<i>Cash as a % of annual income</i>	31%	54%	85%	30%	100%	100%	63%

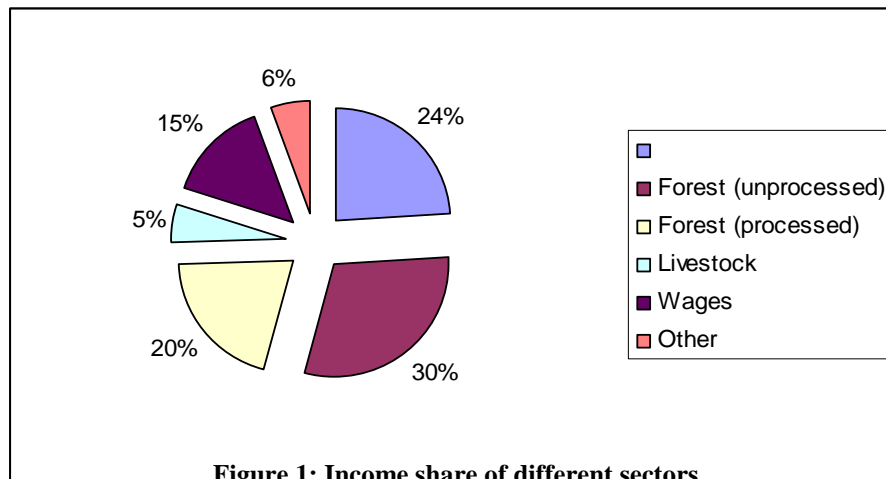


Figure 1: Income share of different sectors

4.1 Structure of cash income

Perhaps the most significant attribute of non-farm sources of income is their high contribution to household cash generation. Rural households are highly constrained in terms of cash for basic consumption expenditure as well as for meeting vital commitments such as school fees, health costs and transport. More than 50% of income from forest products is in cash and this plays a vital role in meeting various expenses. Also important is the timing of forest income (Arnold and Townson 1999), coming mostly at times when households have little else from other highly seasonal activities like cropping. Similarly wage income is mostly in cash although cases of people being paid in kind are not uncommon. Most of the crop produced (69%) goes to meeting household subsistence requirements with very limited marketed surplus. Only 30% of household income is in cash and given the low livestock numbers and the limited number of households who depend on them, this is hardly significant for the average household. Again these observations point to central role that is played by forest income and other non-farm activities undertaken by rural households.

4.2 Income comparisons across sites

Comparing the two study sites reveal important differences in both the amounts and composition of household income (Table 5). Perhaps the similarity in agro-ecology and cultural background among communities in these study sites explain the similar patterns observed on cropping. No significant differences are observed across the two districts with respect to crop income.

However analysis of cash income reveals that villages in Mufulira are able to convert more of their crop output to cash given the ease with which they can access markets, especially in nearby urban centers. Households in Nkhulwashi village in remote Kabompo district could only convert just 3% of their crop output to cash while up to 52% of crop output is sold in Sosala village in Mufulira district. Similar trends are also observed with respect to livestock income in the two districts.

The most notable differences between the two districts are with respect to processed forest products. Mufulira has significantly higher incomes, largely due to the vibrant charcoal processing and sale in surrounding urban centers. Villages in Kabompo are not significantly involved with processing of forest products due to remoteness, limiting such activities to production of locally use tools, utensils and mats. Most of these never reach external markets and sales are limited to local transactions. The abundance of opportunities for casual work in Mufulira due to vibrant economic activity in nearby urban centres and commercial farms explains the big differences in wage income between these two districts. In Kabompo, casual jobs are limited to small and opportunistic inter-household labour exchanges that hardly pay significant amounts.

An interesting scenario is the case of unprocessed forest products. Despite being remote from urban markets households in Kabompo earned significantly higher income from unprocessed forest products. Even their cash earnings from these products (69%) are much higher than for Mufulira (39%). The only explanation to this is the exceptional effort that has been put in developing the marketing of honey in Kabompo and other honey producing areas, perhaps more than what has happened with other products. Honey from these villages is being exported to lucrative organic markets, bringing high incentives to local producers. Organization and skills among bee-keepers has also been enhanced through training and technical support from government and various development agencies. This case demonstrates the benefits of opening up opportunities for remote communities especially through marketing development for products with high economic potential. Although a few more such forest products such as mushroom and wild fruits are abundant in both districts, no such organization and market development has occurred. It's only in easily accessible locations like Mufulira where such poorly supported products can reach lucrative urban markets but again incomes are dampened by lack of organized marketing and product development. Whether there is potential for these other products to achieve similar success will depend on efforts to tackle bottlenecks in product development and marketing.

An interesting example is the case of timber in Kabompo. Despite the high value of indigenous timber species in the area, only 3% of the households reported income from timber. Key among the difficulties in exploiting timber is the poorly organized marketing arrangements. Only individuals with substantial cash amounts can afford to hire transport to ferry timber to markets. Complaints of exploitation by the sophisticated timber buyers in urban areas are also widespread. Realizing the loopholes, well-connected outsiders are now dominating timber exploitation in Kabompo, often operating illegally. The result is not only the loss of income for local resource users but also hastened opening up of local forests that compromise important local livelihood activities like honey production.

Overall, households in Kabompo are severely disadvantaged by the poor linkages with markets. They earn only about half as much income, and about 3 times less cash as their counterparts in Mufulira. Households in Mufulira also enjoy more diversified cash income sources, and are perhaps less susceptible to fluctuations in individual livelihood sectors. Under both scenerios, forest products contribute the highest income share and also contribute over 50% of all cash income.

5 Discussion and conclusion

The results presented about raise an intriguing question whether rural households are really farming households given the exceptionally high dependency on non-farm sectors such as forest collection and off-farm activities, compared to conventional farming sectors. Based on the income composition, it is clear that income from forest products and other non-farm activities can no longer continue to be regarded as ‘complementary’ sectors. Rather these sectors should be recognized as a central part of local economies, needing financial, technical and institutional support to reach its potential. This perhaps is most critical for poor and marginalized communities who lack the assets and expertise that are required for most forms of profitable agriculture. Although the forestry sector has fewer barriers to entry resulting in a larger proportion of households being able to benefit, taking its contribution beyond just providing safety nets will require sustained efforts in product and market development. Fortunately remote communities seem to benefit more from such developments as their resources are under less threat from population pressure and other forms of economic expansion.

Table 5. Income comparisons across district and village

Cropping	Kabompo			Mufulira			All households
	Maveve	Nkhulwashi	Total	Sosala	14 miles	Total	
<i>Total annual income</i>	1468118 (909632)	1318255 (807414)	1393187 (858907)	2255143 (1818417)	1184378 (962618)	1713552 (1557407)	1551718 (1261138)
<i>Annual subsistence income</i>	1052769 (566226)	1281071 (793409)	1166920 (695214)	1083776 (845426)	848311 (695096)	955322 (781881)	1062212 (745038)
<i>Annual cash income</i>	415349 (427750)	37183 (82567)	226266** (360605)	1171367 (1260773)	336066 (547418)	758229** (1059694)	489505 (830185)
<i>Percentage of total income as cash</i>	28%	3%	16%	52%	28%	44%	32%
Processed Forest Products							
<i>Total annual income</i>	97265 (187836)	24552 (50828)	74240** (160847)	1625707 (1736538)	2784328 (2701415)	2218811** (2342119)	1325240 (2078521)
<i>Annual subsistence income</i>	56853 (94972)	10736 (14179)	42250** (81513)	325536 (387646)	312010 (312010)	318612** (336862)	203461 (295463)
<i>Annual cash income</i>	40412 (126927)	13815 (50967)	31990** (108952)	1307195 (1428028)	2472317 (2436134)	1903627** (2080667)	1123778 (1837122)
<i>Percentage of Annual income as Cash</i>	42%	56%	43%	80%	89%	86%	84%
Unprocessed Forest Products							
<i>Total annual income</i>	1745452 (4750394)	2444214 (7235308)	2094833 (6099418)	2638981 (1387053)	1143126 (1310581)	1872806 (1541876)	1983267 (4429053)
<i>Annual subsistence income</i>	800229 (2321732)	516624 (367731)	658426** (1659891)	1817071 (857340)	509676 (555092)	1152330** (975082)	906607 (1378595)

Table 5. Income comparisons across district and village

Cropping	Kabompo			Mufulira			All households
	Maveve	Nkhulwashi	Total	Sosala	14 miles	Total	
<i>Annual cash income</i>	945222 (2509085)	1927590 (7255895)	1436406** (5423815)	824910 (915785)	633450 (555092)	721960** (948625)	1077406 (3891013)
<i>Percentage of Annual income as Cash</i>	54%	79%	69%	31%	55%	39%	54%
Livestock							
<i>Total annual income</i>	234609 (314870)	592905 (1327854)	396039 (932606)	221983 (402876)	414313 (978253)	308286 (721956)	352162 (832815)
<i>Annual subsistence income</i>	201272 (304469)	394941 (660456)	288529 (503713)	174406 (276573)	236623 (367773)	202499 (319181)	245514 (422705)
<i>Annual cash income</i>	33337 (51798)	197964 (764484)	107510 (517681)	47577 (135123)	177689 (760883)	105786 (520910)	106648 (517862)
<i>Percentage of Annual income as Cash</i>	14%	33%	27%	21%	43%	34%	30%
Wage/Casual jobs							
<i>Total annual income</i>	293618 (252449)	186809 (195023)	243974** (232275)	738420 (535583)	2215723 (3648564)	1477072** (2697739)	946466 (2127226)
Other income sources							
<i>Total annual income</i>	127302 (244914)	66645 (101238)	103437** (202018)	642887 (1999471)	423334 (478230)	530189** (1457086)	363318 (1160604)
Total Annual Household Income							
<i>Total annual income</i>	3966364	4633380	4305710	8123121	8165202	8120716	6522171
<i>Total cash</i>	1855240	2430006	2149583	4732356	6258579	5496863	4107121
<i>Percentage of total income as cash</i>	46%	52%	49%	58%	77%	68%	63%
<i>Contribution of forest income to total income</i>	46%	53%	50%	52%	48%	50%	51%
<i>Contribution of forest cash to household cash</i>	53%	80%	68%	45%	50%	49%	54%

** indicate significant difference at 95% level of confidence across districts. Figure in parenthesis are standard deviations

The overall conclusion from the results of this study is that forest products are central to livelihoods, rather than just being secondary to the farming sector. With improved local organization and support for product and market development, some forest products have potential to turn around the fortunes of remote communities who have limited economic opportunities due to lack of assets, limited expertise and are poorly linked with markets. In situations where local resources remain largely undeveloped and inaccessible to the local population, this creates loopholes for external expropriation by well connected individuals who often have more information on markets and institutional shortcomings.

Despite these prospects, remote communities remain relatively poor compared to more accessible locations and various facets of their livelihoods are undermined as a result. Further more conditions that enable households to sustain the few potentially lucrative activities are hardly in place in both study areas. It is not easy to see how households could continue to depend

on forest resources for example. Continued access to these resources is highly threatened by a number of factors that include high rates of deforestation, elite capture of high value resources, and poorly organized marketing for most products.

In Mufulira, the ever-growing demand for charcoal as urban populations continue to grow present a major threat to sustainable forest management. Lack of well managed cutting regimes and other ingenious approaches to ensuring regeneration of local forests paints a bleak picture of the charcoal making enterprises. The punitive government license fees for charcoal production has also encouraged illegal extraction and severely undermined profitability. This has resulted in a highly secretive industry that is characterized by suspicion, uncertainty, corruption and very high transaction costs. Forestry officials hardly have the capacity to monitor activities in charcoal production and yet there are no incentives for self-monitoring and regulation. The result is a bustling underground economy whose impacts can be seen on forest cover. Unless the production of charcoal is better organized, through planned cutting regimes, mutually agreed licensing fee structures and incentives for local resource users to manage local forests, local forests will continue to disappear without much benefit to local populations. Value-adding initiatives such as improved packaging would also improve incomes for local households but this won't happen unless the "illegal" nature of charcoal production and marketing is addressed.

Marketing problems seem to cut across the entire spectrum of forest products in both study sites and unfortunately no concrete solutions are available to overcome the constraints. Community consultations in Kabompo revealed that despite substantial improvements over the years, huge volumes of high quality organic honey still goes to waste each year as the marketing system fails to cope with rising production levels. In this area honey production goes back in history and has strong cultural ties. With some training and organization from development agencies, the area is now among the leading producers of export quality honey. Sadly the benefits are difficult to see locally as marketing bottlenecks and reports of producer exploitation by buyers remain major constraints. Some households have even stopped managing their beehives due to frustration with marketing problems. The foregone benefits for these households are huge and similarly incentives for households to manage local forests for honey production are negatively influence. Incidences of forest fires are now said to be on the increase and practices like early burning which used to protect the forest are reported to be on the decline.

Coupled with these negative trends is also the threat from outside. For a long time the forests in Kabompo have been intact due to low population pressure and very little external influence on local resource use. This is about to change. Recent improvements in the road network have resulted in increased extraction of high value forest products like timber. Unfortunately very few local people (mostly the better off) have benefited from such activities as they require high amounts of capital, better connections and information on urban markets where these products are sold. In most cases timber extraction is being done illegally and the forestry department lacks the capacity to deal with the problem. The involvement of influential people also makes it highly unlikely that government institutions can take decisive action against the offenders. Ironically, well-meaning development initiatives like improving the road network may actually undermine local livelihoods by opening them up to external pressure. Unless these communities are empowered to deal with external threats and also to take advantage of emerging opportunities, infrastructural development may benefit external players at the expense of local populations.

Currently it is difficult to envisage how remote communities like those in Kabompo will benefit significantly from improved infrastructure unless deliberate action is taken to help them confront associated challenges.

Local resource users are not oblivious to threats on key aspects of their livelihoods and constantly refer to the dire status of their livelihood system. In many cases they indicate that these fears encourage a general atmosphere of pessimism among local communities and the lack of faith in local actions. It is a reality that local households will continue to depend heavily on natural resources such as forests for a long time to come and creative solutions are required to sustain the flow of products and services from these resources and also to elevate their contribution to local incomes. Development strategies to transform people's lives under these circumstances will need to recognize the central role of these resources, and identify development options for enhancing wider aspects of local livelihoods without undermining these vital elements of the system.

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Annex 3: Towards community-based management of miombo woodlands in Mozambique

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ABSTRACT

This case study analyses the devolution of forest management in Mozambique. The analyses are augmented by reviews of five CBNRM projects. The locus of power has historically lay with the centre, with local communities not being part of the governance system. Although the legal regime for CBNRM can be seen as progressive, a major outstanding problem relates to its implementation. It remains vague on pertinent aspects of community involvement, including the extent of community rights, powers and benefits in relation to those of other stakeholders. Time is also needed to change the attitude of state and other bureaucrats; those who were implementing top-down management now have to devolve power; the previous mindset remains. Communities are often sceptical of the state, so some of the implementation problems also come from their side, with an unwillingness to fully engage. At the same time, while forests form an important facet of the Mozambican economy it is clear that mechanisms put in place for communities to economically benefit from the commercialization of forest resources occurring in their areas are not adequately and effectively delivering on the envisioned benefits. In particular, the management requirements placed on communities to engage in business ventures are too stringent and thus limit involvement in such ventures.

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8 Introduction

This case study critically analyses the devolution of management of forests and woodlands to different constituencies in Mozambique, with particular emphasis on how such processes relate to rural poverty alleviation. The shift in locus of control and power over resources is not peculiar to Mozambique. It is related to broader policy developments within the international arena, filtering down to the regional and national levels, with its main thrust being to alleviate poverty. For instance, Fabricius et al. (2004) refer to the developments within the region, and beyond, as a ‘movement’ in which states have given back to ‘communities’ authority to manage resources. They point out that this ‘movement’ has been driven by “democratization of resource management that was ushered in by international conventions around people and natural resources and the realization, by states, of the futility of managing resources without local people engagement”. In the face of shrinking publicly-funded budgets for sectors which do not yield immediate financial and economic returns (such as for forestry and natural resource management institutions), governments are seeking to ‘return’ control over woodland resources to the communities most dependent on them. In many instances, there is a presupposition that earlier community controls over woodland use existed and were effective, when this may not have been the case. In other cases, governments may give customary authorities control over natural resources which far exceeds their capacity for management. In others still, it may mean transferring control over resources to a local elite who may use woodlands principally for immediate political or economic gain.

But the extent to which communities have gained real power and control over forest and woodland resources in the country has been limited by barriers in various sectors, including those dealing with land policy, governance and political economy. In general, the Mozambican devolution experience can be considered fragmented, largely reflecting a lack of inter-sectoral phasing and sequencing. For instance, whilst recent land policy reforms sought to extend secure land rights through the legitimization of customary ownership, such reforms have not been matched by appropriate changes in forest and wildlife laws, which at present do not accord rights that are as secure as those conferred through land laws. Rights to dispose of valuable forests, trees and wildlife are still retained by the line ministries and not held by the communities who own the land. This review aims to trace how these relationships are evolving.

The Mozambique wildlife and forest policy is the main instrument through which the government is seeking to create space for local community participation in natural resource management. The policy centres on the principle of participation, enunciating that it is important that those who use and benefit more directly from resources participate in the management and planning processes. Local communities are in effect, targeted as the principal actors in the implementation of the policy. Although such policies have spawned a variety of people-centred natural resource management initiatives across a variety of natural resource sectors, most of the pioneering insights are emerging from the wildlife sector. The forestry sector has lagged behind the wildlife sector in relation to devolving authority of resource management to local people (Matose and Kepe, 2006).

The objective of this paper is to assess the extent to which community-based management of miombo woodlands is contributing to poverty reduction. However, the attempt to achieve this objective was limited by the lack of evaluations of community-based natural resource management (CBNRM) programs. The documents available on some CBNRM projects are not detailed and comprehensive enough to provide useful information such as: the number of households existing in a particular community; social structures; livelihood activities; types of forestry resources and products and their use and market values; and how these resources impinge on the economic wellbeing of the communities. Neither was there baseline data on the basis of which the contribution of various community resource management initiatives could be evaluated. Although the Ministry of Agriculture has a sector specifically created to deal with CBNRM no comprehensive and systematic reports on the impact and current situation of the existing CBNRM initiatives throughout the country exist. Such a situation is a poor reflection on the sector, given the resources being devoted to CBNRM.

The following questions guided the review:

- What learning and adaptation has been witnessed?
- How have participation, democratisation, and increased representation contributed to improved livelihoods for local people? Is the move towards community based management making any difference?
- What is the way forward on the basis of the insights from experiences and the challenges identified?

This review focuses on three aspects that apply to the broader forest-poverty question. The first aspect is the legislative environment and the extent to which it enables CBNRM objectives and principles. Secondly, the report analyzes the disjunction between forest resource policies and land policy. Thirdly, the report considers the underlying tensions between the desires of state agencies to generate revenue from forest resources on land whilst also securing the subsistence values of the resources. Where possible, the analyses in this report are augmented by illustrative information emerging from reviews of five CBNRM projects that are currently underway in Mozambique, including: (a) the Chipange Chetu project in Niassa; (b) the Muchanaglâne project in Sanhote, Nampula; (c) the Derre Morrumbala project in Zambézia; (d) the Pindanganga project in Manica; and, (e) the Ancuabe project in Cabo-Delgado (Table 1).

The review of the progression of Mozambique's move towards community based management is located in the wider debates around CBNRM, as proffered for example by Hulme and Murphree (2001). These authors make the case that there are different trajectories of conservation that have moved away from being state-centric. Where there is full transfer of rights then such a trajectory would be community-based – the state completely devolves resource management to some constellation of local society as 'community'. The case studies that will be reviewed and discussed in this contribution are better characterised as partial community-based. The State has devolved management responsibility but without according local society full property rights over forests and wildlife, especially in cases where the resources have high values. Hulme and Murphree (2001) suggest that three ideas have come to dominate thinking about CBNRM. Firstly, there is the need to shift conservation away from being state-centric and to see rural

Africans in a positive light rather than as degraders of the environment. Secondly, that conserved resources (biodiversity, species or habitats) should be viewed as natural resources to be exploited rather than merely preserved. Thirdly, markets need to play a more active role in providing incentives for conservation which would lead to resources being more highly valued. These authors suggest that they tried to assess the impact of the policy and institutional changes on the livelihoods of Africans who bore the brunt of 'fortress conservation' for many decades. They point out that their writing is seeking to shed light on the impact of policy and practice that attempts to 'redistribute social and political power' (Hulme and Murphree, 2001:5). The current review also attempts to assess how the Mozambican forestry scene has changed in shifting authority towards local communities.

We argue that in order to understand why the state does not transfer 'full property rights' over natural resources it is necessary to understand broader governance trends at state level. The state has historically treated local society, especially rural populations, as subjects. Mamdani (1996) makes the point that the fusion of power and administrative justice are proving to be challenges for the post-colonial state to overcome to provide transparency and democracy. The central state was de-racialised and, largely democratised, but without dismantling the underlying despotic nature of its rural governance structure. Without further reform of the State, the rural populace remains under the grip of an autocratic tribal authority or ruling party officials. And – in the absence of democratisation – development and decentralisation has become a top-down agenda enforced on the people. Anstey (2004) alludes to this development in his analysis of CBNRM in northern Mozambique, by noting the problematic of centralised authority, elite-based decision making and highly bureaucratic administration within the State governance structure. One of the case studies Anstey (2004) reviewed is also included herein.

The rest of the report is organised as follows. The next section provides the context for Mozambique's miombo woodlands, and how communities manage and use forest resources. Section three then provides the policy and institutional contexts for the management of natural resources especially focusing on the impact of legal reforms in the land and wildlife sectors vis-à-vis the forestry sector. The main part of the report revolves around section four which provides detail about the performance of selected case studies of community-based management. In the final section, some conclusions are drawn and recommendations suggested.

9 Forest resources and community management and use of forests

9.1 Miombo woodland cover

The geographical location of Mozambique, from 10 to 26° south of the equator, provides a diversity of climates that determine structural and physiognomic differences in vegetation types. Miombo woodlands in Mozambique occur to the north of the Limpopo River and occupy approximately two-thirds of the natural forest area, followed by mopane (MINED, 1986; Bandeira *et al.*, 1994). MINED (1986) classified miombo into seven different types, based on their leaf-shed pattern and altitude.

Mozambique's richest woodlands in terms of wood products and biodiversity are the mosaics of semi-deciduous wet forest with miombo woodlands that occur in the coastal region of central Mozambique, south and north of the Zambezi delta (Wild and Fernandes, 1968; MINED, 1986; Saket, 1994). Other rich areas can be found in the slopes of high mountains mostly in the

Chimoio plateau and Gurue (MINED, 1986; Saket, 1994; Wild and Fernandes, 1968). In the coastal region of Inhambane and Gaza and a large part of Cabo Delgado and Niassa provinces, miombo woodlands are relatively simple formations with short trees and low tree density. Structurally these are called wooded savannas because of the high grass cover, with low density and small-sized trees (Wild and Fernandes, 1968), and classified tall or short scrub (Saket, 1994).

Because of the structural characteristics of miombo, it constitutes an excellent habitat for a variety of herbivores such as waterbuck (*Kobus ellipsiprymus*), bushbuck (*Tragelaphus scriptus*), eland (*Taurotragus oryx*), sable (*Hippotragus niger*), Lichtenstein's Hartebeest (*A. lichtensteinii*) and carnivores such as lions (*P. leo*), leopards (*P. pardus*). About 80 percent of the large terrestrial mammals of Mozambique are found in miombo woodland. Many other animals, in groups such as insects (including edible worms), reptiles, birds and fish, are associated with miombo (Soto and Siteo, 1994; Hatton *et al.*, 1994; Bandeira *et al.*, 1994).

9.2 Local use of woodland products and household livelihood strategies

The CBNRM projects analyzed in this report were based on six main economic activities using miombo products: charcoal production and sale; building materials harvesting and sales; honey production and sales; fuelwood collection and sales; hand-sawing for timber; and wooden furniture production. The contribution of the forestry sector is invaluable, particularly because much of the population (about 75 percent) live in rural and urban areas where poverty and dependence on forestry resources is high. Rural communities depend exclusively on firewood for cooking, while in urban areas charcoal is the major source of energy for cooking. A study carried out in Beira shows that even in the urban area, where electricity and gas are available, a significant number of inhabitants (50 percent) use charcoal for cooking (Serra and Zolho, 2003).

Table 1: Case study summaries

	Chipange Chetu – Niassa	Sanhote – Nampula	Derre – Zambezia	Pindanganga – Manica	Ancuabe – Cabo Delgado
<i>Year initiated</i>	1998	1997	1998	1999	1999
<i>Institutions</i>	From traditional to committee-based with parallel group for intermediaries	Muchanaglone Association – new committee with traditional authorities reporting to district agriculture	Derre resource management committee – comprising many local organisations	Committee comprising local leadership and 2 community members, but of 12 only 4 remain due to lack of incentives	Management committee based on interests; with provincial government involvement
<i>Current status</i>	Conflicts since 2003. Debate about hunting area with ministry more into the idea of a wildlife farm.	Since FAO support ended in 2002 there are lots of problems; govt not keen on CBNRM	Community awaiting concession approval to derive higher revenue since the withdrawal of govt.	Implementation challenges across the many organisations involved	Broad based rural development focus since 2003
<i>Benefits</i>	USD\$31,000 to community and other individual household benefits	Interest groups: vegetable growing with capital derived from the project. Carpentry group. More in terms of human capital: skills.	Carpentry and honey projects but no details about incomes yet. Community established nature reserve from which more was expected.	DUAT status ('land use agreement') means the community can benefit directly from concessions but to date no income to them yet. Timber plus 20% of revenue.	Private partner involvement led to benefits accruing in the form of employment, school, borehole and camp for tourists. Household level: bush meat, variety of capital equipment for projects.

Dependence on natural resources represents an opportunity for commercialisation of forest products. Serra and Zolho (2003) found that among the charcoal suppliers to Beira there were more than 1000 small operators who transported 2-4 bags of charcoal per day from a distance of about 30 km on a bicycle. This means an average income of about USD 70-140 per month for those families involved in this transportation business. In addition, there are the charcoal makers. The charcoal market is the largest market for forestry products in Mozambican towns. However, other products that are marketed include wood for building materials, medicinal plants and food products.

Many tree species of the miombo woodlands have multiple uses. Some of them are protected by local communities because of their importance in traditional beliefs. Many trees are left in the agriculture fields ("machambas") or simply not cut for firewood because they produce fruits or medicines, or have spiritual values. Some trees are protected because it is believed that they "produce water". These trees generally grow in the riverine areas – it is believed "if you cut them the water source will dry out" (Soto and Soto, 1994). The use of a variety of forest products by local communities constitutes an 'invisible economy' that aids the state by reducing expenses to the order of millions of dollars to the government that has no capacity to otherwise provide medicines, or produce energy and other forest-based products for such rural communities (Williams, 1993; Nhantumbo and Soto, 1994).

The commercialisation of forest products plays a major role in local economies. Building materials are commercialised as much as firewood is. Other products such as wild foods (including fruits, leaves, meat and honey) are commercialized in local markets in the cities or, by the roadsides. They represent an income to rural people, including women and children. Medicinal plants are prescribed by traditional healers to their clients or sold in urban markets (Nhantumbo and Soto, 1994).

Woodcarving is another important activity, using products from miombo woodlands. Woodcarvers normally live in rural areas and some of these crafts are household utensils such as wooden spoons and pestles that are necessary equipment for rural and peri-urban households. Carvings of different kinds of things are used as adornment objects for people in the cities. The most famous woodcrafts of Mozambique are made of *Dalbergia melanoxylon* and *Spirostachys africana* and are commercialized all over the world.

9.3 Contribution of the forestry sector to poverty reduction

As a recent study commissioned by the USAID office in Mozambique to the Confederation of Mozambican Trade Associations (CTA)¹⁶ confirms, Mozambique has an abundance of natural forests. According to this study, natural forests cover an estimated 20 million hectares, or 24 percent of the total country. Excluding the informal sector, the forestry sector in Mozambique provides direct employment for approximately 200,000 people. It accounts for about 10 percent of industrial production and contributes about 1 percent of GDP. This figure excludes fuelwood, and other timber and non-timber forest products that are directly consumed by the rural population or sold in the informal market. In 2004 exports from the sector amounted to US\$30 million, approximately 2 percent of total export earnings. The sector earns the government of Mozambique approximately US\$6 million per year in royalties on logs harvested and, with

¹⁶ USAID. 2006. Improving the Competitiveness of the Timber and Wood Sectors in Mozambique.

opening up of this sector leading to greater competition, these rents could be increased considerably.

It is worth highlighting that the figures indicated above include only the forest products and services that enter the formal market. Several products that are handled through the informal markets are not accounted for. For example, it is estimated that the town of Beira consumes more than 5 million bags of charcoal (50 kg each) per year, but of these fewer than 200 000 bags were licensed (Serra and Zolho, 2003). Further examples of products that do not enter formal markets abound. These include building materials, household utensils, food and medicinal plants; which together significantly increase the real value of the contribution of the forestry sector.

Royalties and taxes accruing from concessions constitute a source of income for communities. Reimbursement of this dividend is a statutory requirement as per Ministerial Directive 93/2005, and is pegged at 20 percent of the licensing rates paid by the forest operator to the state. This legal statute will be discussed later in the paper. However, eligibility of communities to benefit from this is not a straightforward matter, as the communities are first required to constitute a representative committee registered in the district administrative post. This committee is tasked with managing funds, including opening a bank account on behalf of the community. The committee, as the legal entity recognised by the state and the representative of communities, is also expected to present reports of activities funded by the income, together with associated accounts of income and expenditure.

The registration requirements for communities to benefit from the above royalties are too stringent and constitute a major bottleneck, restricting communities from accessing benefits from resources that occur in their areas. For example, out of a total of 700 communities involved in community management projects in the whole country, only 37 have formed local committees, whilst a paltry 17 communities have satisfied all the requirements, with only one having received the statutory 20 percent royalty. The bottlenecks mainly arise from constraints related to the formation of the committees and openings of community bank accounts as well as the relatively low financial incentives (Pear Tree *et al.*, 2005).

10 Legal and Institutional Framework for CBNRM

In 1997, Mozambique adopted a Policy and Strategy for Management of Wildlife and Forestry, through Cabinet Resolution Number 8/97 of April 1. This document sets some principles for wildlife and forestry management which include: (a) conserving basic resources, including biological diversity; (b) involving people who are dependent on forestry and wildlife resources in the planning and sustainable use of such resources; and (c) ensuring that communities benefit from wildlife resources. Similarly, the Wildlife and Forestry Law adopted in 1999 recommends integrated management of natural resources that ensures effective participation of local communities, associations and the private sector. It furthermore establishes that the involvement of the private sector in natural resource management should aim at furthering local community development. Certain events stand out as epochal in the evolution of CBNRM. These include the end of authoritarian systems of governance and the advent of peace ushered in by the political settlement under the Rome accords, leading to the crafting of a draft constitution in 1990. A new constitution was to emerge out of this draft in 2004, with land considered as a foundation for CBNRM since the constitution recognized customary rights to land and land management.

Subsequent developments within the legislative arena that enhanced the shift towards community based management were the enactment of a national Land Law in 1997, and of a Wildlife and Forestry Law in 1999. Although the general thrust of these developments reinforced the evolution of CBNRM, each law had its own enabling and disabling features, which are considered next.

10.1 The constitutional recognition of community rights over natural resources

As in many other African countries, Mozambique's supreme law vests custodianship of land in the state, with the ownership, management and administration of such land devolved to a variety of other stakeholders including agencies of the state, the private sector, and local communities under customary arrangements. The principle of state custodianship is clearly enshrined in the 2004 constitution¹⁷, a revision of the 1990 constitution, which maintains that natural resources in the soil, sub-soil, internal waters, the territorial sea, the continental shelf and the exclusive economic zone, are state property, with the state determining the conditions for their use by the citizens. Although the constitution vests custodianship of land in the state such custodianship has an enabling effect for rural communities in that the state, through the constitution, recognizes and protects community land rights acquired by inheritance and by virtue of community tradition and peaceful occupancy of such areas. The only exception to this principle applies in relation to areas legally reserved for public interest purposes, as is the case of nature conservation areas, or areas already legally given to another person or entity¹⁸.

The 1990 constitutional setting was seen as containing a pro-poor philosophy and a strong statement of the state's social responsibility towards the rural people who constitute the majority of the Mozambican population (Negrão, 2002). In fact, the role of the state, as indicated by the constitution, was not only to determine the conditions for land use and management but also to prevent the emergence of perverse sets of land rights that create situations of dominance or privilege that jeopardize the majority of the citizens (CRM 1990, Article 47.3).

According to Negrão (2002), the constitutional recognition of community land rights independently from formal titles has provided a high sense of protection to the majority of the rural people for whom land continues to be the only source of subsistence and income. Despite the fact that community land rights did not automatically imply rights for commercial use of land and other natural resources, the recognition of rights represented a major achievement for those who advocated the need of increased security of community tenure rights. This philosophy has also had a great influence on the content of the 1997 Land Law, as will be demonstrated. It is in this context that the conceptual and practical aspects of community management of forest resources are analyzed and the relationship between the state and local communities discussed.

10.2 Legislation for the management of land (Land Law of 1997)¹⁹

Based on the 1990 Constitution, in September 1995 a new National Land Policy (NLP) was approved, establishing a clear rights-based approach to guaranteeing land for the poor, as well as a strong development instrument designed to promote new investment in the country (Durang and Turner, 2004). These aspects are summarized in the NLP central mission statement that

¹⁷ Constitution of the Republic of Mozambique, 2004. BR No.51, SERIE I, of December 22.

¹⁸ Ibid.

¹⁹ Law No.19/97, of October 1.

envisions “safeguarding the diverse rights of the Mozambican people over land and other natural resources, while promoting new investment and the sustainable and equitable use of the resources”²⁰.

The enabling effects of the NLP at a broad level, as Durang and Turner (2004) argue, include:

- Guaranteed access to land for the population as well as for investors;
- Guaranteed rights of access to land by women;
- Promotion of national and foreign private investment;
- The active participation of nationals as partners in private enterprises;
- The definition and regulation of basic guidelines for transferring State-allocated land use rights;
- The sustainable use of natural resources that guarantees the quality of life for present and future generations;

The enabling effect of the law is also seen to extend down to the grassroots level, privileging communities over land rights and administration. In terms of land rights, the new land law introduced important provisions to secure such rights to the smallholder sector, by recognizing customary rights of access and management as being equivalent to the state-allocated land use and benefit rights (DUATs)²¹. In terms of land administration, the law also confers legal validity to the various indigenous systems of transferring and inheriting rights, and recognizing the role of local communities in the prevention and resolution of conflicts.

The law furthermore recognizes the “local community”²², as the main entry point to integrating various interests on communal land, recognizing them as constituting “extensive land holding and resource management units reflecting local production and social systems involving a wide range of resources and dynamic patterns of land use” (Negrão 2002, Durang and Turner 2004). Through the local community, local people were given the right and duty to participate in the legalization (demarcation and registration) of new DUATs allocated to investors. A key element in this context is the requirement that investors have to consult local people and secure their approval before they are able to obtain a new DUAT²³.

Box 1 highlights the challenges to formalising community-based management. The pro-poor legislation has opened doors for local communities, but it could be argued that informal systems are more important than formalised approaches (Norfolk and Tanner, 2006).

Box 1. Challenges to formalising community-based management

The new resource tenure framework developed in the last few years is not being introduced and implemented within an historical and social vacuum. The legacy of an authoritarian past has left deep influences on both rural populations and on the government administration. In the first instance, this means that many citizens have generally low levels of trust in the authorities and may not be willing to take risks or incur the costs of taking up new institutional opportunities. In particular areas, with specific experiences of the more authoritarian side of colonial and post-independence administrations, there are rural societies that have

²⁰ English formulation by Durang and Turner (2004)

²¹ Portuguese acronym to “Direito de Uso e Aproveitamento da Terra”.

²² Legal definition provided in Article 1, No.1, of the Land Law.

²³ Land Law, Article 27

limited internal cohesion and low levels of trust in most forms of authority. In the second instance, it means that the State authorities remain largely managed and staffed by an administrative and technical cadre that has been trained and habituated to top-down management processes. Given the recent legacy of a centralised State, many of the officials still feel more comfortable with the benefit options of old rules and in the old uniform of command and control.

This means that formalisation involves much more than just the mapping and registration of land rights. We believe that the case studies provided show this well. For example, the Chipange Chetu case study reveals how the local social history of this area has tended to promote specific characteristics within the population and the institutions that operate there. These include:

- A reluctance to engage with authority or with rules of either a traditional or an administrative nature.
- A context where the legitimacy for a traditional/customary role in conflict resolution and the functioning of social institutions at village level depends largely on the personality of the chief.
- A general belief that government and its agents are extractive rather than supportive and that outside agents in general may at best be a source of patronage and short-term benefits but have little longer-term commitment.
- A general belief that personalized relationships and informal rules matter more than institutions codified in law. Legislation is the not 'the rules of the game' but part of the game.
- It is therefore sad to see that interventions in the context of the new rights are now undermining the hard work and achievements of the early years of the Chipange Chetu initiative. Institutional resistance and entrenched attitudes – as well as overly centralised and inefficient decision-making processes – also threatened to derail the Coutada case. This probability has in effect been pushed to the sidelines by the operator and the community simply getting on with their agreement, and by a range of other actors providing moral and other support advocating in favour of this new and important initiative.

The Canhane Community seem to have moved more easily towards a change in attitude and awareness of new opportunities. This may be a function of the close and continual support offered by Helvetas over an extended period of time, which has served to encourage and build trust amongst the community. In its most recent phase, it has also benefited from legal support provided by the ASL Programme, and the CFJJ-FAO technical assistance that has reinforced the rights-based framework that has been made clear to the investor as 'the' framework within which his access to this prime site will be negotiated.

Conversely, the population in Chipange Chetu probably feel that their initial caution was justified, since the NGOs that assisted initially are now disappearing; ACORD and OPORTUN left in 2004, as a result of financial difficulties, and IUCN withdrew when political tension and elite contestation regarding the hunting operation began. As Mubai et al (2006) describe, these withdrawals have come at precisely the moment when the community most needs the lobbying capacity and support that these organisations were able to offer. In their absence, the community institutions have weakened and become vulnerable to manipulation by elite interests.

However, Mozambique has shown the importance of also having the right policy and legal framework in place, especially if it is the result of a broad consultative and participatory process that gives it legitimacy and support in wider society. The framework then provides an 'appropriate space' within which claims can be acknowledged and pursued. The formal and legal redefinition of rights and status may come later – i.e. negotiated changes to the framework – through the use of these opportunities and 'appropriate spaces' to test the Land Law implementation in practise and develop any changes empirically.

The process therefore begins with an open and participatory policy and legislative process that results in an imaginative law with a high level of legitimacy, allowing many flexible routes to formalisation, and is followed by the use of this philosophical and legal space (by NGOs, communities, local people and their private sector partners) to pursue new economic initiatives which in themselves bring about formalisation and create the space for the more conventional rights registration as a result of the other activities, not as a condition for them to happen.

Thus Mozambique today is perhaps characterised more by the experiments and initiatives going on in the countryside, with deals and frameworks for resource use being negotiated and benefits beginning to flow to the rural poor, than by any serious moves to systematically implement the more standard formalisation of rights in accordance with the law. The point is that the Land Law and the process leading to its adoption has opened up an important space for formalisation, a space within which the informal rights of the poor are recognised and given a new legitimacy without needing to be strictly defined or forced into a rigid formal context. These rights are beginning to be taken more seriously and are becoming less susceptible to challenge because they have been given a broader legitimacy within the law, rather than as a result of their transformation into a 'formal' rights framework.

Nevertheless, this process is taking place within a context of rising demand for land, enclosures, and signs of land concentration in which local rights in many places are not being imaginatively used as described above. Far more efforts and resources are needed to get invisible legal rights onto official maps and records. Our argument does not disguise this need, but rather underlines the fact that registration is just part of a broader package of formalising measures and strategies that can secure tenure for the poor and promote the equitable process of land occupation and use foreseen in the original 1995 Land Policy.

Source: Norfolk and Tanner (2006:35)

10.3 Legislation for wildlife and forest management (Wildlife and Forestry Law of 1999)²⁴

In addition to the Land Law of 1997, a National Forest and Wildlife Policy was approved in 1998, followed by a revised Forestry and Wildlife Law (FWL) approved in 1999. Whilst the former law is considered largely enabling with regards to community based forest management, the FWLs overall effect is generally considered enabling only in terms of underlying principles but disabling in its implementation requirements. The law is considered potentially enabling in principle, first because it shares the same definition of 'local community' as the land law. Therefore, in legal terms the spatial unit in question should be the same as that covered by the land law DUAT (Durang and Turner, 2004). Second, the requirements for investors to consult the local community when seeking forestry exploitation concessions or hunting licenses²⁵ implies that communities are the primary stakeholders, potentially wielding greater influence in terms of balance of power over resources in their areas. And lastly, the FWL provides for integrated and sustainable management of natural resources that ensures effective participation of local communities, local government and associations and the private sector.

Despite these potentially enabling features of the FWL, the government and its branches retain disproportionate powers to define the type of resource uses that communities may undertake to manage and where they can exercise them, and these requirements turn out to be unwieldy and encumbering. The main burdensome requirements include licensing arrangements and management plans required before the licensing. With regard to wildlife uses, communities must have a hunting license to use wildlife resources for consumptive purposes. Local councils issue such licenses 'in accordance with customary norms and practices'²⁶. Subsistence use of forestry resources is exempt from license requirements but it should be undertaken in respect of local norms and practices. Commercial use of wildlife and forest resources is subject to licensing, with communities and other interested actors having to fulfil technical requirements established in the law. Such requirements include, among other things, proof of technical capacity to harvest,

²⁴ Law No.10/99, of December 22.

²⁵ Ibid, Article 26.

²⁶ Ibid. Article 15(3)

transport and process the resources²⁷. Except for subsistence purposes, holders of land rights must always apply to the government for use of wildlife, forest and other resources existing on their land.

The lack of parity between rights structures accorded through devolution reforms in the land sector on one hand and the forestry and wildlife sector on the other, further makes for a rather confounding devolution scenario in Mozambique. The overall effect is that the land tenure regime by itself does not clarify the use regime for particular resources occurring on such land. Thus, communities that have acquired a land title are not automatically entitled to exploit land and the forest resources on a commercial basis. The forest and wildlife law requires a license and a management plan to grant the use of forest products for commercial purposes. This requirement was imposed as part of the national strategy for the forest sector to contain the rampant use of forest resources that hitherto occurred before 1997. The regulatory requirement existing then was based on a one-year simple license that encouraged log-and-leave resource exploitation strategies without long-term commitment to the sustainability of the land or the forest (FAO, 2005). The blanket enforcement of the new licensing requirements severely undermines local communities' access to commercial benefits of such resources because of the stringent and complex licensing requirements that need to be fulfilled before the resources are commercially exploited.

For purposes of licensing, the law divides the national forest estate into three categories based on permissible use intensity. These are: (i) areas for intensive forestry, usually those associated with high productivity; (ii) areas with medium forestry productivity, that become candidates for extensive forest use, with a further condition being that such areas can be converted to other land use other than forestry; (iii) multiple use areas, where forestry is not the main activity and where inter-changeable use of the land is also permissible.

Generally, areas for intensive forestry are used for forest concessions while those with medium productivity are used for simple license (one-year) – specially designed for rural communities and individuals that are willing to extract small quantities of forest resources (up to 500 m³ of timber per year) during a relatively short period of time. Simple licenses may also be located in areas defined for purposes other than forestry, and the trees used for commercial purposes especially when there is need to convert land cover from forest to agriculture or pasture. Apart from the conservation²⁸ and forest areas established for forest concessions and logging licenses,

²⁷ Ibid. Article Ibid. Article 15(1)

²⁸ The forest and wildlife law establishes three categories of protected area including: (1) National parks, designed purely for the protection of nature and managed by the Department of Conservation Areas of the Ministry of Tourism. No resources may be extracted and no settlements are allowed within this category. Examples of these areas are the Gorongosa National Park and the Zinave National Park, established particularly for wildlife protection; (2) National reserves, which include game and forest reserves, managed by the Department of Forestry and Wildlife of the Ministry of Agriculture and Rural Development. Human settlements and resources extraction may be allowed but restricted by the rules set by the conservation plan. Areas under this category may also be co-managed by other organizations including local communities and NGOs. Examples of these areas include the Niassa Reserve, one of the largest areas established for protection of elephants. There are 13 forest reserves classified within this category. The forest reserves were established to provide timber to state agencies either for building purposes or for furniture (e.g. Licuáti, Mecuburi, Derre and Matibane) or for protection of water catchments (e.g. Moribane, Maronga, Zomba and Mpalwe). Most of the forest reserves do not have a formal management plan and some of them have been invaded by local communities for agriculture (e.g. Mecubúri and Moribane) and by poachers to cut valuable timber (e.g. Licuáti) (Siteo and Enosse, 2003); (3) Community conservation areas with local or cultural interest, managed by local or district authorities. These areas include sacred areas such as the Chirindzene forest, which can also provide medicinal plants and other goods for local

there are areas, generally those with low forest productivity, where local communities can make free use of forest resources for subsistence and can also convert these areas to agriculture or pasture without a specific management plan. These areas are among the open-access areas with no specific management regime, but may require a simplified management plan if used for commercial purposes by local community associations. The restrictive framework of these provisions will be discussed in the conclusions.

The Confederation of Mozambique Trade Associations (CTA) reports that there are several ways in which communities can participate and benefit from forest concessions, including as concessionaires, partners to concessions and as simple license holders. Negotiating a concession should fulfil three basic requirements, namely: (i) ensuring proper community consultations before the establishment of forest operations (ii) requirement for community benefits to be clearly spelled out in both simple licenses and concessions (number of jobs created) and (iii) should be part of the contract agreement. The role of the government within the whole set-up is to promote the social responsibility among the partners and to reimburse a complementary contribution of 20 per cent of the royalties accruing from the concessions back to the communities (cuff Tanzania case, Dewees and Wily, 1999). The major impediments to more meaningful empowerment within this setting includes a balance of bargaining and entrepreneurial power tilted in favour of the private sector and the low proportion of benefits accruing to the communities in the form of employment opportunities as well as state dividends (20 per cent). Thus, though the principal laws are generally enabling with regards to community based forest management, much still has to be done to improve the institutional infrastructure that has been put in place to allow for the implementation of such initiatives. However not all barriers to community based forestry initiatives are of a legal or implementation character alone – history also counts, as it may have a strong conditioning effect on attitudes and mindsets.

10.4 History counts when attitudes matter!

The new resource tenure frameworks developed in the last few years were not introduced in an historical vacuum. The legacy of an authoritarian past has left profound attitudinal imprints on both rural populations and on the government administration. In the first instance, given the often capricious and arbitrary exercise of power under previous undemocratic arrangements, many citizens have generally low levels of trust in the authorities and may not be willing to take risks and challenges associated with taking up opportunities that the new institutional environment offers. Such reluctance is likely to be felt more in areas that suffered more acute experiences of the more authoritarian strands of colonial and post-independence administrations; furthermore, many edifices of state power largely remain. In the second instance, it means that the state authorities continued to be managed by an administrative and technical cadre that has been trained and habituated to top-down management processes. Given the recent legacy of a centralized state, many of the officials still feel uncomfortable with new ways of doing business other than the command and control ways they have been used to.

Thus, the institutionalization of community based forest management initiatives takes much more than just the mapping, re-aligning and registering of land rights. History counts when

communities. Most of these areas are ruled by local beliefs and myths. Traditional leaders may use these areas for agricultural harvesting and rain ceremonies. Access to these areas is granted by the traditional leaders and, in general, rules are strictly followed.

attitudes matter, with the catch being that there tends to be more reluctance to engage in more democratic systems of resource management in areas that suffered the hitherto existing non-democratic exercise of power most.

Hence, institutionalisation of community based forestry management initiatives may require much more than just reforming legislation and putting in place the implementation arrangements. The process transcends the purely legal to the attitudinal and facilitative, including civic education, capacity building, and most importantly perhaps, recognizing that change will be slow and incremental rather than profound. For instance, a recent report on Chipange Chetu by Mubai *et al*, (2006) showed that it was not until 2001, when payments from the hunting concession were first made to the community groups that they began to feel and exercise any real sense of ownership over the project. In a related case from Coutada 9, benefits had already started flowing to the communities even before the resource management initiative had been formalised. It is equally interesting that in the case of Coutada 9, the resource flows have actually preceded formalisation in the conventional sense, with a series of agreements struck that have as their basis, once again, a careful process of negotiation and trust-building.

An argument is made that the issue of trust is of critical importance given that administrative discretion remains a key element in the implementation of land and resource legislation and that government sector agencies and actors are the main agents of delivery of such discretion. The administrative structure bestowing wide discretionary oversight to state officials in regulating access to land and resources has to be trusted by the citizens if it is to secure the goodwill and cooperation required for community based forest management initiatives to succeed. The poor will continue to be circumspect about occupying spaces opened up by new pro-people reforms for as long as such people do not trust actors seen as drivers of such reforms. Further, anything other than full commitment and engagement by the poor communities will only serve to provide avenues for rent-seeking behaviour by those administering the process, which in turn will tend to favour the politically or economically powerful and also about policy credibility the relevance of incentives. This is illustrated by the Chipange Chetu case study in section 4.

The evolution of community based forest management in Mozambique has shown the importance of also having the right policy and legal framework. In Moore's words the framework provides an 'appropriate space' within which claims can be acknowledged and pursued. Coming up with the framework is key since the formal and legal redefinition of rights and status may always come later through learning-by-doing adjustments that are made to improve practice as policy gets implemented. By their very nature, community based natural resource management initiatives are social learning experiments. The process begins with an open and participatory policy and legislative process that results in an imaginative law with a high level of legitimacy. Such a process accords many flexible routes to formalization, and is best followed by the use of this philosophical and legal space (by NGOs, communities, local people and their private sector partners) to pursue new economic initiatives with emerging experiences being fortified to sustain community gains. Real empowerment does not end with simply adjusting the legal environment per se but through sustained efforts to remove the impediments that may detract from the attainment of more thoroughgoing empowerment.

Thus Mozambique is characterized by the experiments and initiatives in the countryside, with deals and frameworks for resource use being negotiated and benefits beginning to flow to the rural poor, than by any serious moves to systematically implement the more standard formalization of rights in accordance with the law. The point is that the Land Law and the process leading to its adoption has opened up an important space for formalization, a space within which the informal rights of the poor are recognized and given a new legitimacy without needing to be strictly defined or forced into a rigid formal context. These rights are beginning to be taken seriously and are becoming less susceptible to challenge because they have been given a broader legitimacy within the law, rather than because of their transformation into a 'formal' rights framework.

Nevertheless, this process is taking place within a context of rising demand for land, enclosures, and signs of land concentration in which local rights in many places are not being imaginatively used as described above. More efforts and resources are required to get invisible legal rights on to official maps and records. My argument does not disguise this need, but rather underlines the fact that registration is just part of a broader package of formalizing measures and strategies that can secure tenure for the poor and promote the equitable process of land occupation and use foreseen in the original 1995 Land Policy. Box 2 highlights some of the tenurial changes that need to take place to align forest management, timber production in particular, towards community needs in order to reduce poverty through sustainable forest management.

Box 2. How can communities enter the timber business (financial and technological capacities)?

- *Improve ways to manage illegal activities, especially community level sanction*
- *Improve awareness of forest law, policies and regulations*
- *Analysis of aspects of the different tenure types*
- *Improving capacity for collaborative management of protected areas*
- *Developing approaches to Sustainable Forest Management to include charcoal, wood, non-timber forest products (NTFPs) as part of community management*
- *Develop opportunities to transfer open access areas to local community management and benefits (plans, capacity)*
- *Register customary land use rights*
- *Seek ways to balance sustainable natural resource management and community benefits such as value addition and processing*
- *Understand the role of customary rules, knowledge and context of present day needs*

Source: Siteo, 2006 (FAO Tenure country case study: forthcoming)

11 Community-based management – Insights from case studies

Many community-based projects were promoted in the 1990s under a variety of objectives that included improving the living standards of rural communities, promoting their participation in decision-making processes and sustainably managing forest ecosystems. This section aims to distil the major lessons emerging from such projects. To achieve this it drew information from five CBNRM projects in the miombo region covering the provinces of Niassa, Nampula, Zambézia and Manica. The main sources for this review were project documents of the specific projects, the general review of CBNRM projects in Mozambique presented at the Third National

CBNRM Conference in 2004, and the recent review of the commercial timber and logging sector.

11.1 Project institutional arrangements and sustainability

11.1.1 Ancuabe, Cabo-Delgado

Looking at community management around Ancuabe in Cabo-Delgado, the initiative started in 1999, involving a working group for management of natural resources involving NGOs such as Helvetas, AMA, AMOCASI, the private sector and the provincial government. There was a need to reduce uncontrolled explorations of natural resources in the district and successful experiences such as Tchuma Tchato in Tete and the Gonarezhou Park in Zimbabwe provided a good motivation for the materialization of the project. The project is located in the province of Cabo Delgado, District of Ancuabe, in the northern part of Mozambique. It occupies an area of 48734 ha, in the villages of Ngura, Zambezia, Muaja, Miegane, Nonia, Nipataco, Mirangore, Nacololo, Naua and Santo Insidro.

The project implementation started with the creation of a new institution to change the scenario from uncontrolled and individualist exploitation of natural resources to a regulated and integrated exploitation approach. In this context, a management committee was created, integrating all interest groups, hunters, carpenters, farmers, exploiters of firewood energy, and social groups. The government got incorporated through the provincial forest and wildlife and the district directorate of education.

For the creation of the committee, meetings with different social and interest groups were organized, after which a general meeting to approve the project was also organized. The selection of members for the committee followed a democratic process. Each interest or social group nominated a representative. After that, members of the executive body were elected, namely, the president and vice-president, the secretary and treasurer. To ensure representation, a social group could not occupy two positions simultaneously in the executive body. The committee responds to the community and also provides general information to the district directorate for agriculture about farms devastation by wild animals.

11.1.2 Chipange Chetu, Niassa

The Chipange Chetu project was created in 1998, in Matchedje and Macaloge, in the Sanga District, occupying an area of 3500 to 4000 km² and with the aim to eliminate furtive hunting, wood smuggling to Tanzania and the use of poison to catch fish. The project also aimed at ensuring the transfer of authority and powers over natural resources to the local community level in order to promote local development through economic,

Traditional authorities controlled the use of natural resources before the project, but this was resulting in a free access to the resources given their weak inspection capacity. The exploration of resources was made in an uncontrolled manner and without limits. To solve this problem a local committee was created and their members trained in forest and fauna legislation, land management legislation, leadership aspects and community inspection. The process was participative and democratic and there was an election of the president, the vice, the secretary

and the treasurer. Traditional leaders were given the role of committee advisors and they could not occupy other positions to avoid accumulation of powers. A complementary group was constituted integrating government and non-governmental institutions, namely, Provincial Forestry and Wildlife Services, District Agricultural Directorate, Administration of Sanga, IUCN/WWF, ACORD and OPORTUN with the mission of promoting community training, research and other activities.

11.1.3 Muchanaglane, Sanhote, Nampula

The project started in August, 1997, in the Sanhote/Niviria region of the Monapo District, province of Nampula. It occupies an area of 4.000 hectares. The objective was to reduce illegal woodcutting and to promote improved practices of honey production, coal and vegetables. It involves different groups of interest, including sawyers, carpenters, vegetable growers, charcoal-makers and beekeepers. The Netherlands government and FAO financed the first phase, started in 1997 the government from Mozambique is providing support to the second phase initiated in 2002, through the national program for agricultural development (PROAGRI).

The Muchanaglane Association is composed of four committees (Sanhote, Niviria, Mukhunula, Mulapane). Prior to project implementation, traditional authorities controlled the use of natural resources and this was not changed when the project was initiated. Although community committees were created specifically for resources management and for representation of all social groups, traditional leaders are also members of the committees and are always consulted before any decision on the use of natural resources is taken.

Creation of committees followed a participatory approach, and the different social groups were consulted. A president, the vice, secretary, treasurer, juridical and chief of control chosen by vote, constitute the committee. Besides the management committee and groups of interest, the project implementation involves the participation of, and coordination with, the provincial services of forests and wildlife, district directorate of the agriculture, district administration, and local authorities. The decision-making process involves a series of meetings for consultation with the interested parties, after which the president of the committee decides. Some conflicts happened at the beginning of the project, due to difficulties mainly in understanding the allocation of decision-making powers between the committees and traditional leaders and district authorities. This situation has been clarified and the committee also reports to the district directorate of agriculture.

11.1.4 Pindanganga, Manica

The project began in January of 1999 as an initiative of the provincial government supported by GTZ. It covers an area of 41 000 ha in the district of Gondola, in the Makhati locality. Its boundaries are the national highway n°1 (East), the Púngue River to the North, by the Massatua and Nhamaware rivers in the west and the Nharissenguere and Nhahurungu rivers in the south. The initial activities of this initiative were very opposed by the community. It was only after the visit that some members of the community made to the program Tchuma Tchato in Tete that a change in attitude was verified.

The support from GTZ just lasted one year at the end of which the provincial directorate of the agriculture took responsibility for the project. In 2000 FAO was integrated in the project and it supported activities of delimitation of the community area, forest inventory, elaboration of the management plan, zoning, training and construction of camps. FAO's assistance finished in 2003 and the project continued with the financing from PROAGRI.

Community authorities in this area consist of traditional leaders (Regulo), villager chiefs, Mfumos and auxiliary personnel. The committee created in the project has a president, chief for uncontrolled bushfires, forests chief, secretary, treasurer, consultants and two members of the community to control the committee's activities. The members of the committee and the community agents were chosen, based on requirements such as good behaviour, honesty and being a resident of Pindanganga. Both the community agents and the committee members were recognized by local government authorities. At this moment, of the 12 initially chosen, only 4 continue exercising their activities. The others gave up allegedly for lack of incentives.

11.1.5 Derre-Morrumbala, Zambezia.

This project was initiated in 1998 by a local NGO (Associação Comunitária de Defesa e Saneamento do Meio Ambiente da Zambézia - ACODEMAZA) funded by the Finish Government, which provided financial and technical support. It was created with the purpose of promoting improved use of forest resources, through zoning and sustainable management of valuable resources, of guaranteeing community access to forest benefits and of promoting local tourism in the area. It operates in the buffer zone of the Derre National Reserve as there was a potential to involve local communities in improved agricultural practices, crop production, primary processing and commercialization of non wooden forest products and carpentry activities.

The project aimed also at solving conflicts between local communities and external people who used to extract forest products, including a product used by communities to manufacture coffins and which was becoming difficult to obtain because of excessive tree cutting for commercial purposes by loggers. On the other hand, communities were also unhappy because all revenues derived from forest exploitation were channelled exclusively to the state without any benefits to local people. Lack of information about new loggers, lack of wood for local processing by communities and lack of animal protein due to excessive hunting were other reasons for conflicts. ACODEMAZA decided to intervene to revert the situation and propose the creation of a reserve but this initiative was not well received because none of their members resided in the area and their activities were based in the provincial capital city of Quelimane. As a way of solving this constraint, in 1999 32 residents and non-residents of Derre decided to form a local organization named Associação Comunitária de Defesa e Saneamento do Meio Ambiente de Derre -ACODEMADE).

It was only after ACODEMADE's creation that communities started to organize themselves and form committees for resources conservation which allowed them a better control of the use of their resources. After verifying the improvements produced by the project agencies from the provincial government become involved in 2001 in the financing of certain community activities and in the monitoring of resources use. They also made informal promises of various benefits for the communities which, however, were never materialized. Disillusioned, communities started

pressuring government agencies to keep their promises which resulted in their withdrawal from the area.

Five types of institutions were involved in the management of the project, namely traditional leaders, neighbourhood representatives, religious leaders, conservation committees and local government. Traditional healers are also involved as counsellors of traditional leaders. The Derre resources management committee involves five communities each one represented by two members democratically chosen. Apart from these members, each community has selected six scouts to participate in monitoring activities.

In this section, we have therefore analysed how various projects started because it has serious implications on sustainability, internalization of ownership and control, responsibility assumption and when financial/technical support should start and end. In general, these projects were promoted by non-government organizations, which provided the initial technical and financial assistance, this being particularly so for Ancuabe, Sanhote and Derre. However, in other instances – including the Chipange Chetu and Pindanganga cases - the projects were promoted by government agencies, especially the provincial services for forests and wildlife (SPFFB). Support from donors and the government is always good whilst it lasts but the problem is that, more often than not, such support does not last long. Thus, despite initial promises emerging lessons highlight the fragility of projects given that their initial successes were externally induced processes without concerted efforts to empower local actors to take charge of driving such processes on their own. The Sanhote project provides a good example of this.

11.2 Fine tuning the procedural and implementation aspects of CBNRM

While the legal framework is considered favourable to local community participation in natural resources management (CTA 2006), constraints remain at the level of interpretation and implementation. For example, the wildlife and forestry law was approved in 1999 and foresees the delegation of State powers to the local communities for natural resources management. However, there is no complementary generic law on the distribution of delegated powers and how local authorities and communities feature, neither is there a complementary set of procedural steps of powers so devolve through FWL will be implemented. The overall effect is that CBNRM projects have largely been implemented behind a backdrop of procedural uncertainty, with progress being achieved depending on the willingness of the government agent that happens to be in charge at a certain time and place. A great deal of discretionary decisions, both political and technical, are placed on the government with the overall result being that state authorities at central, provincial and local level still wield disproportionate discretionary power over the process of State authorities (central, provincial and/or local) continue to influence the process of establishment and operation of CBNRM projects. As is shown in the Ancuabe, Sanhote and the Tchuma Tchato projects, government agents maintain enormous influence and authority in regulating access to resources thereby marginalizing customary institutions whilst prejudicing local people's customary rights over the benefits of their resources (Matakala and Mushove, 2001).

The largest challenge for the State is the need to complete the legal framework, with particular attention to procedural aspects, and to guarantee a more professional and transparent attitude

over natural resource jurisdiction from its agents at all the levels, particularly at the provincial and district levels. Also of particular importance, is the need to move forward with the decentralization of certain powers related to natural resources management as urged by the recent constitutional review.

11.2.1 Ancuabe, Cabo-Delgado

The project is currently called Rural Development Program for Ancuabe, the alteration happened in 2003, motivated by the change in the approach by Helvetas, principal sponsor. The new approach gives emphases to agricultural production and commercialization, and to food security issues. Management of natural resources is seen as component of the food security program. The program develops training on water and soil conservation, uncontrolled bushfires and land law dissemination. Carpenters interest groups are organized in associations in each community and they choose their areas of performance in coordination with the SPFFB and previously existing operators.

One constraint faced by the project has to do with the damages caused by elephants. The program is conducting training in techniques to drive away the elephants and promote block farming in order to concentrate community efforts. There are also bushfires as a way of driving elephants away. The AMA association is negotiating funds with DANIDA to cover the reduction in sponsorship by Helvetas, expected in 2007

11.2.2 Chipange Chetu, Niassa

The project activities have been paralysed since 2003, due to conflicts with potential operators interested in the area. overlapping authority between a traditional queen and the local committee as resulted in different treatment external investors and in internal conflicts within the community that have led to the government decision that a reorganization phase should be undertaken. This reorganization is apparently still on-going, sponsored by the Irish cooperation. A community consultation is foreseen for determining continuation of project activities. Recommendations produced by a team that made a field visit to the project defend the transformation of the project into community hunting area (coutada) for the practice of synergetic tourism, where communities could intervene as entrepreneurs. However, this suggestion was not approved by the SPFFB, which preferred its transformation into a wildlife farm (fazendas do bravio), a legal mechanisms seen as a more open and accessible model for community participation. When the conflict arose, the process of acquisition of DUAT was well advanced and the local committee had already produced its by-laws.

11.2.3 Muchanaglane, Sanhote, Nampula

The project is currently facing a lot of sustainability problems. Access to financial resources continues to be a great constraint for the project. The project does no longer count with direct support from FAO. This support ended in 2002, when FAO shifted its technical support from the CBNRM project to support technicians of the government provincial unit for community-based management. Since then, the project is facing difficulties supposedly because the government does not place much importance to CBNRM initiatives and project implementation was much easier in the first phase when funds from donors were available (Zacarias, *pers. comm.*).

11.2.4 Pindanganga, Manica

There is very scarce information on the present stage of the project's execution. However, some constraints were pointed out as having hindered project implementation which included conflicts between the traditional leaders and the representatives of neighbourhoods, lack of communication with the provincial government agencies of agriculture and forestry and wildlife, difficulties of means of transportation to remove apprehended products obtained illegally, lack of equipment for the community agents and lack of coordination among institutions.

11.2.5 Derre-Morrumbala, Zambezia

With the withdrawal of the government agencies that used participate in resources monitoring, the community, who has currently 39 scouts, assumed full responsibility for this task. Although communities could not get assistance of the government to produce a management plan and no annual inventories are performed, resource use and exploitation is made in the areas indicated by the committee after approval by the community.

At the moment the project has applied for a concession for forestry exploitation which will allow it to enter into partnerships with private operators upon payment of a fee in favour of the communities in accordance with the payment plan adopted by the project. A constraint faced by the project at the moment is the fact that the carpentries created through the project are now paralyzed due to lack of raw materials for their operations. Access to these materials is pending approval of the concession application.

11.3 The issue of institutional choice in CBNRM projects

The issue of institutional choice is central to CBNRM, with appropriate decisions having to be made on whether to use the public domain of elected representatives operating within decentralized arenas or whether to build on existing customary forms – or to meld the best of both worlds. In general, CBNRM projects in Mozambique have entailed the establishment of new institutions without necessarily evaluating the need and relevance of such institutions vis-à-vis the existing ones. In some cases conflicts emerged with the creation of new institutions, as traditional authorities felt that their positions and powers were being taken away. On the other hand, the new institutions faced difficulties in imposing their authority to communities that hitherto were used to free access to natural resources, with such communities naturally showing resistance to the new models of resources use and management.

Furthermore, the new institutions, particularly elected committees at the community level showed institutional fragilities, including limited coordinative capacity and impaired authority to negotiate and deal with the government and private operators, as the Derre and Pindanganga projects demonstrate. Neither do such communities have capacity to impose their authority over traditional leaders who are the leaders ordinarily already in place within such settings. For example, some traditional leaders have been involved in illegal actions. The animosity between the committees and traditional leaders often sees the former clandestinely embarking on destabilization activities including conniving with timber operators to sell timber illegally harvested from concession areas. And such activities tend to be prevalent in areas where there are delays in disbursing the 20 per cent dividend of concession benefit. Such practices are

reportedly prevalent in some projects, including those in Zambezia, Cabo Delgado, and Manica (CTA, 2006).

The Chipange Chetu case study reveals how the local social history has tended to reinforce high levels of community disengagement from most things to do with the state, as evidenced by:

- A reluctance to engage with authority or with rules of either a traditional or an administrative nature
- A context where the legitimacy for customary or other systems of governance and the functioning of social institutions at village level depends largely on the personality of the chief, and not on the assurance that such institutions collectively render.
- A general belief that government and its agents are extractive rather than supportive and that outside agents in general may at best be a source of patronage and short-term benefits but have little longer-term commitment
- A general belief that personalized relationships and informal rules matter more than institutions codified in law. In other words legislation is not perceived as constituting 'the rules of the game' but as part of the game.

Thus, one of the major initial obstacles to institutionalization of community based forestry initiatives in Chipange Chetu was the fact that many of the local people were wary of the real intentions of the project. Anstey (2002) notes that: "...even after eight months of discussion locally and the implementation of a number of activities such as the PRA process, discussion of objectives and controls over outsider use, there was still a general belief that the programme was for the benefit of the Government or individuals in the NGOs and the talk of devolution to local institutions was merely a variation on a historical theme of local disempowerment."²⁹ Entrenched attitudes in the Chipange Chetu case fed into community reluctance and disengagement within an otherwise already overly centralized and inefficient decision-making process. The overall result was that the operator and the community simply getting on with their agreement, at the expense of the regulatory actors. In contrast, the Canhane Community seems to have moved more easily towards a change in attitude and awareness of new opportunities. This may be a function of the close and continual support offered by Helvetas over an extended period of time, which has served to encourage and build trust amongst the community. In its most recent phase, it has also benefited from legal support provided by the ASL Program, and the CFJJ-FAO technical assistance that has reinforced the rights-based framework that it has been made clear to the investor as 'the' framework within which his access to this prime site will be negotiated. A key insight also appears to be that facilitation by third parties, including civil society, is critical for success.

But the contribution of civil society to community based forest management is best considered in relation to sustainability since most civil society interventions suffer from project proclivity. For instance, the NGOs that were facilitating forestry initiatives in Chipange Chetu, including ACORD and OPORTUN reached their exit stages well before community reluctance to participate in the initiatives had been overcome. However, not all civil society actors withdraw because they have reached the end of their timeframes. IUCN is reported to have left Chipange Chetu because of the uneasiness associated with elite contestation of hunting licenses within the area. As Mubai et al (2006) describe, these withdrawals have come at precisely the moment

²⁹ Tanner and Norfolk (2006) also make this observation.

when the community most needs the lobbying capacity and support that these organizations were able to offer. In their absence, the community voice has further been weakened and become vulnerable to manipulation by elite interests. In line with Sally Falk Moore's arguments³⁰, the challenge in the above Mozambican cases is to create 'appropriate space[s] where legitimate claims [can] be acknowledged', instead of opting for the easy way out.

11.4 Resource value and benefit sharing arrangements

The perception that there is potential of gaining tangible benefits from a community resources management project constitutes a critical factor. In most instances it is this factor that determines the motivation for a community to participate in a collective management initiative which in some cases imposes restrictions on their access to, and use of resources. But not all the projects have the propensity of generating significant economic benefits. For instance, most of the community forest management initiatives are located in low vegetation productivity zones that are designated for multiple uses. Resources usually extracted from such areas include low value non timber forest products that do not generate significant economic benefits to the potential beneficiaries. In contrast the projects based on the exploitation of the wildlife, such as the one in Tchuma Tchato, tend to result in larger monetary benefits, with much of the revenue accruing from safari hunting and tourism operations (Nhatumbo et al, 2004).

According to the CTA report most communities involved in CBNRM projects in Mozambique access less benefits than they are entitled to, with such benefits often arriving late. Both government and private operators fail to deliver benefits to the communities, partly because of the superficial nature of consultations, the absence of an enforceable contract between the communities and operators, and because of logistical problems. The lack of enforceability lies in the weakness of operators largely dealing with the government instead of communities, with the exception of a few experiences such as the Chipange Chetu. In turn, operators become unaccountable to communities. The uncertainty of benefits undermines community motivation to participate in CBNRM projects. When they do arrive, most of the monetary benefits are allocated to community projects, including the construction of schools, hospitals, roads, grinding mills, water sources, etc. Wherever it occurred, this mode of distributing benefits was reported to register significant increases in the level of resultant support given by the benefiting communities (CTA, 2006). Each of the case study experiences in relation to the issue of benefits and rights accruing to communities are highlighted below.

11.4.1 Ancuabe, Cabo-Delgado

Members of the committee were trained in matters related to the relevant legislation for management of natural resources, a good deal of knowledge has been shared on forest and wildlife law, land law, fisheries law, and the environment law. This fact is seen as a great gain for conservation as the community is gaining awareness about the particular importance of certain precious and/or rare species and pays more attention to hunting seasons by interrupting their hunting activities when it is necessary.

The interaction between members of the committee, government and private sector is good. The private sector is the major protagonist of training opportunities for community members,

30 Cited in Cousins and Claassens (2006)

particularly on inspection matters. On the other hand, community members are employed in privately owned operations. This project brought tangible and intangible benefits for the local community. Tangible benefits included the construction of a school, an accommodation camping for tourists in Ungura and a fountain of drinking water, all infrastructures that contribute to poverty reduction. Intangible benefits consist in the knowledge that the community acquired in terms of natural resources management and concerned legislation.

Individual benefits have also been received namely credit packages in the form of livestock and oleaginous seeds for women, fishing equipment, manual wood processing equipment and bush meat, depending on the economic area of interest that a person was involved. The benefits distribution method was defined by the interests groups and by the SPFFB.

The management committee have the mandate to decide about participation in resources management, but it has to consult the local community before taking a decision. Requests for exploration of natural resources by interest groups are submitted at the locality level, then go to the village chief and lastly to the committee. Private sector applications are submitted to the committee, which decides after consulting the local community.

The power to allocate, transfer and revoke natural resources use rights belongs to the government through the provincial services of geography and cadastre but the committee and the courts are involved in conflict resolution.

11.4.2 Chipange Chetu, Niassa

As a result of the training that different NGO's have provided in the area, local communities acquired a good level of legislation knowledge. Current benefits of the project implementation consist in the production and sale of honey and sawed wood, construction of access roads and health clinics. These roads facilitate communications with areas that were inaccessible before. Furthermore, there is now some openness in the market, and local products can be exchanged internally and in other zones. On the other hand, the community has already received payments resulting from the different activities of the project in the value of 6180 USD in 2001 and 31000 USD in 2004.

Economic benefits from sport fishing, game shooting, etc, were also expected for 2005.

At the end of each year of activities each community involved must present a report indicating the application of the allocated revenues. The project has undertaken a zoning of the areas with abundance of resources. The contents of the management plan were defined in a participative way involving the community and the technicians of SPFFB. The decisions on participation in resources management are entrusted to the management committee, which is facilitated by SPFFB.

11.4.3 Muchanaglane, Sanhote, Nampula

The members of the committee were trained in matters related to legislation governing natural resources management, especially forests and wildlife, land and environment, and have the mission to disseminate that knowledge to the general community. The project has also resulted in benefits in institutional organization and capacity building. Training in financial management and in environmental law enforcement, increase of awareness about the need for conservation of

resources, organization of interest groups, delimitation and legalization of the community area and the elaboration of a local management plan, are some of the examples. The vegetable growers group received support in instruments such as sprinklers and hoes. The carpenters have a license for wood exploration and a joint bank account. They pay an annual fee for the license to the district government and have been also able to build furniture to local schools. The carpenters' interest group does manual processing of the wood and has been able to place their products in the local market, in the city of Nampula. Distribution of benefits is decided within the group of interest and the level of satisfaction is considered good. It is important to highlight the high level of community awareness in relation to good practices of resources management. Since the project started, community members have denounced several incidents of illegal activities.

11.4.4 Pindanganga, Manica

The community possesses DUAT with the registration no. 3/2001. This legal instrument allows that any operator interested in the area may obtain the community's acceptance ratified by the committee, which is then submitted to the local administration and the provincial services of forests and wildlife for knowledge. After this process, the interested party negotiates with government authorities which establish an exploration tax from which 20 per cent are deducted in favour of the community. In order to exercise the right to receive this benefit, the community celebrated a contract with the Inchope Wooden Company. This arrangement had to be terminated allegedly due to incompatibility of the machinery used by the company with resources conservation. There was another operator in the community area, named Pita Mujeque Alfredo to whom the community demanded the construction of health clinic, two classrooms and inspection services in Xindahuma. Since the year 2005, the community benefits from 234,00 MTN/m³ of wood and 2,00 MTN/bag of charcoal, besides the 20% foreseen in the forests and wildlife legislation. However, the funds were not yet channelled to the community. The first two amounts are collected locally and they finance the activities of the management committee.

Since 2001 the community was licensed for exploration of forest resources, namely for charcoal production, bamboo and wood collection and commercialization.

Six members of the committee are subscribers of bank accounts and management is done with support from the local administration that evaluates and approves the use of the money.

The use of traditional practices of honey production, the furtive hunting, the bush devastation, and death threats to community agents constitute the main constraints in the development of the project. The transgressors they are imposed punishments that vary from the construction of houses, cleaning, improvement of the infra structures of the camp, confiscation and sale of the apprehended products.

11.4.5 Derre-Morrumbala, Zambezia

One of the decisions taken by the project was to create a nature reserve. As a result of this, no forest exploitation is allowed in the reserve area. While it is considered too early to evaluate project results, some improvements have already occurred. For example, as a result of the project, communities have recovered their forests base and improved their access to the forest

product used for producing coffins. Access to firewood also became much easier and closer to community residences.

With the assistance of ORAM and FONGZA, community members were exposed to information related to environmental legislation which improved their understanding of conservation objectives and benefits. 37 ponds for fish production were created. The fish is destined for consumption and for reproduction. The largest expectation of community members was opportunities of employment based provided by private loggers.

There are interest groups of carpentry and honey production. Some groups received training and basic tools from the Finnish Sustainable Forest Management project. The local government has exercised pressure for all the carpenters in order for them to join the association however there is uncertainty among the group with regard to the benefits that may result from their involvement. The group of interest of beekeepers were being trained in construction of beehives using local material, honey collection and primary processing to ensure good quality.

Commercial agriculture (cotton and sunflower) is promoted by AGRIMO, a local private company. As it constitutes an opportunity for the development of the local economy development, it also represent a threat to the of natural resources base, since the expansion of the agricultural areas means the destruction of the forest. Many farmers don't stick to the cotton cultivation and sunflower due to the low prices practiced that does not compensate the undertaken effort.

11.5 The role of the private sector and private-community partnerships

As indicated earlier, Mozambique's natural resource laws and policies envision sustainable management and economic development. Such laws specifically provide for investment in the natural resource sector in order to promote economic development. One approach that has been advanced by these policies and laws is the establishment of partnerships between local communities and state agencies and the private sector. However, such partnerships are still to effectively take root with competition between local people and outsiders over land and natural resources still quite prevalent (Durang and Turner 2004). And in areas where such partnerships have evolved, particularly in the area of forest concessions, the spirit of genuine co-equal partnership is still to evolve with the current balance of power generally favouring private investors, and political, economic or other elites. This tends to be the case because in another assessment existing laws have no clear provisions with recommendations for action for both the state and investors to promote local development and poverty alleviation through sustainable use of natural resources and benefit sharing. Also absent from the laws and regulations are procedural provisions that establish the legal weight and value of community consultation processes and there are no principles or guidelines for informing partnership agreements between communities and private investors (Salomão, 2004).

An assessment made in the tourism, forestry and wildlife sectors on impact of private-community partnerships showed that³¹:

³¹ Análise das Concessões Existentes nas Àreas de Conservação Transfronterças. 2004. MITUR/DINAC/GACTF.

- There is a generalized failure from the part of the government to enforce existing laws and regulations regarding community rights to land and other natural resources, and failure to monitor private sector compliance with prescribed procedures for community consultation and, especially, compliance with commitments assumed in the partnership agreements.
- There is a clear bias on the part of the government to protect private sector interests at the expense of community rights and interests. This is a cause of major concern among rural communities and has led to community distrust of the government and hostility towards the private sector.
- So far, the “agreements” resulting from consultation processes undertaken by government agencies and the private sector reflect a great deal of manipulation and are generally not respected as legally binding instruments either by the government nor by the private sector itself. The current setting is therefore potentially a breeding ground for rent capture by powerful and influential actors within state agencies and the private sector.
- The government still has not put in place an unambiguous supporting policy that espouses clear-cut principles of partnership, with the effect being the prevalent clashes that occur between communities and the private sector.

The opacity of contracts as they currently evolve is best illustrated by the example of Pindanganga project where the community, with much fanfare, celebrated contracts with Inchope Woods and with the operator Pita Mujeque Alfredo. However, there are no details of the provisions of these contracts nor of their real impact as required by the law. Most of the partnership contracts are only restricted to issues pertaining to the recruitment of local labour force for the companies operating in community areas. And cynically, most private investors claim that the 20% fee deduction in favour of communities is their own contribution and not the statutory requirement that it is (CTA, 2006).

Recommendations continue to be made that formal business partnership contracts between communities and the private sector should be encouraged, and the playing field over which such partnerships are fostered needs to be levelled. Communities should have more meaningful equity in such ventures if they are to be effectively motivated. More egalitarian contracts are likely to reduce the presently prevalent misunderstandings and thus reduce business risk while at the same time building a long-term symbiotic relationship (CTA, 2006);

11.6 The role of NGOs and donors

Civil society organizations have played an important role in promoting CBNRM objectives as well as the objectives of the poverty reduction action plan. They have made a fundamental difference by supporting local communities in the exercise of their rights, with initiatives that include legal awareness, technical assistance for community land delimitation and land rights certification, assistance in negotiations with government and private operators, and fundraising. Their involvement and contribution has resulted in their formal recognition as key partners in natural resources management. The law recognizes the role for NGOs participation in the local councils for participatory management (COGEP).

Donor support has determined not only the existence but also the continuity of many projects. This support played a fundamental role in the initial phases, but many projects failed to identify and strengthen internal sources of financial resources, thus weakening their sustainability basis.

Projects that were not able to secure financial support after the withdrawal of their initial supporter have ceased to exist, with an apt example being the Ancuabe project. This also highlights a more general problem of how 'projects' are the delivery mechanism for fundamental reforms by the State. In turn, this raised an important question regarding the efficacy of use of resources for this type of reform using 'projects'.

12 Discussion and conclusions

Although the legal regime for CBNRM can be seen as progressive, a major outstanding problem relates to its implementation (Nhantumbo et al., 2002) where it remains vague on pertinent aspects of community involvement, including the extent of community rights, powers and benefits in relation to those of other stakeholders (Salomão, 2002). There also are still gaps and obscurities that seriously undermine any possibility of meaningful implementation of the provisions already approved and these gaps mainly relate to a lack of the legal and procedural mechanisms to promote community conservation (Anstey, 2001; Salomão 2002). The existence of such gaps sees many projects being implemented on an ad-hoc basis.

At the same time, while forests form an important facet of the Mozambican economy it is clear that mechanisms put in place for communities to economically benefit from the commercialization of forest resources occurring in their areas are not adequately and effectively delivering on the envisioned benefits. In order to improve contribution of the forestry sector to community poverty reduction, it is recommended that:

- The government, the CTA, the private sector, and NGOs need to do more to promote corporate social responsibility and outline the benefits and responsibilities of investors and communities.
- There is need for fostering formal community-private sector partnerships.
- Community institutions should receive the resources and support so as to secure access to their 20 percent royalties, and so as to be in a position to negotiate and form lasting mutually beneficial partnerships.
- When there are long delays in getting communities incorporated and bank accounts opened, the local government administration at the district level should hold the funds on behalf of the communities;
- Research is needed on alternatives to bank accounts (such as community trust funds), to overcome organizational problems at the community level.
- Adequate time for preparatory discussions and community consultations should be allowed during the planning phase of concessions and in doing the simple license agreements.
- The efficacy of the current regimes of royalties in reducing poverty should be reviewed as the royalties seem patently low.

A list of common recommendations to further improve the enabling environment for community participation in forestry resources management have been made by several researchers (Anstey, 2001; Nhantumbo, 2002; Salomão, 2004; Serra, 2004; Calengo, 2004, Durang and Turner 2004). For purposes of brevity these are listed in abbreviated format below:

- Need to expand the scope of community land rights to include other resources and promote their use for commercial purposes;
- Need to clarify substantive community decision-making powers in CBNRM areas;

- Need to define the powers and limits of State intervention in areas where natural resource management powers have been delegated to local communities;
- Need of clear guidelines for private sector (corporate) social and environmental responsibility in CBNRM areas, including guidelines for community-private sector partnerships;
- Need to institutionalize and support CBNRM as a rural development mechanism.

Whilst the above recommendations relate to the enabling environment at broader levels, other generic lessons and recommendations pertain to levels closer to the ground as projects get implemented. For instance, Nhantumbo and Duncan (2003) offer a generic set of instructive lessons on what needs to be done to make CBNRM projects more effective including:

- There is need for support for the establishment of management committees,
- There is need for the development of guidelines for negotiation and agreement models between the private sector and communities,
- Mechanisms for periodical monitoring of agreements need to be in place
- Guidelines for accountability of the committees managing financial resources on behalf of communities need to be in place.

There have also been a number of specific recommendations, pertaining to particular projects. For instance, an evaluation done for the Tchuma Tchato Programme, a community-based wildlife management program initiated in 1995 in the north-western province of Tete, provides useful insights and lessons which include:

- The programme should actively support communities in requesting and acquiring long-term leases over the land and rights over resources. The shift towards community proprietorship over land and resources and the shift in project implementation towards community capacity building and facilitation are the two factors most likely to move the programme forward.
- There is a need for greater support to the establishment of effective and accountable community institutions that are representative of local residents and responsive to their needs.
- The programme faces some key issues of sustainability. It needs to see how it can rationalize its staffing structure, cut costs and become more efficient. Where possible, existing staff should be absorbed into the private sector or government.
- The programme needs to develop a management structure that can provide the necessary technical support and supervision to the field. More attention needs to be given to developing the technical capacity of project and government personnel in CBNRM projects.
- The programme needs to make a considerable shift in mode of implementation from conservation education and control of activities and decisions by project staff towards light touch community empowerment and facilitation. Where appropriate, external expertise needs to be engaged to help effect this shift and to mentor project staff.
- Project activities need to be more oriented towards community capacity building so that project inputs can be reduced as communities begin to run their own affairs. Approaches such as the participatory resource assessments and land use planning carried out in Chintopho Ward should be further developed and applied.

It is hard to assess the extent to which community based natural resource Management (CBNRM) experiences in Mozambique have effectively responded to the dual objective and expectations associated with community participation in natural resources management. That is, the promotion of natural resources conservation with the participation of local people and, the promotion of local socio-economic development through sustainable use of the local resources. A number of aspects are yet to be tackled within the Mozambican legal framework in order for CBNRM to be visible, used and formalized as an institutional mechanism for promotion of rural development.

Regarding the legal gaps, in an analysis of the progress in the adoption of effective policies and laws related to natural resources management and relevant for community conservation from 1990 to 1998, Anstey (2001) concluded that the central feature of the policy and legal developments was the lack of capacity to deliver an “enabling environment” (i.e. legal mechanisms which would promote community conservation). In our opinion, this is still true especially with regard to regulations on community participation in natural resources conservation, as many projects are being implemented on ad-hoc basis.

On the other hand, the practice shows that CBNRM experiences must be better assessed and documented so that the lessons learned so far can be more systematic and used to improve the processes. It has been indicated that community activities and uses of forest products and other natural resources are not included in the official reports. They are not documented so their contribution to the national economy is not evaluated and formally recognized. CBNRM is still an informal activity deserving a lot of attention and promotion. It has also been pointed out that government agents maintain a heavy hand over CBNRM projects and the Tchuma Tchato and Chipange Tchetu projects provide examples of what needs to be attended to in this regard.

In returning to the broader issues raised at the beginning of this report, it is necessary to situate where Mozambique is in effecting community based forest management around miombo woodlands. First, has the management of Miombo woodlands moved away from state-centered management towards community-based as suggested by Hulme and Murphree (2001) and Fabricius *et al.* (2004)? Whereas the policy and legal statutes have provided the overall framework of moving away from state-centric conservation, the evidence from the different case studies across the country point to a number of challenges still being faced in stimulating community-based management. The issue of devolving costs by the state while retaining benefits appears to be apply here, in the sense that communities are striving to manage resources without access to the high value timber. Perhaps a much bigger challenge lies in the lack of capacity by communities as projects were initiated by external agencies that withdrew before there was sufficient adaptive capacity to take over management of resources. All the same, it could be argued here that with sufficient benefits accruing to communities, beyond the 20 per cent that is burdened by administrative state bureaucracy, communities could derive sufficient value from resources to develop their own capacities to handle concessions and other complexities of resource utilization by the broader markets.

The last challenge brings us to the second issue about the governance framework: state-society relationships as they pertain to rural communities. This is the issue where Mamdani’s thesis perhaps provides some explanation as to why there is a disjuncture between democratic sounding

policies within the land and forest laws, and practices as felt by communities striving to derive more benefits from woodland resources around them. Remnants of the bifurcated state are at play here through the factors that Anstey (2004) pointed out in relation to the Mozambican governance system. These are 'limited local democracy and dispersal of power within the system, centralized authority or elite based decision making and a highly bureaucratic administration' (Anstey, 2004: 190). The locus of power has historically lay with the centre, with the peripheral communities not being part of the governance system. Now with the new dispensation, as promulgated in the recent statutes, time is needed to change the attitude of state and other bureaucrats, so as to devolve power to rural communities in order for them to manage and benefit more from resources around them.

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Annex 4: Economic Shocks and Miombo Woodland Resource Use: A household level study in Mozambique

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ABSTRACT

Quantitative analysis of household use of miombo resources is limited, and detailed accounts of a full range of environmental resources are scanty. The present manuscript aims to (a) quantify the contribution of miombo woodlands to the household economy; (b) assess the role of miombo woodlands as safety nets in the face of household level economic shocks; and (c) identify the socio-economic determinants of woodland resource use, in the buffer zone of the Gorongosa National Park in Mozambique. Environmental resources from the miombo woodlands make significant contributions to household economies in the study area. Linkages between income levels and miombo resource use are complex. Poorer households tend to use miombo resources for subsistence, while richer households use them for cash income. Our results demonstrate that environmental resources act as a crucial safety net against income shocks, related to health shocks and fire damage. The results highlight the need for incorporating use of miombo woodlands into poverty reduction strategies.

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14 Introduction

Issues related to environmental degradation, global climate change, and rural poverty have attracted unprecedented attention in recent times. Internationally, there has been an increased resolve to address the links between rural poverty and environmental degradation in the developing world; particular emphasis has been placed on improving the livelihoods of rural poor, which in turn would help conserve the environment. However, the relationship between rural households and environmental change is not clearly understood. A lack of physical and economic accounts is one of the main factors limiting understanding of the relationship between poverty and environment (Duraiappah 1998, Cavendish 2000).

The problem of lack of data is more acute in Africa than in other regions, where reliable data on the use of key environmental resources is either non-existent or inadequate (Cavendish 2000, Fisher 2002). For instance, while there is a wealth of literature on the contribution of tropical forests elsewhere (Peters et al. 1989, Hegde et al. 1996, Godoy et al. 2000a, Hegde and Enters 2000, Pattanayak and Sills 2001), relatively less is known about the *miombo* woodlands in Africa, although there is evidence that rural households in Africa use environmental resources extensively (Sale 1981, Campbell 1996, Campbell and Luckert 2002, Kaimowitz 2002). Quantitative analysis of household use of miombo resources is limited, and detailed accounts of a full range of environmental resources are scanty. Given that an ecosystem represents a basket of highly differentiated goods and services, more empirical evidence examining household dependence on these resources in a robust analytical framework is necessary (Cavendish 2000).

Micro-level quantitative analysis is important from policy, economic and ecological perspectives. Woodlands are vital for welfare of the rural African communities: millions of people depend on woodlands for a host of products; the traditional, swidden agricultural systems depend on the woodlands for nutrients; and woodlands are the source of fodder for livestock (Campbell and Luckert 2002, Kowero et al. 2003). However, there is a lack of appreciation of the economic potential of the woodlands, and as a result, in spite of their importance to households, miombo woodlands are rapidly being lost to make way for other development activities. One of the reasons for the low profile of miombo woodlands is the lack of quantitative micro-level research on woodlands' contribution to household welfare (Cavendish 2000). Micro level analyses provide insights that potentially help devise policy interventions for sustainable use of the miombo woodlands. It is, therefore, imperative to quantify woodland contributions to household welfare and raise the profile of the woodlands in the policy debates, and develop policies that achieve the twin objectives of woodland conservation and local livelihood improvement.

Household level data is comprehensively captured in the Income and Expenditure Surveys (IES) in many parts of the developing world. However, typically, these surveys do not account for environmental resources used by rural households for consumption and cash income generation, which lessens their usefulness for the study of poverty and environment relationships. This necessitates purposeful collection of household accounts of environmental resource use (Cavendish 2000, Cavendish and Campbell 2007; Pattanayak and Sills 2001, Fisher 2002).

The present manuscript aims to (a) quantify the contribution of miombo woodlands to household economy; (b) assess the role of miombo woodlands as safety nets in the face of household level economic shocks; and (c) identify the socio-economic determinants of woodland resource use, in the buffer zone of the Gorongosa National Park in Mozambique. Particularly, it will help answer the following questions. How much do environmental resources contribute to the household economy? Are poor households more dependent on environmental resources than the rich? Do miombo woodlands act as social safety nets when households are faced with income shocks? What socio-economic factors influence environmental resource use?

Mozambique characterizes the problems mentioned above. Mozambique is one of the world's poorest countries. The lengthy civil war lasting 16 years combined with droughts and flood alienated about six million people from their land, and adversely affected agricultural activities of those who were not displaced (Unruh, 1998; Simler et al. 2004). According to the National Household Survey of Living Conditions conducted in 1996-97, about two thirds of the population lived in absolute poverty. While the poverty rates varied from province to province, Sofala province, where the present research was conducted, had the highest poverty rate (88%) (Simler et al. 2004). Recently, however, the country made rapid strides in poverty reduction during a period of high economic growth (World Bank 2004).

Mozambique has an area of 799 390 km², with a population of 17.24 million (Government of Mozambique, 2005)³³. About 71% of the population lives in rural areas, and about 93% of the rural dwellers directly depend on natural resources (Ribeiro 2001). In addition, about 41% of the urban labor force is also dependent upon vocations related to agriculture, forestry and fisheries. Agriculture is extensively practiced with a small fraction (14%) of the total cultivable area (36 million ha) actually cultivated and with low use of inputs (Nhantumbo 2000; Ribeiro 2001). However, from statistics compiled from FAO (2005) it is estimated that some 24% of the land area (19 million ha) is subject to shifting cultivation, and about 1 mill on ha is under permanent cultivation.

Mozambique is moderately forested with about 39% (30 million ha) of forest area. The forestry sector plays an important role in the national economy by contributing about 4% of the GDP and about 80% of energy needs (FAO, 2005). Although the current rates of deforestation in the country are relatively small (FAO, 2005), there are significant human pressures on the woodland resources (Ribeiro 2001, Kowero et al. 2003). A range of forest products is extracted from forests, such as construction timber, fuelwood, charcoal, wildlife and so on. In addition to heavy human pressure, forest fires are a major threat, with about 40% of the country being affected by fire every year. Fire is known to be one of the main tools for land clearing for cultivation, hunting, timber harvest and acquisition of other goods and services including charcoal production and honey collection, and for protecting resources from wild animals. Evidently, while forest resources are critical to development in Mozambique, forests are under heavy pressure.

There is considerable evidence of use of wild resources in the country (Ribeiro 2001, Jindal 2004). However, there is a lack of systematic quantification of resource use at the household

³³ FAO (2005) provides land use data for the 787,608 km² area.

level, although certain partial valuations have been attempted. For example there were two socio-economic studies in the very community which is the focus of the present research. A socio-economic assessment of Nhambita community reported that about 69% of the families earned their cash income from sale of natural resources including farm produce. However, the report did not provide estimates of the contribution of forest resources to households (Howell and Convery 1997). Jindal (2004) established a socio-economic baseline of Nhambita community, who observed that annual household cash income fluctuated widely from a meager US\$ 9 to US\$ 2,850. While it provided some interesting insights into the community and its use of forest resources, it did not provide detailed household environmental resource accounts. As a result, there is a lack of understanding on some basic questions such as what is the total value of environmental resource use and how does the resource use relate to other socio-economic parameters.

Against the above background, the present research aims to develop comprehensive accounts of the household environmental resource use.

15 Methods

15.1 Study area

The study was undertaken in Chicale *Regulado*³⁴, located in the buffer zone of the Gorongosa National Park (GNP) in the Sofala Province, Mozambique (Fig. 1). The choice of this area was guided by several factors including past research in and around GNP and continued interest and efforts in Park rehabilitation. Further, there is a small scale agro-forestry based carbon sequestration project, which can be categorized as a payments for environmental services (PES) project, under implementation in Nhambita *Regulado* (Jindal, 2004; Stern Review, 2006; Hegde et al. 2007b). Farmers have signed voluntary contracts with the project implementing agency (EnviroTrade, a UK based company) to plant indigenous and fruit tree plants on their farm (either on the farm boundaries or in mixed rows along with crops) and manage them for 25 years in return for annual cash payments. The objective is to sequester carbon through the plantings and sell carbon credits in international carbon markets. Households which have signed contracts and planted trees (in both the first and second year of the project) are categorized as PES project-participant households.

The project also has a menu of other forest based activities for the development of the community, such as carpentry, bee keeping, nursery development, community garden development, etc. and provides full time employment for about 100 people. It also provided limited seasonal employment in forest fire prevention and patrol activities. Besides employment, the project distributed guinea fowls for rearing and red gram seeds for cultivation to community members (see Hegde et al. 2007b for details).

Chicale *Regulado* covers a total of 20 km² area, with over 1,100 households spread over five villages, namely Nhambita, Bue Maria, Munhanganha, Pungue and Mbulawa (Table 1). Nhambita village, where the *Regulo* Chicale family resides, is considered as the centre of the study area. Three villages, Nhambita, Bue Maria and Munhanganha, are located close to each other within the buffer zone of the GNP. On the other hand, Mbulawa village is located outside

³⁴ Traditional authority.

the GNP boundary, and Pungue is situated on the GNP boundary such that a part of the village is inside and a part outside. Key characteristics of the villages are shown in Table 1.

The villages also differed in terms of farming systems and environmental resource use patterns. While farming in the first two villages was mainly subsistence; Bue Maria village had a mix of traditional and commercial agriculture (limited area was under vegetable, cotton and sesame cultivation); while Pungue, being located on the bank of the river Pungue, had relatively more commercial farming systems (with tobacco; vegetables). While the first three villages had households gathering more traditional environmental products predominantly for subsistence, households in Mbalawa and Pungue had a mix of both subsistence and commercial products. Mbalawa had households producing charcoal for sale and undertaking gold panning (for sale), besides gathering subsistence products, while households in Pungue undertook fishing (both subsistence and sale) and gold panning, besides gathering subsistence environmental products. Because of the proximity of the three villages, Nhambita, Bue Maria and Munhanganha, for the purpose of the present research, they are considered as one village henceforth.

Brief historical background

The Nhambita community land was legalized in 2003 after a claim was made under the new Land Act (No. 19/97) which permits communities' ownership of their ancestral land and management of its resources for the benefit of the entire community as per a pre-approved management plan. Part of the com-

Fig. 1: Map showing the location of Gorongosa National Park, Mozambique



Table 1: Key characteristics of villages in the study area

Village					
Characteristics	Nhambita	Bue Maria	Munhanganha	Mbalawa	Pungue
<i>Location</i>	<i>Within buffer zone</i>	<i>Within buffer zone</i>	<i>Within buffer zone</i>	<i>Outside park</i>	<i>On the park boundary</i>
<i>Distance to tarmac road</i>	<i>9 km</i>	<i>18 km</i>	<i>10 km</i>	<i>1-6 km</i>	<i>1-4 km</i>
<i>Access to markets</i>	<i>Poor</i>	<i>Poor</i>	<i>Poor</i>	<i>Medium</i>	<i>Fair</i>
<i>Main forest products</i>	<i>Own use: wild food, grass, fuel, poles & limited use of clay for pottery & timber</i>	<i>Own use: wild food, grass, fuel, poles, limited timber & fish</i>	<i>Own use: wild food, grass, fuel, poles & limited use of timber & fish</i>	<i>Own use & sale: wild food, fuel, bamboo, charcoal, poles, timber & gold panning</i>	<i>Own use & sale: wild food, fuel, bamboo, poles, fish & gold panning</i>
<i>Farming</i>	<i>Mainly subsistence;</i>	<i>Subsistence & commercial (cotton; sesame)</i>	<i>Mainly subsistence;</i>	<i>Mainly subsistence;</i>	<i>Both subsistence & commercial (tobacco; vegetables)</i>
<i>Major environmental resource collected</i>	<i>Poles, wild food, clay for pottery</i>	<i>Poles, wild food, fish</i>	<i>Poles, wild food</i>	<i>Poles, wild food, bamboo, charcoal, gold panning</i>	<i>Fish, poles, wild food, gold panning</i>
<i>Number of households</i>	<i>64</i>	<i>42</i>	<i>65</i>	<i>414</i>	<i>441</i>
<i>Households sampled</i>	<i>22</i>	<i>17</i>	<i>19</i>	<i>131</i>	<i>141</i>

munity land was taken over by the National Park Authority when the then Hunting Reserve was upgraded to the National Park in 1965. To minimize the poaching pressures inside the GNP during its rehabilitation, a buffer zone strategy was used that envisaged involvement of the local community in the management of the GNP (Zolho 2005).

Climate and geography

The climate is subtropical with alternating cool and dry winters (April-October) and hot wet summers (November-March), with May being the coolest and October being the hottest month. The area lies within the 600 mm and 800 mm per annum rainfall isohyets, and is generally influenced by the Gorongosa Mountain. Most of the rain is received between November to March, with July to September being the driest months (Zolho 2005).

Geographically, land in Gorongosa consists of eroded surfaces of granite and basaltic gneiss complex of Precambrian times, which, after heavy weathering, result in sandy soils that are generally unsuitable for any form of intensive farming (Tinley 1977). The vegetation is dry miombo, interspersed with evergreen thickets on the deeper alluvial sands. There are a few narrow patches of thick riverine forest along the seasonal streams, such as the Lupice, and river Pungue (Zolho 2005).

Land use

Land use in the GNP and surroundings consists of three types: protected area; buffer zone and community land. The protected area is under the State administration. The buffer zone, land immediately adjacent to the GNP boundary, is jointly managed by the government, communities and other stakeholders. While subsistence farming is allowed in the buffer zone, no other commercial activity, including hunting or extraction of forest products for commercial production, is allowed. The community land is managed by the communities under the Land Act. Activities in the community land include subsistence farming, charcoal production, fishing, hunting, etc.

15.2 Research design

Questionnaire-based quarterly household surveys, which explicitly integrated quantitative environmental resource use data with household economic data, were the main source of data used in the research. In addition to the four quarterly surveys, two annual household surveys and two village surveys – one each at the beginning of the research and one at the end – were undertaken. Use of surveys in economic research was first suggested by Ciriacy-Wantrup (1947). Household surveys provide a rich source of information at the household level, and its relationship with policy (Deaton 1997). Questionnaires developed by CIFOR-PEN³⁵ were adapted and expanded to suit the objectives of the research.

Quarterly surveys helped in capturing information at short recall, on the types and quantities of environmental products collected, their consumption and sale, along with prices received and revenue received; household consumption patterns; quantities of farm inputs used and crop yields obtained; off-farm employment and wage income earned. Past research demonstrated that accuracy will increase significantly when recall period is shortened, particularly for irregular income sources such as forests and woodlands (Campbell et al. 2001) and here there are high seasonal variations both in availability of resources as well as in agricultural harvests, which cause sharp seasonal differences in earnings and access to food (Cavendish 2000, Simler et al. 2004). The annual household surveys, conducted at the start and end of the field work, provided information on demography, land use, economic shocks and any changes occurring over the 12-month period.

Village surveys (focus groups) involving key informants, also conducted at the start of the field work, provided a good introduction to community demography, helped finalize household sampling issues in consultation with communities, and provided qualitative information on the influence of geography, climate and other issues affecting livelihoods. A list of all the crops grown and forest products collected in the village, including fish and non-forest environmental products, was prepared, which was used to adapt and augment the questionnaire.

Sampling

Since official household census was not available, we updated the household rosters with village headmen (*Nfumo*'s) by listing all households under their responsibility (Cavendish 2000). These households were then arranged alphabetically, and then a sample was chosen using a random

³⁵ Details can be seen at (http://www.cifor.cgiar.org/pen/_ref/home/index.htm).

number table. Where the selected household was not available for interviews, either due to multiple-listing³⁶ or inability to participate due to sickness or old age, the immediate next household on the list was chosen. It is important to have a sample size that is adequate for a statistical analysis. Sample size would depend on population heterogeneity, required level of precision and availability of resources (Singleton et al. 1993). Considering the heterogeneity in the area, we decided to draw a large sample.

The initial sample was 335 households. Five households migrated in the middle of the research missing at least two rounds of survey, and were excluded from the analysis. Another 24 households were temporarily away during survey months, thereby missing one round of survey. However, these households were included in the analysis, with the missed entries being substituted by the sample averages. Eventually, a sample consisting of 330 households was used for analysis.

Valuation of environmental resources

The environmental resources were valued and aggregated in a consistent manner for households involved in both market and non-market activities to produce household income accounts (Cavendish 2000). Households were asked to report the price of products sold. Where the product was not marketed, households were asked to place a price they would be willing to pay for a product, if they were to buy the same. Since the reported prices differed from household to household, we used quarterly average prices³⁷ to value products. Since most products were not traded in the market, one would expect households to have considerable uncertainty in valuing their resources, resulting in ambiguous or random responses or missing values. Surprisingly, households were able to place a value on almost all of their products, which were broadly comparable to each other, a finding consistent with Cavendish (2000) and Campbell et al. (2001) in neighbouring Zimbabwe.³⁸ To assess the plausibility of these values, we compared the reported prices of environmental goods with the local prices of their nearest substitutes wherever possible. For example, value of wild vegetables was compared with cultivated vegetables; value of wild birds captured was compared with chicken; value of game animals captured was compared with that of farm animals; and so on.

The reported quantities of various products were in local measures. We used consistent conversion rates to convert the local measures into standard measures. There were, however, difficulties. For instance, converting *molho* (meaning a bundle or bunch) into standard measures was challenging. For example, fuelwood was always reported in *molho*'s and so were wild vegetables, where the two *molho*'s differed by a large magnitude. The conversion task became even more complex when a catch of rats was also reported in *molho*'s. Direct observation was helpful in devising coarse conversion rules. For instance, one *molho* of fuelwood (weighing approximately 10 kg) was different from a *molho* of wild greens, weighing about a kg; which were different from a *molho* of rats numbering 4 or 5 (medium sized) to 8-10 (small sized).

³⁶ There were cases where households were listed in more than one village.

³⁷ Prices quoted by households, including the local market prices where appropriate, in the quarterly surveys were averaged after the end of the quarterly surveys, and used in the valuations.

³⁸ There were some exceptions. For instance, in the case of medicinal herbs, two households came out with figures that were nearly ten times higher than the figures reported by other households.

Quantifying the value of grazing by livestock was difficult. We valued the number of livestock units sold and consumed at home in each of the four quarters.

Income definition

Following Cavendish (2000), we used gross (total) income, as the measure of overall household welfare³⁹, defined as the sum of cash income, net gifts/transfers, subsistence income (from crops and livestock) and environmental income (value of all environmental products collected for consumption and cash income earning. Incomes were reported in local currency *metical* (plural *meticais*; MTS⁴⁰).

Field work

Field work was undertaken from January to December, 2006. Eight enumerators⁴¹ were recruited and trained, who conducted the interviews in the local language (*Sena*), under the supervision of the researcher. Enumerators went through an intensive 2-week training which included review of the questionnaires, 'in-class' demonstration and mock interviews, which helped address many inconsistencies in phrasing questions and recording responses. Actual interviews were started in a phased manner which helped further refine interview skills of enumerators. Each enumerator was given responsibility of 40 households either in his native village or in the neighboring village. The survey supervisor and the researcher conducting both interviews as well as monitoring remaining interviews (which included both 'surprise' visits to the interviews being done by enumerators, post-interview cross checks with the respondents and regular questionnaire scrutiny). The advantage of placing the enumerator in his own village (or neighboring village) was that it helped build trust with the households which in turn helped obtain information which otherwise would be difficult to collect by an outsider.

The four rounds of quarterly surveys were held in March-April (1st round), June-July (2nd round), September (3rd round) and November-December (final round) of 2006. The two village (community) surveys and annual surveys were held in March (beginning of the survey season) and November (end of the survey season). At the beginning of the field work, discussions were held with key informants and other members in each of the five villages.

16 Analysis and results

16.1 Socio-economic summary of households

A summary of some socio-economic variables of the sample households in three villages is shown in Table 2. On average, a household consisted of about six members. The average size of household was around 6; average size being largest in Mbalawa (6.38) and smallest in Nhambita (5.28). Literacy rate, which is the ratio of total literate members in the household to total members, was around 58%, which varied from 52% (Mbalawa) to 65% (Pungue). The average size of total land holding was around 4 ha of which 2.14 ha was cultivated. On average,

³⁹ Consumption is often preferred to income as a measure of welfare (Deaton, 1980), but in rural Africa consumption and income are not dissimilar (Cavendish 2000). We also measured consumption in this study; it will be examined in subsequent analyses.

⁴⁰ All calculations in this study are based on old currency; under the currency reforms, the last three digits in the currency have been removed. The exchange rate fluctuated throughout the study period; however, we use a constant exchange rate of 1US\$ = 26,500 MTS.

⁴¹ Enumerators had varying educational qualification, with diploma (highest), certification course and high school (lowest).

Table 2: Socio-economic summary of sampled households

<i>Variable</i>	<i>Nhambita</i>	<i>Mbalawa</i>	<i>Pungue</i>	<i>Overall</i>
<i>Sample</i>	58	131	141	330
<i>Size of household</i>	5.28 (2.08)	6.38 (2.82)	5.67 (2.63)	5.75 (2.63)
<i>Number of females</i>	2.9 (1.59)	3.18 (1.89)	2.87 (1.67)	3.00 (1.75)
<i>Number of males</i>	2.31 (1.41)	2.89 (1.77)	2.77 (1.66)	2.73 (1.67)
<i>Number of adults</i>	3.19 (1.25)	3.54 (2.10)	3.33 (1.95)	3.39 (1.91)
<i>Mean education of the household head</i>	3.00 (1.93)	3.42 (2.14)	3.54 (2.08)	3.39 (2.08)
<i>Household literacy (%)</i>	53.22 (50.47)	51.51 (51.00)	64.95 (57.13)	57.56 (53.84)
<i>Total land area (ha)</i>	4.94 (4.81)	3.25 (1.77)	4.40 (3.16)	4.04 (3.16)
<i>Area of agricultural land (ha)</i>	2.42 (1.29)	1.86 (0.98)	2.29 (1.35)	2.14 (1.22)
<i>Length of household formation (years)</i>	20.67 (13.83)	17.06 (12.99)	18.29 (13.50)	18.21 (13.36)
<i>Value of assets (MTN)</i>	579 (1,034)	446 (641)	732 (1,787)	592 (1,313)

Figures in parenthesis are standard deviations

households were formed about 18 years ago. Length of household formation varied from 17 years (Mbalawa) to 21 years (Nhambita). On average, value of assets held by households was about 600 MTN, in the form of bicycle, radio, cash, etc. Owning these assets is considered as status symbol.

16.2 Type and extent of environmental resource use

The types of environmental resources collected and extent of household participation are indicated in Table 3. Over three quarters of the sample households participated in collection of animals as food. This category included a range of animals, including rats, cane rats, antelope, etc. Participation was higher in Nhambita (located inside the GNP) and Mbalawa (outside the buffer zone). Collection of birds and insects as food was higher in Mbalawa than the other communities. Two households in Nhambita reported to have sold a part of their animal catch. Participation in medicinal plants collection was highest in Nhambita, where four households reported selling their produce. Over a quarter of the sampled households collected tubers. Participation rate was highest in Mbalawa (31%), followed by Pungue (11%). Mushroom collection was a low level activity in the entire area, with about 8% households involved.

Nearly 60% of the households collected poles, with less than 5% of all households selling poles. Participation in collection was highest in Mbalawa, whereas trading was highest in Nhambita. Collection of bamboo, important for construction, was a major activity with nearly 47% participating. Participation was highest in Mbalawa (56%), followed by Pungue (48%). Nearly 15% of households in Mbalawa and 11% in Pungue reported selling bamboo. On the other hand,

collection of timber was not a major activity for the sample households since less than 5% of the households participated in collection, and less than 1% selling timber.

Charcoal making was an important activity in Mbalawa where 23% of the households were involved in this activity. Gold panning was a major activity in Mbalawa where about 32% of households were involved. According to the GNP authorities gold panning is a prohibited activity. However, households continue doing it. About 3% of households participated in collection and sale of stones; over 10% participated in collection of clay; and about 7% sold articles made of clay. We have excluded from the table products such as fuelwood, wild vegetables, etc. which were collected by all households.

16.3 Socio-economic differentiation and environmental resource use

Do poor or rich households extract more environmental resources? To answer this question, we classified households according to per capita gross income, and compared the income composition of four income quartiles (a block of 25% of sampled households each) (Tables 4 and 5).

Farming accounted for the largest portion of the gross income (33%) and about 9% of the cash income. Overall, environmental resources accounted for roughly about 40% of the gross income and 25% of the cash income of the households, on average (Tables 4 and 5). Wage income accounted for 11% of the gross income and 32% of the cash income. Livestock sector contributed about 7% of the gross income and 10% of the cash income. In terms of gross income, value of crops used at home declined from the bottom quartile (low income households)

Table 3: Collection of select environmental resources (% of all households)

Category	Product	Indicator	% Households participating in			
			Nhambita	Mbalawa	Pungue	Overall
Number of household	..	.Number	58	131	141	330
Food	Animals	Collection	81.03	80.92	73.76	77.88
		Sale	3.45	0.76	0.00	0.91
	Birds	Collection	5.17	37.40	13.48	21.52
		Sale	0.00	0.00	0.00	0.00
	Insects	Collection	36.21	70.23	38.30	50.61
		Sale	0.00	0.00	0.00	0.00
	Fruits	Collection	60.34	63.36	50.35	57.27
		Sale	0.00	0.00	0.00	0.00
	Tubers	Collection	2.41	31.30	10.64	26.67
		Sale	0.00	0.00	0.00	0.00
Mushrooms	Collection	1.72	8.40	10.64	8.18	
	Sale	0.00	0.00	0.00	0.00	
Medicine	Medicinal herbs	Collection	65.52	54.96	25.53	44.24
		Sale	6.90	0.00	0.00	1.21
Construction	Poles	Collection	58.62	68.70	50.35	59.09
		Sale	10.34	3.05	4.26	4.85
	Timber	Collection	5.17	6.11	4.96	5.45
		Sale	1.72	0.00	0.71	0.61
	Bamboo	Collection	20.69	56.49	48.23	46.67

	Sale	0.00	14.50	10.64	10.30
Charcoal	Collection	0.00	22.90	0.71	9.39
	Sale	0.00	22.90	0.71	9.39
Gold panning	Collection	0.00	32.06	13.48	18.48
	Sale	0.00	32.06	13.48	18.48
Stones	Collection	8.62	3.82	-	3.03
	Sale	8.62	3.82	-	3.03
Clay	Collection	13.79	16.79	3.55	10.60
	Sale	8.62	11.45	2.13	6.97

to top quartile (high income households). However, share of crop sales increased from first to third income quartiles, which declined in the highest income quartile (Table 4). Similar patterns were observed in the case of cash income (Table 5). Crop sales contributed more to richer sections (third and fourth quartiles) than the poorer sections. On the other hand, livestock sale contributed more to lower income households (first and second income quartiles).

Even more marked patterns were observed in environmental income. Environmental products jointly accounted for a larger share of gross income of high income households than that of the low income households. However, the value of unprocessed forest products consumed at home (consisting mainly of vegetables, roots, insects and animals) was higher for low income households than high income households. Value of environmental products sold for cash income was higher for high income households.

Table 4: Composition of gross income (%)

<i>Variable</i>	<i>Household quartiles</i>				<i>All households</i>
	<i>Lowest 25%</i>	<i>25-50%</i>	<i>50-75%</i>	<i>Top 25%</i>	
<i>Crop used at home</i>	37.03 (14.19)	31.46 (12.04)	27.86 (13.30)	21.83 (14.56)	29.51 (14.58)
<i>Sale of crops</i>	1.86 (4.49)	2.31 (3.45)	4.14 (7.77)	3.27 (5.41)	2.90 (5.57)
<i>Livestock use</i>	1.98 (2.99)	3.77 (5.01)	2.94 (3.96)	1.54 (2.50)	2.55 (3.82)
<i>Livestock sale</i>	3.45 (6.51)	5.29 (7.94)	4.15 (7.97)	2.14 (3.84)	3.75 (6.84)
<i>Use of unprocessed forest products</i>	25.19 (11.29)	23.64 (11.74)	20.86 (10.98)	19.63 (12.03)	22.32 (11.67)
<i>Sale of unprocessed forest products</i>	0.81 (4.10)	0.42 (1.47)	0.87 (2.45)	1.38 (4.17)	0.87 (3.26)
<i>Use of processed forest products</i>	0.72 (1.74)	1.13 (2.44)	1.13 (2.67)	1.96 (7.46)	1.24 (4.22)
<i>Sale of processed forest products</i>	0.82 (3.88)	3.14 (8.00)	5.93 (13.09)	7.53 (18.83)	4.37 (12.54)
<i>Fish use</i>	3.84 (7.29)	4.43 (6.55)	6.09 (9.36)	10.67 (14.23)	6.27 (10.16)
<i>Fish sale</i>	0.71 (2.68)	0.75 (2.34)	1.88 (4.55)	4.12 (7.44)	1.87 (4.90)
<i>Use of mineral</i>	0.18	0.23	0.34	0.32	0.27

Table 5: Composition of cash income (%)

Variable	Household quartiles				All households
	Lowest 25%	25-50%	50-75%	Top 25%	
Sale of crops	6.62 (12.11)	7.33 (10.65)	10.93 (17.88)	10.33 (17.33)	8.82 (14.90)
Sale of livestock	11.54 (20.97)	14.37 (20.25)	10.31 (17.25)	5.06 (8.69)	10.31 (17.71)
Sale of unprocessed forest products	1.97 (8.51)	0.93 (3.48)	2.19 (6.33)	3.91 (12.98)	2.26 (8.60)
Sale of processed forest products	2.94 (13.05)	7.97 (16.30)	5.99 (14.64)	12.01 (26.05)	8.70 (21.66)
Sale of fish	2.98 (11.55)	2.37 (6.99)	11.45 (24.30)	11.90 (21.52)	5.83 (15.10)
Sale of non-forest environmental products	5.06 (16.41)	5.79 (16.88)	7.04 (15.97)	16.23 (26.22)	8.55 (19.79)
Wage	43.99 (33.08)	40.11 (28.90)	30.39 (28.57)	15.13 (17.36)	32.35 (29.63)
Business	2.37 (9.64)	6.33 (17.50)	8.04 (20.22)	14.66 (28.73)	7.87 (20.63)
Other sources	22.53 (25.36)	14.79 (20.54)	13.25 (20.70)	10.76 (18.27)	15.31 (21.72)
Total	100	100	100	100	100
Cash income (MTN)	3,406 (2,494)	5,633 (3,010)	8,062 (4,938)	16,190 (23,773)	8,346 (13,197)
N	82	82	83	83	330

Figures in parenthesis are standard deviations

products	(0.99)	(0.95)	(2.94)	(2.25)	(1.97)
Sale of mineral products	1.87 (6.76)	1.76 (5.72)	3.20 (8.00)	7.45 (12.63)	3.58 (8.97)
Wage	13.88 (14.29)	13.73 (12.19)	10.49 (9.81)	5.00 (4.48)	10.76 (10.88)
Business	0.92 (4.79)	2.89 (8.75)	4.45 (12.23)	9.52 (20.29)	4.46 (13.22)
Others	6.73 (8.84)	5.03 (8.83)	5.67 (10.84)	5.26 (8.95)	5.26 (8.95)
Total	100	100	100	100	100
Gross income (MTN)	10,866 (4,998)	15,507 (4,820)	18,857 (6,409)	31,760 (27,993)	19,284 (16,672)
N	82	82	83	83	330

Figures in parenthesis are standard deviations

Composition of environmental income showed some interesting patterns (Table 6). In value terms, fuelwood was the dominant environmental product for the three lowest quartiles, accounting for over 20% of the environmental income. For the top quartile, fish was the dominant product, accounting for roughly a quarter of the environmental income, followed by fuelwood. Share of fuelwood in the environmental income progressively declined from bottom quartiles to the top. On the other hand, contributions of fish, processed forest products and non-forest environmental products increased from bottom to top income quartiles. The share for poles and thatching grass, both used for construction, increased from first to third quartile and dropped in the top quartile. Other products, such as bamboo and animals, did not show a linear pattern of

change across income quartiles, and the remaining ones were less significant in terms of their share in the environmental income.

16.4 Economic shocks and environmental resources use

Economic contribution of environmental resources is sharply debated in the literature (Perez and Byron 1999, Cavendish 2000, Godoy et al. 2000b, Pattanayak and Sills 2001, Fisher 2002). Many researchers assume that forest products serve as “gap fillers” (i.e. income supplements or safety nets during income shortfalls) rather than engines of development (Godoy et al. 2000b). In the literature, there is often a tendency to combine the different roles of forest products under “livelihood support”, ignoring the vary different roles that forest products play. The safety net function of forest products is considered important particularly for the poorest households, and there have been calls to give greater attention in research to this role (Cavendish 2000, Pattanayak and Sills 2001, Fisher 2002). The literature demonstrates the myriad of income shocks that households have in the face of, e.g., crop loss, livestock loss, and health shocks, and shows how households choose to respond to these shocks (Paxson 1992, Rosenzweig and Binswanger 1993, Kochar 1999, Pattanayak and Sills 2001, Rose 2001, Fisher 2002, Cameron and Worswick 2003). Communities in and around GNP regularly witness a variety of shocks, e.g. regular bouts of cerebral malaria, diarrhea and other waterborne illnesses; a variety of accidents (falling from trees, snake bites, etc). The GNP area was the heart of armed conflicts

Table 6: Composition of environmental income

Variable	Household quartiles				All households
	Lowest 25%	25-50%	50-75%	Top 25%	
<i>Timber</i>	1.81 (8.94)	1.03 (4.88)	0.74 (3.65)	0.96 (5.38)	1.33 (6.02)
<i>Poles</i>	5.30 (9.37)	5.51 (9.37)	5.61 (7.10)	4.21 (5.46)	5.15 (7.32)
<i>Fuelwood</i>	40.19 (21.72)	29.71 (20.73)	21.58 (15.24)	18.02 (21.04)	27.33 (21.52)
<i>Bark</i>	1.23 (2.64)	0.79 (2.54)	0.54 (1.41)	0.17 (0.59)	0.68 (2.00)
<i>Bamboo</i>	4.56 (9.26)	8.62 (14.19)	5.92 (12.34)	8.82 (16.24)	6.98 (13.33)
<i>Fruits</i>	1.84 (3.32)	1.16 (2.10)	2.15 (2.10)	1.60 (2.79)	1.69 (3.01)
<i>Tubers</i>	0.81 (2.32)	1.05 (2.45)	2.38 (7.17)	1.18 (3.21)	1.36 (4.31)
<i>Vegetables</i>	10.86 (6.71)	6.95 (5.41)	7.45 (7.37)	5.09 (5.77)	7.58 (6.67)
<i>Mushrooms</i>	0.12 (0.57)	0.06 (0.27)	0.33 (2.03)	0.02 (0.08)	0.13 (1.07)
<i>Medicinal herbs</i>	0.45 (1.54)	0.40 (1.52)	0.27 (0.59)	0.25 (0.60)	0.35 (1.15)
<i>Broom-grass</i>	1.24 (1.02)	1.00 (0.76)	0.82 (0.71)	0.66 (0.68)	0.93 (0.83)
<i>Thatching grass</i>	4.28 (8.59)	6.64 (8.87)	7.10 (11.24)	3.16 (4.86)	5.29 (8.81)
<i>Grass</i>	2.49 (8.42)	0.77 (3.02)	0.90 (3.98)	1.03 (3.13)	1.30 (5.15)
<i>Animals</i>	4.78 (5.92)	6.99 (7.02)	5.40 (5.20)	4.43 (4.73)	5.40 (5.83)
<i>Birds</i>	0.39 (1.21)	0.50 (1.44)	0.37 (0.83)	0.48 (1.40)	0.43 (1.24)
<i>Insects</i>	1.46 (3.2)	1.07 (1.75)	1.02 (2.11)	0.74 (1.28)	1.07 (2.20)
<i>Honey</i>	0.18 (0.93)	0.59 (3.66)	1.00 (3.84)	0.53 (2.04)	0.58 (2.88)
<i>Processed forest products</i>	3.29 (9.45)	9.36 (16.42)	11.78 (20.68)	12.77 (25.56)	9.32 (19.27)
<i>Fish</i>	11.23 (10.84)	14.26 (19.57)	18.48 (22.91)	24.45 (29.69)	17.13 (23.50)
<i>Non-forestry products</i>	3.48 (10.84)	3.52 (9.62)	6.16 (14.30)	11.42 (17.54)	6.16 (13.78)
<i>Total</i>	100	100	100	100	100
<i>Gross income (MTN)</i>	3,941 (3,500)	5,682 (3791)	7,708 (5,400)	19,196 (28,454)	9,264 (15,923)
<i>N</i>	82	82	83	83	330

Figures in parenthesis are standard deviations

during the civil war⁴², including the laying of anti-personnel mines which continue to present huge risks. Fire hazards are rampant: a major fire occurred during the study period, sweeping through a part of the area destroying homes, fields and stored grains, resulting in the death of two

people (including someone from a sampled households). Various shock-related incidents, including crop loss, livestock loss, illness, death of a household member, fire, theft, loss of employment, etc. were examined in this study, along with estimates of monetary loss in terms of actual damage occurred or lost employment income. Household responses to each of these shocks were also examined. However, for the purpose of this analysis, we consider only illness and fire as household specific economic shocks, and examine the safety net role in the context of household use of environmental resources.

Conceptual framework

Empirical literature covers a range of models on diversification and risk coping mechanisms (Paxson 1992, Rosenzweig and Binswanger 1993, Kochar 1999, Pattanayak and Sills 2001, Rose 2001, Fisher 2002, Cameron and Worswick 2003). Following Rose (1999), the theoretical framework underlying the empirical analysis is based on a two period model (which can be extended to multiple periods without the loss of generality) involving household efforts⁴³ into environmental resource extraction. The 2-period model allows inclusion of ex ante and ex post, and consideration of economic shocks. The first period is the one prior to the occurrence of a shock (such as sickness or fire)⁴⁴, and the second period is the period subsequent to the occurrence. The household collects environmental resources in each period.

Let “ ξ ” be a random variable representing the shock that adversely affects the household income. In period 1, the household does not know the actual occurrence of ξ , but knows its mean value (μ) and variability of intensity (ρ). The household’s production and resource extraction efforts in the first period, E_1 , depend on μ and ρ , and also factors such as agricultural income, wage income, demography and other variables.

$$E_1 = L_{E_1}(\mu, \rho, w, A, \theta) \text{ ----- (1)}$$

Let A be the wealth level (including cash in hand, stored food grains, etc.) in period 1; w be the wage employment; θ be a vector of parameters describing environmental resource extraction. We expect the ρ to affect E_1 in two ways. First, through a “portfolio” effect i.e. given the wage income and wealth level, the household may be assumed to adjust its resources. Second, there may be a “precautionary effect” whereby the household might collect environmental resources either to supplement (or complement) farm harvest. Both of the above will generate positive effects of ρ on environmental resource extraction.

In period 2, the household knows the value of ξ and ρ , and responds to them directly. Therefore, the efforts in period 2, E_2 , conditional on decision in the Period 1 is

⁴² We were warned about ongoing de-mining operation during field work, and were advised not to deviate from the beaten tracks while on foot.

⁴³ We do not define this in terms of number of labour days spent in actual resource extraction. Instead, we use the environmental income (aggregated values of products used at home and products sold for cash income) per capita.

⁴⁴ Rainfall in 2006 was normal, and crop yields were normal in the study area.

$$E_2 = E_2(E_1(\cdot), \varepsilon, \mu, A, \theta) \text{ ----- (2)}$$

where $\varepsilon = \xi - \mu$

We would expect ε to affect environmental extraction through income and substitution effects. When ε is low (high), income shortfalls are low (high) and the household will increase (reduce) environmental resource extraction to smooth income.

Total environmental extraction for the year, E_T is the sum of E_1 and E_2

$$E_T = E_T(\mu, \rho, \varepsilon, w, A, \theta)$$

$$E_T = E_1(\mu, \rho, w, A, \theta) + E_2(E_1(\mu, \rho, w, A, \theta), \varepsilon, \mu, w, A, \theta) \text{ ----- (3)}$$

The presence of ex post responses to shock can be tested from the above equation (3), using the test of: $\partial E_T / \partial \varepsilon \neq 0$ ⁴⁵.

Empirical strategy

Although data was collected on a quarterly basis, we use annually aggregated data. The safety net role of environmental resources is examined in two ways. First, a household might respond to shocks by increasing own consumption of environment resources (say, wild food) due to paucity of cash income to buy food. We employ a multiple regression to examine the determinants of the total value of environmental resource use.

Second, a household might respond to shocks by extracting and selling environmental resources to tide over the liquidity crisis caused by an economic shock. However, only some households sold environmental resources, which resulted in the remaining households taking zero entries. Therefore, we create a binary variable (yes/no; 0/1) indicating whether a household sold environmental products, and use a logit model for estimating the parameters.

The following estimating equation was used for regression.

$$y_i = \alpha + \beta X_i + \delta Z_i + \varepsilon_i$$

where y represents per capita environmental income; X is a vector of socio-economic variables with β beta representing their parameters; Z a vector of dummy variables representing shocks; and ε is the error term.

For the logit model, the following specification was used:

$$P^*_i = a + bX + cZ + e$$

where P^* is a latent dichotomous variable (1 or 0) with the outcome that whether a household earned a cash income from the sale of environmental resource; X is a vector of household

⁴⁵ However, as Rose (1999) argued, there could be factors other than shocks considered here which bring about uncertainties in resource use. The test mentioned above cannot be considered as the response to risk. If responses are not correlated, then it could be a response; if there is correlation among the risks then the response may be considered as the net response to all sources of risks, which will lead to a potential omitted variable bias that needs to be addressed.

variables and Z a vector of dummy variables representing the shocks; a , b and c are the respective coefficients; and e the error term.

Descriptions of the variables used and the expected sign of the coefficients are indicated in Table 7. The models were estimated using Stata (version 8).

Multiple regression

The regression produced consistent estimators with most of the variables taking expected signs (Table 8). We used robust standard errors. There were no missing variables in the model⁴⁶, but there was a problem of non-normal errors⁴⁷.

Table 7: Description of the explanatory variables

Variable	Explanation	Expected sign
<i>pcland</i>	<i>Per capita land holding (ha)</i>	-
<i>Lnwage</i>	<i>Natural log of wage income per capita</i>	-
<i>Woman</i>	<i>Dummy variable if the household is headed by woman</i>	+/-
<i>Hhborn</i>	<i>Dummy variable if the household head was born in the village</i>	+
<i>Hhform</i>	<i>Number of years the household was formed</i>	+
<i>Hhform2</i>	<i>Square of the number of years</i>	-
<i>Outpark</i>	<i>Dummy variable if the household was outside the park</i>	+
<i>Pespart</i>	<i>Dummy variable if the household is participating if the PES project</i>	-
<i>Distance</i>	<i>Distance (km) to the forest from the household</i>	-
<i>Sick</i>	<i>Dummy variable if a member of the household fell sick in the year</i>	+/-
<i>Fire</i>	<i>Dummy variable if the household witnessed a fire in the survey year</i>	+/-

The estimation produced some interesting results. We expected per capita land to influence the environmental resource negatively. However, it turned out that there was a positive relationship between land holding and environmental resource use, which was statistically highly significant. It implies that, holding all other factors constant, an additional ha of land is predicted to increase the environmental income by 34%. One plausible explanation could be that environmental products include all wild products from wild and naturally occurring on fallow land and crop lands. Some of the animals were reported to have been captured either in the crop land or fallow land. Because of these reasons, we observe a positive relationship between environmental income and land area. The negative and significant sign on the variable *woman* (i.e. household headed by a female) is interesting. It implies that female headed households earned 29% less environmental income than male headed households.

The two variables concerning length of household formation i.e. number of years of household formation and square of the years of household formation, have an interesting interpretation. First year of household formation brought about 3.24% reduction in environmental income, while the second year was estimated to reduce the same by 3.18% (i.e. 0.06% higher than the first year). This implies that households that were formed earlier earned more environmental

⁴⁶ Using the Ramsey RESET test, we could not reject the null hypothesis that the model has no missing variables.

⁴⁷ The errors turned out to be non-normal. We used log transformation of some of the variables which helped to partially mitigate the problem; yet, the regression failed the skewness-kurtosis test for normality.

income than households that were formed recently. Participation in the PES project was estimated to reduce environmental income by 57% compared to non-participant households. Holding all other factors fixed, an extra one km distance between household and forest resource base was estimated to reduce the environmental income by 5%.

The two shock variables had an interesting explanation. Households that reported sickness resulting either in direct monetary expenditure and/or wage loss due to loss of labor days were estimated to extract more environment products and increase their environmental income by 42% which was statistically significant (p value 0.05). Similarly, households which experienced fire increased their environmental income earnings by 34% (p value 0.006).

Table 8: Regressions with robust standard errors

<i>Variable</i>	<i>Coefficient</i>	<i>Robust standard errors</i>	<i>P-value</i>
<i>pcland</i>	0.3400	0.1036	0.001
<i>Lnwage</i>	-0.0570	0.0541	0.258
<i>Woman</i>	-0.2945	0.1369	0.036
<i>Hhborn</i>	0.1667	0.1110	0.133
<i>Hhform</i>	-0.0296	0.0082	0.000
<i>Hhform2</i>	0.0003	0.0001	0.003
<i>Outpark</i>	0.2111	0.1378	0.124
<i>Pespart</i>	-0.5732	0.1236	0.000
<i>Distance</i>	-0.0500	0.0356	0.160
<i>Sick</i>	0.4201	0.1932	0.046
<i>Fire</i>	0.3410	0.1428	0.006
<i>Constant</i>	14.2727	0.7220	0.000

$N = 303$ $F(11, 291) = 8.53$ $Prob>F = 0.0000$ $R^2 = 0.2105$

See Table 7 for variable descriptions

Logit regression

Results of the logit regression are presented in Table 9. Wage income significantly increased the odds of selling environmental products. The odds of selling were also significantly less for female-headed households compared to male-headed households. Household formation had a diminishing influence on the odds of selling environmental products. PES-participation and distance to forest significantly reduced the odds of environmental product sales. On the other hand, sickness significantly increased the odds of selling environmental products.

Table 9: Logit regression on participation or non-participation in sale of environmental products

<i>Variable</i>	<i>Odds ratio</i>	<i>Std. Error</i>	<i>Z</i>	<i>P-value</i>
<i>pcland</i>	0.9900	0.2267	-0.04	0.965
<i>Lnwage</i>	0.6466	0.0937	-3.01	0.003
<i>Woman</i>	0.2500	0.0864	-4.01	0.000
<i>Hhborn</i>	1.3668	0.3572	1.20	0.232
<i>Hhform</i>	0.9515	0.0213	-2.23	0.026
<i>Hhform2</i>	1.0005	0.0003	1.47	0.142
<i>Outpark</i>	1.0203	0.3811	0.05	0.957
<i>Pespart</i>	0.4269	0.1309	-2.78	0.006
<i>Distance</i>	0.6980	0.0912	-2.75	0.006

<i>Sick</i>	2.0726	0.8380	1.80	0.071
<i>Fire</i>	1.5137	0.6309	0.99	0.320

$N = 303$ $LR\ chi2(11) = 61.79$ $Prob > chi2 = 0.0000$

$Log\ likelihood = -178.09453$ $Pseudo\ R^2 = 0.1478$

17 Discussion

17.1 Household dependency on forest resources

Our results provided an indication of the extent of livelihood diversification by households, which is in line with other studies in Africa (Fisher, 2002; Barrett et al. 2001). Besides farming and livestock, households gathered a variety of environmental products, deriving about 40% of their gross income and 25% of cash income from environmental products. This finding is in line with other studies in southern Africa (Fisher, 2002; Campbell et al., 2002; Cavendish 2000).

Farming was a major activity to households, particularly for poorer households. Poorer households cultivated corn and sorghum and some pulses mainly for their own consumption, which formed the bulk of the farm output value. They seldom sold their food crop output, except when facing severe liquidity problems. On the other hand, richer households earned relatively larger proportion of their income (gross and cash income) from sale of crops, as also demonstrated by Campbell et al. (2001). We have seen that some of the households cultivated tobacco and cotton purely for commercial purposes. It may be recalled that these crops were introduced during the colonial time in Mozambique.

Livestock is considered an important asset in Africa. Farmers usually sell their livestock to meet the liquidity problems. This perhaps explains why low income households derived larger share of income from livestock than richer households. Although all households used unprocessed forest products for consumption, poorer households derived a larger share of their gross income from these products. Rural communities in southern Africa experience severe food shortages during the months (January-March) immediately preceding farm harvest (Fisher, 2002). During interviews, some of the households reported having lived only on wild food during hungry months. Value of the processed forest products used at home was more or less same for all households. However, richer households derived larger shares of their income from processed products and non-forest environmental products. On the whole, our results demonstrate that poverty and environmental resource dependence are closely linked; however, some qualification is necessary. Poorer households use environmental products for own use, while richer households use the environmental resources for cash income. As the income levels rise, the pattern of resource use changes towards more commercial products. This finding is in conformity with other studies (Hegde and Enters, 2000).

17.2 Socio-economic factors and environmental resource use

Empirical evidence on the role of environmental resources as safety nets is limited. Our results of the linear and logit regressions present some interesting insights. Environmental resource use and sale were significantly influenced by gender. Particularly, female-headed households collected significantly less environmental products than the male-headed households, and their probability of participation in the sale of environmental products was also less. This has an important policy implication. A substantial proportion of households are headed by women; some of them are

households consisting of single woman. Many male members reportedly perished during the civil war, and the fate of many is still unknown. GNP used to be the capital of the rebel forces during the war, and many households reported losing their male members during the war. Besides the HIV/AIDS pandemic, alcoholism was seen to be a problem, particularly among men. It was reported that consumption of local beer not only drained household budgets but also significantly impacted human health. There were also other factors, such as diseases and accidents which claimed a significant number of lives. As a result of these factors, significant numbers of households are headed by women, and these households tend to be resource poor were more vulnerable to economic shocks.

More established households tend to extract more environmental resources than younger families. Older families tend to have a greater knowledge and familiarity with the geography, seasonality, and quality and quantity of resource availability in their surroundings, and as a result will be in a better position to extract resources. Similarly, the probability of young families participating in the sale of environmental products was also less.

Participation in the PES-scheme was found to significantly reduce environmental resource use and also the probability of participation in sale of environmental products. PES project participants received free seedlings and annual cash payments subject to satisfying minimum conditions. One of the clauses in the contract is that no additional area will be cleared and burnt, after signing the contract. This may have discouraged the PES-participants from burning the forest. About a quarter of the participants were directly employed by the project, in the carpentry unit, forestry and agro-forestry research, community plantations, nursery operations, etc. Some of the participants also received red gram seeds for sowing, and some received jungle guinea fowl for rearing. Some of the PES-participants also got part-time employment in forest fire prevention and control operations which the project undertook. All of the above factors may have acted as an effective alternative to hunting and gathering activity, otherwise undertaken by the households, and resulted in reduced use of environmental resources.

The two shock variables, sickness and fire, were found to significantly increase environmental resource use, and sickness was found to increase the probability of sale. These findings confirm the role of environmental products as safety nets. Besides HIV/AIDS, diseases like malaria, cholera, diarrhea, etc were a common problem in GNP and surroundings. The Government undertakes, from time to time, preventive measures in urban and semi-urban areas, but they rarely reach remote villages like Nhambita. Many of the diseases in the study area are waterborne (diarrhea, cholera), which are preventable provided strict hygiene is observed. Drinking water was a problem, as these villages use stream water for drinking⁴⁸ which is more likely to be contaminated. There is a public health post in Pungue which caters for minor ailments. For major health problems, households need to go to the district headquarters at Gorongosa (about 40 km). In the absence of western medicine (which is luxury even in urban and semi-urban places) households tend to use herbal medicine or visit the spiritual leaders and seek spiritual remedies. For these reasons, even a minor ailment can have debilitating effect on lives of the villagers.

⁴⁸ A well was being built in Nhambita with the help of aid agencies including the PES-project.

Fire is a common tool for cleaning agricultural land after harvest. Use of fire is risky for PES-participants since some of them planted seedlings in mixed rows in the field, and death of seedlings will imply loss of cash payments. Fire is also used in hunting (to smoke animals from their holes and trap them). Households that suffered fire damage significantly increased their use of environmental resources. Although there was a positive relationship between fire and sale of environmental products, it was not significant statistically.

18 Conclusions

Environmental resources from the *miombo* woodlands make significant contributions to household economies in rural Africa. Our results demonstrate that environmental resources act as a crucial safety net against income shocks, related to health shocks and fire damage. This highlights the need for incorporating the *miombo* woodlands as part of poverty reduction strategies in Africa. Linkages between income levels and *miombo* resource use are complex. Poorer households tend to use *miombo* resources for subsistence, while richer households use them for cash income.

There is a lot of emphasis on female-headed households in rural Africa, in view of their vulnerability to hardships. We had anticipated that, owing to limited resources and alternatives, female-headed households would extract more environmental resources in relative terms than male-headed households, in view of limited requirements of capital and skills for extraction of environmental resources. But, it turned out to be the opposite case in GNP area. It re-emphasizes the vulnerability of female-headed households to hardships given that limited social security measures are in existence in the developing world and highlights the need for increased livelihood security to female-headed households.

We observed that PES-participant households extracted less environmental resources compared to participant households. Due to the negative link between PES and environmental resource use, PES-like schemes are likely to be a useful tool to generate greater environmental goods by reducing pressure on the environment, while at the same time improving or maintaining economic wellbeing of households.

19 Acknowledgements

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Annex 5: Poverty, environmental income and rural inequality: A case study from Zimbabwe

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ABSTRACT

Rural households rely heavily on goods and services freely provided by environmental resources. However, there have been very few adequate quantitative analyses due to a lack of appropriate household data sets encompassing economic and environmental data. Standard household budget surveys (HBSs) inevitably lack data on environmental income. We use a 213 household data set from rural Zimbabwe to undertake a quantitative analysis of the impact of environmental income on household welfare. Environmental income, in this case largely from woodland-based resources, is strongly and significantly equalising, bringing about roughly a 30 percent reduction in inequality (as measured in standard HBSs). However, including the value of environmental income leaves analysis of the causes of poverty and rural differentiation unchanged from those done with the standard data. While environmental income is important in mitigating poverty, it is unlikely to be important in lifting people out of poverty.

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21 Introduction

How poor are rural households? How unequal are rural societies? And what explains these phenomena? These questions have a long history and continue to engage leading economists (see for example Sen 1982, Dreze and Sen 1990, Dasgupta 1993, Deaton 1997). At the same time, there has recently been increasing interest in the economic relationship between rural households and environmental resources (in particular, forest resources – e.g. Cavendish 2000; Fisher 2004; Vedeld et al. 2004). It has been suggested that rural households may depend quite heavily on freely-provided environmental goods and services to sustain their welfare, through the provision of both productive inputs and consumption goods. Since these environmental resource uses are classically omitted from standard household budget surveys (HBSs), it has also been suggested that there is a substantial gap in our quantitative understanding of rural households (Dasgupta 1993; Vedeld et al. 2004).

To date, there have been few adequate empirical attempts to quantify the value of environmental resource use, and the impact these have on inequality of rural households. We use a 213 household data set, collected from Shindi in rural Zimbabwe (Cavendish 2000, 2002). This data set is derived from a household budget survey that rather uniquely collected comparable quantity and price data on both environmental resource use and all other economic activities at the household level.⁵¹ An earlier, widely-cited publication (Cavendish 2000) has shown that: (a) environmental resources make a significant contribution to average rural incomes; (b) poorer households also depend heavily on these resources, which contribute c.40% to their incomes; (c) richer households, however, use greater quantities of environmental resources in total; and, (d) considerable differentiation exists in the economic characteristics of environmental goods.

Given the quantitative significance of environmental income, we explore the impact that including environmental income has on estimates of inequality by contrasting income measures that included and excluded environmental income. Simply measuring inequality is only one task, though: there is the equally compelling question of the determinants of poverty and inequality. So we also examine whether conclusions concerning the causes of rural differentiation remain unchanged when the rural income measure is changed so dramatically.

The typical rural household survey produces an estimate of income which errs considerably by ignoring freely-provided environmental goods. By contrast, our survey has derived a truer measure of income, incorporating these values. So one can think of this paper as an exploration of the extent to which this particular error in the measurement of rural incomes affects our understanding of rural inequality and poverty: in short, is the traditional view of rural inequality and poverty seriously misleading? To what degree is environmental income inequality-promoting or reducing? And how does including or excluding environmental income affect our understanding of the underpinnings of rural poverty and differentiation? These questions have particular pertinence in the field of poverty analysis, due to fact that both in Zimbabwe and indeed globally, poverty is overwhelmingly a rural phenomenon. For example, in Zimbabwe it

⁵¹ This method was used as the basis of the Poverty and Environment Network (PEN) which has embarked on the world-wide collection of a 30+ data sets on forests and household income (<http://www.cifor.cgiar.org/pen>)

is estimated that 88 percent of the poor live in rural areas, while 31 percent of rural dwellers are classed as being poor (World Bank 1996).⁵² Thus any answers to these questions on the impact of environmental resources on our measurement of rural poverty have potentially wide significance.

The paper proceeds as follows. In the next section we briefly describe the research area, data collection and definitions. In Section 3 we demonstrate the overall quantitative significance of environmental resources to rural households. Section 4 looks at the impact of environmental income on the measurement of inequality, using a range of indices to measure inequality. We find that the inclusion of environmental income dramatically and significantly reduces estimates of inequality. In section 5 the causes of poverty and rural differentiation are explored through the decomposition of poverty and inequality indices. Conversely, here the inclusion of environmental income made little difference to findings as to the causes. Section 6 concludes, stressing the poverty mitigating role of environmental income, but the lack of evidence that environmental income can lift people out of poverty.

22 Research area, data collection, definitions

22.1 Research area

The data underlying this study were collected during 13 months of fieldwork (August 1993 to September 1994) in Shindi Ward, Chivi Communal Area, Zimbabwe. Shindi Ward is located in south east Zimbabwe, and is an area of some 200 km² comprised of 30 villages. In terms of its economic status, Shindi is typical of Zimbabwe's Communal Areas: that is, it is poor, lacks basic infrastructure (no tarred roads, water supply or electricity), its agricultural system is agro-pastoral (or hoe-based where people have no large livestock), and remittances from non-Shindi sources play an important role in supporting the local economy. In terms of its physical and resource characteristics, it is important to stress given the concerns of this study that Shindi is not an untouched, resource-abundant area. Rather, it has been settled for a long period of time and since the 1950s there has been substantial growth in the settled population both from natural increase and resettlement in Shindi of whole villages from other parts of Zimbabwe. In consequence, the environmental resource base has been much reduced in the last 40 years.

22.2 Data collection

The quantitative data were collected using household-based questionnaires, administered in the local language by a team of six local enumerators. In the absence of an official census, a household roster was compiled consisting of 1,092 households, and 218 households were randomly selected. Five dropped out over the course of the year. The questionnaire used was of the Income, Consumption and Expenditure (ICE) type: however, a number of modifications were made. First, the four quarterly surveys were augmented by beginning- and end-of-period surveys on demographics and household assets, including livestock. Second, the standard ICE framework was expanded to include special sections on the quantitative use of environmental resources. Third, best recall periods for each questionnaire item were investigated locally, and

⁵² These data are drawn from the 1990/91 Income, Consumption and Expenditure Survey conducted by the Zimbabwe Statistics Organisation. Other estimates of poverty in Zimbabwe give higher figures than the ICES. The Poverty Assessment Study Survey of 1995 estimated overall poverty to be 62 percent of the population, while Ravallion and Chen (1996) estimated that, in 1993, 39 percent of the population were living on less than US\$1 per person per day.

the questionnaires designed accordingly. Forth, a range of special questionnaire modules were added focussing on specific environmental utilizations, for example firewood collection and storage, housing and construction, tree planting, fields and environmental improvements, fencing, agricultural risk etc.

22.3 Environmental resource use data set

We briefly outline some of the principles used in producing the data set (Cavendish, 2000; 2002). First, we defined environmental resource as a resource that is freely provided by natural processes, i.e. it can treated as “Nature’s bounty.” In Shindi, the vast bulk of these resources were derived from areas – such as rangelands, woodlands, aquifers, and rivers – that are held under communal ownership. However, there were some wild species that grow spontaneously on private lands: these we also included in our definition of environmental resources. At least 100 different resource utilisations were identified, and in many cases multiple wild species were used for each resource utilisation. A broad classification of these environmental utilisations demonstrates the range of economic functions offered by these resources (Table 1). It was also clear that hardly any of these utilisations would be picked up by a standard HBS.

Table 1 - A Classification of Environmental Resource Utilisations by Economic Function

Consumption Goods	Inputs	Output Goods	Durables and Stocks
1. Wild fruits	1. Firewood (beer brewing)	1. Wild fruit sales	1. Furniture
2. Wild vegetables	2. Firewood (brick burning)	2. Wild vegetable sales	2. Large utensils (wood)
3. Large wild animals	3. Leaf litter	3. Wild animal sales	3. Firewood store
4. Small wild animals	4. Termitaria	4. Wine sales	4. Construction wood
5. Wine	5. Livestock browse/graze	5. Firewood sales	5. Fencing (wood)
6. Other wild foods	6. Thatching grass	6. Construction wood sales	
7. Firewood		7. Thatching grass sales	
8. Agricultural tools (wood)		8. Other wild good sales	
9. Small utensils (wood)		9. Carpentry sales	
10. Mats (reeds)		10. Woven goods sales	
11. Woven baskets		11. Pottery sales	
12. Pottery		12. Env.-based labour income	
13. Wild medicines		13. Gold sales	

The environmental resource use and non-environmental economic data were valued and aggregated using standard principles for households involved in both market and non-market activities, to produce household income accounts (see Grootaert 1982). In particular, wherever possible, economic transactions – including environmental utilisations – were valued either at households’ reported prices or at local market prices; value-added was calculated where relevant, including for subsistence agriculture; and where valuation of resource utilisations was difficult, methods were developed using the best price data available. The household income data were then made welfare-comparable by adjusting for inter-household differences in household attendance, household size and demographic structure: thus in this paper “income” refers to income per adjusted adult equivalent unit (aeu) (Cavendish 2002).

22.4 Basic definitions: Consumption, income, poverty and inequality

Consumption versus income

Although it is more common for poverty studies to choose per capita consumption as a measure of individual welfare (Deaton 1980), in our study there is little difference between income and consumption as such a high fraction of household total income is made up of the consumption of own-produced goods and the consumption of own-collected environmental goods, which appear in both income and consumption accounts. We have thus used income as the measure of welfare.

In our analysis of poverty we have used the poverty headcount index. The 1990/91 ICES used lower and upper rural poverty lines of US\$61 (Z\$209) and US\$100 (Z\$340), while the 1995/96 PASS used much higher lower and upper rural poverty lines of US\$137 (Z\$1,180) and US\$224 (Z\$1,924). If these various US\$ poverty lines were ordered and applied to Shindi using the 1993/94 period average exchange rate (Z\$7.71 per US\$), they would imply poverty lines of Z\$470, Z\$771, Z\$1,056 and Z\$1,727 respectively. We have chosen poverty lines fixed with reference to the standard income distribution in our sample, here called the 50th and 75th percentile poverty lines. These are the boundaries between the middle quartiles and the top and second quartiles, respectively. These are roughly equal to the ICES lower and upper rural poverty lines translated into Z\$ for 1993/94.

Income measures to be compared

To answer the questions, we first define the different income measures that are to be compared. The first – “total income” – is drawn from the full, environmentally-augmented questionnaire. It is the broadest measure of income that can be derived from those data, and incorporates the value of all measured environmental uses as well as the other three income categories of Table 1.

The second measure we label ‘standard income’: this comprises cash income (excluding environmental cash income), net gifts and the net value of own production. This measure of income excludes all environmental income sources, and is a plausible estimate of the income measure that would be derived for the sample households if a standard HBS had been implemented over the same period.

We argue that the standard measure is similar to what would be calculated in a standard HBS for two reasons. Firstly, standard HBSs exclude all the questions we included concerning the use of environmental resources, without which it is not possible to calibrate environmental resource use. For example, very few household surveys in developing countries have attempted to value even the household's use of firewood, yet this is the most widely recognised use of environmental resources. As for less well-known resource utilizations – such as wild foods, natural fertilisers, natural construction materials and production inputs – these are completely excluded. Of course, there are some environmental values that a standard questionnaire may pick up in passing. This may be the case especially with environmental sources of cash income, which we have excluded from standard income. Since standard HBSs do have sections on cash income generally, it may be argued that they would pick up this item. However, field experience leads one to be cautious about this assertion. General questions about “other cash sources” rarely pick up even significant cash sources, and this is particularly true of resources which are regarded locally as “small” or “inferior.” Many of the data on environmental cash income were only picked up in our questionnaire because there were specific questions asking about these income sources, without which it is unlikely that these data would have been volunteered by the respondents. This goes even for categories like environmentally-derived local labour income,

since the activities which comprise this item were thatching, digging termitaria, carving and roof mending. It is reasonable to assume that without questions specifically targeted at these items, they would not have been uncovered.

The second reason that the standard measure is what would be calculated from a standard HBS is that the non-environmental sections of the questionnaire were explicitly modelled on standard HBSs, such as those conducted by national statistical agencies and under Living Standards Measurement Survey of the World Bank. Indeed, the survey questions on resource use were “piggy-backed” onto standard question and categories concerning income, consumption, expenditure and assets.

The results we have derived may depend too heavily on a potentially contestable definition of standard income. In particular, excluding all environmental income from the standard income measure could be thought to be unnecessarily restrictive. We address this problem by defining a third income measure, labelled “expanded income”. Here we include environmental income sources that might be captured by a typical HBS, even if there were no questions aimed at environmental income *per se*. There are two sorts of variables that meet this criterion. The first is environmental cash income sources which could possibly be picked up through general questions on cash income. These were income from gold panning; cash derived from the sale of large carpentry items (such as doors, door frames, furniture, mortars, pestles, cart frames, shelving, tables and chairs); and environmentally-based local labour income (eg. thatching, roof mending and digging termitaria). The second is environmental income sources that would have appeared in the typical HBS' income measure through default. The example here is the value of all environmentally-derived fertilisers. In a typical HBS, the data on the value of these would not be collected, so that the value of these inputs would not be deducted from gross agricultural output. To calculate expanded income, then, we have simply taken these various environmental income sources and added them to standard income to produce a more catholic measure of income produced in a typical HBS.

Inequality indices

A plethora of inequality measures exist, and different combinations of these are used in different studies of the issue. We have estimated a wide range of inequality measures. We have done this partly in response to the lack of consensus concerning the theory of inequality measurement, and partly as it allows greater comparison between the results of this study and the results of other works on inequality. But also by using a wide range of inequality indices, we augment the robustness of our findings, in that the results cannot be dismissed as an artefact of the indices chosen. The seven indices calculated were: Relative mean deviation, Coefficient of variation, Variance of logarithms, Gini coefficient, Mean log deviation, Theil entropy index, Generalised entropy-2 (see Kanbur 1984, Shorrocks 1980, Cowell and Kuga 1981, Shorrocks 1984).⁵³

As noted earlier, in order to make welfare comparisons conceptually feasible across households, we adjusted the crude household income data by an equivalence scale which made allowances for differences in individuals' needs and for economies of scale in household production (Cavendish 2000). While this makes it plausible to claim that, in our inequality measures, we are comparing welfare across households, it is only feasible to extend that claim to welfare across

⁵³ For more details on last inequality index, see Appendix 1

individuals if we assume that equivalent incomes are equally distributed within the household. While this is an implicit assumption often made in studies of inequality, it is hardly plausible, especially in view of the compelling evidence that intra-household distributions are far from egalitarian (Alderman *et al* 1995, Behrman 1997). In other words, all our calculations for inequality will be underestimates, even if we cannot say by how much this is likely to be the case.

23 The basic income accounts

Income accounts at a high state of aggregation are presented in Table 2, with income sources booked under one of four categories: cash income, net gifts/transfers, subsistence income and environmental income. This table demonstrates clearly the quantitative importance of environmental resources to rural households (see also Cavendish 2000). In total value terms, environmental resources account for as great a quantity of income as (non-environmental) cash income, while in terms of average budget share, these resources account for 35 percent of total income, just less than that of the largest item, subsistence consumption. Given that the value of these resource utilisations does not appear in standard household studies, these data confirm that there is a substantial quantitative gap in the conventional understanding of rural households. They also lead naturally on to the concerns of this paper. With such a large source of omitted value, how confident can we be of conventional inequality estimates? How does environmental income affect these measures? And does it alter our perspectives on poverty derived from standard analyses?

24 Inequality and environmental resources

The estimates for the inequality measures for the different measures of income are presented in Table 3. We start by discussing the standard income measure as this by construction is the income measure closest to those produced by standard HBSs. The Shindi community is not wildly unequal. This is supported by comparing the Gini coefficient for Shindi ($G = 0.36$) against the coefficient for a range of other countries (World Bank 1997). The Gini coefficient for Zimbabwe as a whole is 0.57, while the coefficients for other African countries which are either Zimbabwe's neighbours or which have similar income levels are Côte d'Ivoire 0.37; Egypt 0.32; Ghana 0.34; Guinea 0.47; Lesotho 0.56; Mauritania 0.42; Morocco 0.39; Senegal 0.54; South Africa 0.58; and Zambia 0.46. Shindi also seems to be less unequal than other parts of Zimbabwe: one study of income distribution in 1990/91 for all Communal Areas calculated the Theil entropy index to be either 0.33 or 0.35, depending on the indicator of welfare used (Jenkins and Prinsloo 1995) while another, based on an earlier data set of 1984/85, calculated the all-Communal Areas Theil to be 0.34 (Jackson and Collier 1991).

Adding environmental income into the welfare measure (“total income”) produces a sizeable and significant reduction in measured inequality that is consistent across inequality measures. Taking the totemic Gini coefficient, this falls from 0.36 for standard income to 0.30 for total income: a reduction of c.19 percent. In fact, the Gini records the lowest reduction in inequality of all the

**Table 2 - 1993/94 Shindi Total Income
by Aggregated Income Source (Z\$)**

Income Source	Sum of Incomes Per Adj. Aeu	Income Budget Shares (1)
Cash income		
Crop Income	6,935	3.42
Livestock Income	3,359	1.86
Unskilled Labour Income	4,277	2.91
Skilled Labour Income (Teaching)	6,534	1.23
Crafts and Small-Scale Enterprises	6,173	3.03
Remittances	28,405	13.36
Miscellaneous Cash Income	344	0.16
Subtotal: Cash Income (Excluding environmental cash income)	56,026	25.96
Gifts and Transfers (net)		
Subtotal: Gifts and Transfers (net)	4,664	1.67
Value of Own-produced Goods		
Consumption of Own Produced Goods	50,111	30.23
Input Use of Own Produced Goods	11,143	6.94
Subtotal: Value of Own Produced Goods	61,254	37.17
Environmental Income		
Gold Panning	12,313	7.23
Environmental Resource Utilization Cash Income	7,625	4.62
Consumption of Own Collected Wild Foods	9,557	6.29
Consumption of Own Collected Firewood	11,836	7.35
Consumption of Own Collected Wild Goods	952	0.65
Use of Environmental Goods for Housing	4,476	2.7
Use of Environmental Goods for Fertiliser	879	0.57
Livestock Browse/Graze of Environmental Resources	10,186	5.79
Subtotal: Environmental Income	57,825	35.2
Total Aggregated Income	179,769	100
<i>Summary Data</i>		
Mean Income Per Adj. Aeu	844	..
Median Income Per Adj. Aeu	721	..
1. Average income shares are calculated as the mean of the individual household's budget shares, rather than the simpler procedure of calculating the aggregate share of the income subcomponent in total income. This reduces the impact of extreme individual household values on the average budget share value.		

indices used: more distributionally-sensitive measures such as the log variance, mean log deviation, Theil entropy index, and Generalised entropy-2 record reductions in inequality of 30 to 44 percent. Thus environmental income appears to have a strong equalising effect for rural households. Indeed, the degree of rural inequality revealed in the total income measure is very low indeed: not only is this only roughly half the national Gini coefficient for Zimbabwe, but it is also one of the lowest recorded in international comparisons. So use of the total income measure changes our view of inequality in the sample area: rather than regarding the area as a moderately inegalitarian one, based on standard practice, in fact we should regard it has a fairly equal society.

Table 3 - Inequality Indices for Standard and Total Measures of Income

Inequality measure ¹	Standard income (A)		Expanded income (B)		Total income (C)		Inequality reduction from standard to total income (A) vs. (C)			Inequality reduction from expanded to total income (B) vs. (C)		
	Inequality index	Std. error	Inequality index	Std. error	Inequality index	Std. error	Percent reduction	t-test of difference	t-stat significance ²	Percent reduction	T-test of difference	t-stat significance ²
Relative mean deviation	0.53	n.a.	0.49	n.a.	0.42	n.a.	20	n.a.	n.a.	13.5	n.a.	n.a.
Coefficient of variation	0.83	0.079	0.73	0.067	0.62	0.053	25.1	2.2	0.01	15.3	1.3	0.09
Log variance	0.44	0.056	0.39	0.05	0.28	0.032	36.8	2.5	0.01	28.4	1.9	0.03
Gini	0.36	0.023	0.34	0.021	0.3	0.018	18.6	2.3	0.01	12.7	1.6	0.06
Mean log deviation	0.22	0.028	0.19	0.023	0.14	0.017	35.3	2.4	0.01	25.4	1.7	0.05
Theil entropy index	0.24	0.035	0.2	0.028	0.15	0.021	36.9	2.2	0.02	24.7	1.4	0.08
Generalised entropy-2	0.34	0.065	0.27	0.049	0.19	0.033	43.9	2.1	0.02	28.3	1.3	0.1
Mean income ³	573		652		844							
Standard deviation ³	476		480		526							

1. All formulae for the standard errors of inequality measures are taken from Kakwani (1990).
2. t-test significance are for one-sided t-test.
3. Income is measured in Z\$ per adjusted aeu per annum.

The percentage differences in inequality as measured by expanded income and total income is smaller than the differences between standard income and total income. And the differences between expanded and total income inequality measures are less statistically significant. However, for the six inequality measures for which we have conducted tests, all six are significant at the 10 percent level, while two are significant at the 5 percent level. The differences between standard and total income ranged between 19 and 44 percent, while between

expanded and total income the differences range only between 13 and 28 percent. Nonetheless this still remains a reasonably large reduction in measured inequality, so that even with a broader conception of standard income, incorporating environmental income still matters in percentage terms.

From this examination of environmental income and inequality, we can draw two conclusions. The first is that environmental income has a significant and substantial equalizing effect on rural income distribution. Secondly, failure to include environmental income in rural household questionnaires in fact leads us to make significant errors in our estimation of the true degree of aggregate income inequality. Inequality estimates based on standard income – the income concept closest to standard questionnaire practice – will significantly overestimate the degree of rural inequality, probably by about 30 percent. Yet all the evidence we have on rural inequality in fact comes from these types of flawed estimates. Rural communities are hence likely to be more equal than currently suspected.

25 The causes of poverty and inequality

We have seen that accounting for environmental income has a dramatic impact on income measurement (Cavendish 2000) and measures of inequality: will it have a similarly substantial impact on our understanding of poverty and inequality?

25.1 Environmental income and the causes of poverty

We can analyse the causes of poverty by constructing a poverty profile, implemented through the decomposition of the aggregate poverty measure (headcount poverty) by different sub-groups of the population (for the methods see Appendix 1). Table 4 shows the results for two different poverty lines and the standard and total income measures.⁵⁴

As to choice of the stratifying variables underpinning the sub-group decompositions, we have focussed on the set of exogenous factors which emerged from the fieldwork as being of potential significance in explaining differentiation within the research area. These were the distribution of productive assets such as livestock, land and human capital; certain household demographic factors such as the type of household head and the size of the household; and the household's economic connections, namely whether individuals connected to the household had been able to enter formal labour market on either a full-time or part-time basis. As well as being key factors identified in the fieldwork, these are close to the sets of variables that are identified as correlates of poverty in other studies of rural households.

Looking at the standard income results, certain stratifying variables appear to have a clear relationship with the headcount poverty probabilities (Table 4). In particular, variations in land distribution and formal labour market access seem to have a substantial impact on the chances of someone being poor. For both poverty lines, individuals living in households with small land holdings have a higher than average probability of being poor, and this probability declines monotonically as land size increases. Likewise, individuals living in households with no one in formal wage employment are more likely to be poor than the average person, but this likelihood

⁵⁴ For simplicity the estimates for expanded income are not shown in this section – those results do not change the conclusions reached in this section.

falls systematically as household members are increasingly involved in formal labour markets. Indeed, as soon as the household has anyone at all in formal wage employment, the poverty probability falls to half the average or less.

Table 4 - Subgroup Headcount Poverty Probabilities and Significance Tests ⁽¹⁾

Source of Stratification ⁽²⁾	No. of households in sub-group	50th Percentile poverty line		75th Percentile poverty line	
		Standard Income	Total Income	Standard Income	Total Income
All Households	213	0.5	0.16	0.75	0.46
<i>A. Type of Household Head</i>					
Married Male, Resident	131	1.15 ++	1.24	1.15 +++	1.14 +
De Facto Female	43	0.32 --	0 ---	0.56 ---	0.51 ---
De Jure Female, No Married Sons	22	1	0.57	0.79 -	0.89
De Jure Female, Married Sons	12	1.49 +	3.13 +++	1.22	1.81
Divorced/Widowed Male	5	1.59	0	1.33	0 --
<i>B. Age of Household Head</i>					
0 to 30	34	0.53 ---	0 --	0.74 ---	0.32 ---
31 to 40	64	0.87	0.59 -	1.02	0.78 -
41 to 50	46	1.13	1.63 ++	1.13 +	1.46 +++
51 to 60	36	1.27 +	1.39	1	1.21
61 and over	33	1.27 +	1.52	1.05	1.25
<i>C. Education Level of Household Head</i>					
0 to 3 years	137	1.21 +++	1.42 ++	1.08 +++	1.19 ++
4 to 6 years	31	0.83	0.2 --	1.07	0.98
Primary School Leavers	28	0.5 ---	0.45	0.76 --	0.39 ---
Junior Certificate or more	17	0.47 --	0 --	0.63 --	0.64 --
<i>D. Household Size</i>					
0 to 2 Adj. Aeus	28	0.36 ---	0 --	0.57 ---	0.16 ---
2 to 4 Adj. Aeus	66	0.81 -	0.28 ---	0.93	0.53 ---
4 to 6 Adj. Aeus	82	1.26 ++	1.38 +	1.17 +++	1.4 +++
6 to 8 Adj. Aeus	24	1.16	1.57	1.11	1.63 +++
8 or more	13	1.38	3.37 +++	1.02	1.5 +
<i>E. Value of Large Livestock Per Adj. Aeu</i>					
Z\$0	125	1.08	1.2	1.03	1.1
Z\$0 to Z\$500	44	0.95	1.42	1	1.09
Z\$500 to Z\$1,000	29	0.96	0 --	1.06	0.75
Z\$1,000 or more	15	0.53 --	0 -	0.62 --	0.43 --
<i>F. Cultivable Land Area Per Adj. Aeu</i>					
0.0 to 1.0 acres	55	1.63 +++	2.39 +++	1.28 +++	1.74 +++
1.0 to 1.5 acres	85	0.94	0.81	1.02	0.89
1.5 to 2.0 acres	34	0.64 --	0.37 -	0.9	0.7 -
2.0 to 3.0 acres	28	0.64 --	0 --	0.76 --	0.62 --
3.0 plus acres	11	0.36 --	0	0.36 ---	0 ---
<i>G. Employment Status of the Household</i>					
No one in Formal Wage Employment	93	1.39 +++	1.62 +++	1.19 +++	1.15
1 or More in Part-Time Wage Employment	73	0.87	0.86	1.04	1.01
1 or More in Full-Time Wage Employment	38	0.52 ---	0 ---	0.6 ---	0.8
Full-Time and Part-Time Wage Employment	9	0 ---	0	0.44 ---	0.24 --

Table 4 - Subgroup Headcount Poverty Probabilities and Significance Tests⁽¹⁾

Source of Stratification ⁽²⁾	No. of households in sub-group	50th Percentile poverty line		75th Percentile poverty line	
		Standard Income	Total Income	Standard Income	Total Income
Notes:					
1. Binomial distribution test of the null hypothesis that the subgroup headcount measure equals the overall headcount measure. The binomial distribution test is preferred to a standard t-test due to the small sample size of some of the subgroups. As the subgroup sample size increases, the tests converge. +++ (---) Subgroup P_0 index significantly higher (lower) than the overall P_0 index, 1 percent significance level; ++ (--) 5 percent significance level; + (-) 10 percent significance level.					
2. Some of the sub-groups for the sources of stratification are self-evident or are described in the text. Otherwise: A. "Education level of the household head" refers to the highest level of education completed by the household head. Primary School Leavers is a qualification obtained after 7 years schooling and the Junior School Certificate is obtained after 9 years of schooling. B. By "large livestock" is meant cattle and donkeys. Values are Z\$ end-period local market prices. C. "Cultivable land area" comprises the total land area in acres which the household either used, owned or rented in 1993/94					

Moderate relationships exist between other subgroup decompositions and poverty probabilities. As one might expect, there appears to be a negative relationship between poverty and the education level of the household head. For households where the head has a very low level of education (the most common category), poverty levels are a little above background rates for both poverty lines. These fall as the household head acquires more education, especially after seven years of education. Poverty probabilities also fall as the value of large livestock per person, though this only is marked at values of Z\$1,000 per person. Perhaps more surprising is the positive relationship between poverty and household size.⁵⁵ Individuals in small households have much lower poverty probabilities, while those in households with 4 or more adj. aeus have poverty probabilities at or above the average. Finally, there is a relationship between some household headship types and poverty. Individuals in *de jure* female headed households, with married sons in the household, have a greater than average chance of being poor, while those in *de facto* female headed households have a poverty risk that is consistently lower than the background rate. This undoubtedly reflects the fact that these households receive remittances from husbands who are away working in formal labour markets: their lower poverty rates are therefore connected to the results linking poverty to labour market access.

Thus, if a conclusion were to be drawn on the profile of the poor from standard income alone, it would be that the poor tend to be in households with older heads; where the head is less well-educated; where the household is larger; but most crucially in households which have little cultivable land per person and which have restricted access to formal wage employment.⁵⁶ How far does this profile change if we use analyse poverty using the total income variable instead? The surprising answer is how similar the results are for the two different income measures. In fact, the difference between the poverty probabilities of two income measures appears to be more one of emphasis than one of direction.

⁵⁵ A positive relationship between poverty and household size has frequently been found in studies of poverty. But this is often argued to be an artefact of the equivalence scale used to transform household income or consumption data, for example by using per capita adjustments which overweight children, or by ignoring economies of scale in household production (for a discussion of these points see Lanjouw and Ravallion 1995). However, in our study we have adjusted household income data by using weights for different household members, and we have also included an economies of scale adjustment in our equivalence scale, so these effects should not undermine the result.

⁵⁶ These conclusions are very similar to those of Grootaert et al (1996), who found higher per capita welfare associated with being in small households with younger heads, larger farms and a non-farm source of income.

Thus, if we examine the two most important correlates of poverty, namely land distribution and the employment status of the household, the figures show that incorporation of environmental income reinforces rather than overturns the results of the standard income measure. For land distribution (and for both poverty lines), incorporating environmental income increases the poverty probability of individuals in households with small amounts of land, and reduces the poverty probability for those with larger land areas. Likewise, for analysis by employment status of the household, use of the total income measure either leaves the poverty probabilities untouched (75th percentile poverty line) or increases the importance of access to the formal labour market in explaining poverty (50th percentile poverty line). A similar story holds for most of the other indicators. Environmental income lowers the poverty probability of households with young heads and increases that for households with older heads; it lowers the poverty probability of small households and increases that of large households; and it also increases the poverty probability of households with a poorly-educated head and decreases that of households with a more educated head. So, by making the distribution of the poverty probabilities starker, the use of the total income measure would seem generally to intensify the relationship between the sources of stratification we have analysed and household poverty, rather than altering this relationship. This conclusion is reinforced when we look at statistical tests of significance in the correlates of poverty (Table 4). The most striking feature is how similar the results are for the different income measures and poverty lines. Thus, although excluding environmental income results in very much lower estimates of rural incomes, it does not change our analysis of why poverty exists.

25.2 Environmental income and the origins of inequality

The next stage is to explore the causes of the inequality. As for the above poverty analysis, we use decomposition techniques to pursue these questions (see Appendix 1 for methods). Decomposition calculations for the Generalized Entropy measure (GE_2) by disaggregated income source are presented in Table 5. The central results are clear: inequality in the sample is overwhelmingly accounted for by variation in cash income from formal wage employment, and this preponderance occurs whichever income measure is used. Thus, for the standard income measure, variation in formal wage employment contributes 61 percent to overall inequality, as against a contribution to mean income of only 29 percent. For total income the values are 47% and 19%, respectively. So this income sources' contribution to aggregate inequality is far higher than its contribution to overall income, and far greater also than the contribution to inequality of any other single income source. Unequal receipts of cash from formal sector employment clearly drive inequality and differentiation in the research area.

Agriculture – in particular variations in the value of own consumption – is the second most important source of aggregate inequality, contributing 12 percent for both standard and total income. Variations in livestock income have only a moderate role to play in aggregate inequality, and environmental income variables play a very small role in explaining aggregate total income inequality. Despite reasonably sizeable subgroup mean incomes, the consumption of wild foods, firewood use, gold panning and environmental cash income account for only 1, 3, 2 and 2 percent, respectively, of overall inequality. Looking at it another way, these four income sources together comprise, on average, 23 percent of aggregate total income while at the same time comprising only 8 percent of aggregate total income inequality. So once again we observe the important role of environmental resources as an equality-promoting income source.

25.3 Discussion: environmental income and barriers to entry

The analysis of this section has produced a puzzle. On the one hand, the inclusion of environmental income in the measure of household welfare substantially reduces measured inequality. On the other hand, environmental income has very little effect on the analyses of the causes of inequality and poverty. So the types of conclusions that would be drawn on these issues from more conventional data sets derived from HBSs were found to be very similar to those drawn from the "better" measure of household welfare used in this study. These results seem paradoxical. Given environmental income has such a dramatic impact on measures of inequality and poverty, one might expect it should also have a dramatic impact on measures of the origins of inequality and poverty as well.

We sketch an answer to the problem. If entry into formal labour markets and improved agricultural production can raise household incomes substantially, why do only some households do this? The answer is that both these paths out of poverty are conditional on a pre-existing level of capital accumulation. In the case of remittances, the crucial condition is to have a sufficient level of education to allow entry into the formal labour market. But this education level presupposes that a child's school fees have been paid for a number of years beforehand: in other words many years of investment are required before a household can expect to receive some return in the form of income. Further, since school fees cannot be paid in kind, investment in education presupposes not a just a steady flow of surplus, but in practice a steady flow of cash income to the household. In a similar fashion, sustained improvements in agricultural yields requires sustained fertilisation of the local area's sandy soils, and this means either a regular flow of cash (to purchase fertiliser), or sufficient accumulation at some time in the past to have purchased livestock.

Thus, entry into income-raising activities involves significant up-front costs which have to be met via cash payment. In other words, substantial entry barriers exist to these two enrichment activities. The existence of these entry barriers has two effects. First, they present a powerful obstacle to poorer, asset-constrained households from entry into income-raising activities. Second, they imply that economic returns will vary systematically with the existence of these entry barriers. For activities with zero entry cost, all rent will be competed away. The only activities which will start to generate a reasonable surplus are those into which entry is restricted. This creates is a poverty trap. Those households which already have sufficient assets to lever themselves into higher-return activities can go on to earn some surplus, and this may allow them to continue further the path of accumulation by alleviating the many production constraints that affect both rural agriculture and rural enterprise development. By contrast, those which start poor will have very restricted earning opportunities: these households have to work hard even to keep still, and they often exist in a "vicious cycle" of poverty characterised by low nutritional status, low labour returns and low crop production. (For models linking asset constraints, entry barriers and rural class formation, see Eswaran and Kotwal 1986 and Dasgupta 1993).

This emphasis on entry barriers as the cause of rural differentiation provides an answer to the conundrum posed earlier, namely the reason why environmental income has such a marked impact on total levels of income and inequality and, but not on the correlates of household differentiation. Since so many environmental collection activities are free entry, so they are activities which are disproportionately undertaken by worse off households. The effect of

omitting these activities from the income measure would therefore systematically overstate inequality. However, because environmental income sources are free entry, they are also low return and therefore will play little role in enabling households to overcome the accumulation constraints which bar the household from raising its income significantly. Hence incorporation of environmental resources into the rural income measure will make little difference to the analysis of the underpinnings of rural inequality and poverty. It is for this reason that our earlier decomposition analyses produced such similar results for standard and total income.

26 Conclusions

In this paper we have been concerned to examine the impact of environmental income on both the measurement and the causes of rural poverty and inequality. We analysed the impact of environmental income on inequality indices by comparing our measure of rural incomes, total income, with that which would be derived from the typical household budget survey, labelled standard income, which excludes by definition all environmental income sources. Dramatic results ensued. The total income measure produced estimates of inequality which were 20 to 30 percent below that of the standard income measure, a similar finding to that of Fisher (2004) for rural Malawi. The results were found to be robust to a range of inequality indices. The quantitative magnitude of the results was reduced somewhat when working with a broader definition of the typical HBS income measure, but the differences in poverty and inequality estimation were still substantial and statistically significant.

Table 5 - Inequality Decomposition by Detailed Income Sources and Standard and Total Income

Income Source ⁽¹⁾	Sub-group Mean Income ⁽²⁾	Sub-group Inequality Index	<i>GE</i> ₂ - Standard Income		<i>GE</i> ₂ - Total Income	
			Absolute Contribution	Share of Agg. Inequality	Absolute Contribution	Share of Agg. Inequality
A. Agriculture				0.17		0.17
Cash crop sales (net)	10	29.50	0.011	0.03	0.006	0.03
Trad. crop sales (net)	23	1.39	0.006	0.02	0.003	0.02
Consumption of own crops	208	0.15	0.041	0.12	0.024	0.12
B. Livestock				0.07		0.10
Livestock cash income	16	3.45	0.010	0.03	0.005	0.02
Cons ⁿ of own livestock	27	0.69	0.014	0.04	0.007	0.04
Livestock fodder & browse	48	1.14	n.a.		0.007	0.04
C. Labour Income				0.61		0.47
Unskilled labour income	20	1.07	0.000	0.00	0.001	0.00
Formal wage employment	164	2.57	0.209	0.61	0.092	0.47
D. Other Productive Enterprise				0.06		0.10
Crafts and SSEs	29	4.62	0.012	0.03	0.006	0.03
Misc. cash income	2	29.30	0.001	0.00	0.000	0.00
Input use of own production	52	0.62	0.009	0.03	0.006	0.03
Gold panning	58	1.40	n.a.		0.004	0.02
Env. cash income	36	1.58	n.a.		0.003	0.02
E. Gifts				0.08		0.09
Private gifts (net)	10	115.73	0.029	0.08	0.017	0.09
Government gifts (net)	12	2.62	0.001	0.00	0.001	0.00
F. Environmental Collection and Consumption						0.07
Cons ⁿ of wild foods	45	0.22	n.a.		0.002	0.01
Firewood use	56	0.20	n.a.		0.006	0.03
Use of wild goods	5	0.49	n.a.		0.000	0.00
Env. housing inputs	21	2.12	n.a.		0.002	0.01
Environmental. Fertilisers	4	2.31	n.a.		0.000	0.00
Total	844		0.344	1.00	0.193	1.00
1. This table uses the same basic income categories as Table 1, but regroups them by functional classification of income i.e. by agriculture; livestock; labour income; other productive enterprise; gifts; and environmental collection and consumption						
2. Income is measured in Z\$ per adj. aeu per annum.						

There are a number of important corollaries that follow from these findings. The first is that measures of income based on typical household budget surveys are likely to be quite substantially underestimated, while measures of inequality are likely to be substantially overestimated (dramatically so if conducted amongst households more resource-dependent than ours). But these are exactly the type of surveys on which most estimates of rural poverty and

inequality are based. Our results suggest that it is reasonable to be cautious in assessing such estimates where attention has not been paid to the bundle of free goods that natural resources offer rural agents. The second, conversely, is that environmental income *per se* is a quantitatively large and significantly equity-promoting income source. Given that the vast bulk of these resources are located in the commons, particularly communal woodlands and rangelands, then the importance of the preservation of the commons (and conversely the equity and poverty impacts of commons degradation or resource privatization) is obvious.

Third, there is a counterpart to this static estimation error in incomes and inequality, and that is a potentially significant dynamic estimation error of rural income growth. This is due to the fact that typical surveys only measure a subset of total income, so that while measured household incomes may be increasing at a certain rate over time, household (true) total incomes may be increasing at a greater or lesser rate, remaining static or even declining. Likewise, measured inequality may be improving based on the standard income measure while at the same time true inequality is worsening. So given the results of this Annex, measurement from other studies of both the statics and the dynamics of rural incomes and welfare may be in question.

Finally, we also examined the causes of inequality and poverty through decomposition analysis. Here it was found that, by contrast, the inclusion of environmental income made very little difference to decomposition results, in that the same variables were found to be significant correlates of rural inequality and poverty whether standard or total income measures were used. Variation in households' access to non-environmental cash income was found to be the most significant source of rural inequality, arising overwhelmingly from differences in households' entry into formal labour markets. However, agriculture was found also to be a significant secondary source of rural differentiation. We hypothesised that the origins of these results lay in the presence of entry barriers for these economic activities. We suggested that the existence of these entry barriers simultaneously explained the importance of formal wage employment in underpinning rural inequality and poverty, the greater dependence of poorer households on free-entry environmental income sources, and the lack of impact on decomposition analysis from including the value of environmental utilizations in the measure of household income. Powerful economic constraints appear to exist to rural accumulation: these constraints are not alleviated in our research area by the presence of environmental resources and the potential for their utilisation. Thus, environmental resources are unlikely to be important as a pathway out of poverty. On the other hand, the large contribution of environmental resources to total income indicate how important they are as a means of mitigating poverty. And on a relative basis, they are much more important to poorer households than richer households.

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Appendix 1. The decomposition of poverty and inequality indices amongst different sub-groups

Decomposing headcount poverty

There are a number of ways in which poverty estimates can be decomposed: we use an intuitive one, namely sub-group poverty probabilities derived from the headcount poverty measure. Let the sample be exhaustively partitioned into $j = (1, \dots, J)$ mutually exclusive subgroups, with each subgroup having n_j members. The headcount poverty measure for the j th subgroup, $P_{0,j}$, is then equal to q_j / n_j , where q_j is the number of members in the j th subgroup with incomes $x_i \leq z$ (where z is the poverty line, and x_i is the income of the i th member), so that $P_0 = \sum_{j=1}^J P_{0,j} n_j / n$. Then

the sub-group poverty probability is the sub-group headcount measure normalised on the aggregate headcount poverty measure, i.e. $P_{0,j}/P_0 = (P_{0,j} - P_0) / P_0 + 1$. This means that if the j th subgroup's poverty probability is greater (less) than one, this subgroup is more (less) likely to be poor than the sample as a whole. So we compare the intensity of poverty across sub-groups by calculating these sub-group poverty probabilities for different poverty lines and for the two different income measures (Table 4).

Decomposing the Generalised Entropy-2 inequality index

Jenkins (1995) presents an outstanding analysis of inequality trends for the UK using decomposition analysis. The material presented in this section of the paper owes a great debt to the methods developed in his work. We have restricted ourselves to the decomposition of Generalized Entropy-2 (GE_2). The Generalised Entropy class of inequality measures is the only one that is symmetric, scale invariant, convex and additively decomposable. Use of GE_2 avoids log transforms, so that it can cope with zero observations, while computation of GE_2 itself can be done simply from group or subgroup means and variances. This follows from the fact that:

$$GE_2 = \frac{1}{2} \frac{1}{n} \left[\sum_{i=1}^n \left(\frac{x_i}{\bar{x}} \right)^2 - 1 \right] = \frac{1}{2n\bar{x}^2} \sum_{i=1}^n (x_i - \bar{x})^2 = \frac{1}{2\bar{x}^2} \hat{\sigma}^2$$

This ease of calculation is especially useful when dealing with a large number of decompositions. The formula also shows that $GE_2 = 1/2 (R_2)^2$ i.e. equals half the squared coefficient of variation (\bar{x} is the mean income, while $\hat{\sigma}^2$ is the variance of income).

Specifically, we decompose inequality by income source. Decomposition by income source is aimed at uncovering the particular income sources that have a high inequality "loading": i.e. it highlights the specific economic activities which are associated with rural inequality. This is a particularly attractive procedure for the purposes of this study. Decomposition can be carried out as follows.⁵⁷ Let income be partitioned into F sub-groups, with the f th income source having the sample mean \bar{x}_f and the sample variance $\hat{\sigma}_f^2$. Define s_f as the contribution of the f th income

⁵⁷ Decomposition by income source is a difficult procedure, following Shorrocks (1982a, b) which showed that the choice of decomposition rule is totally independent of the choice of inequality index, so that an infinite number of candidate decompositions are compatible with any given inequality measure.

source to total inequality, so that $\hat{I}_i = \sum s_f$. Then we need to generate suitable values of these s_f 's using appropriate decomposition rules. It can be shown that:

$$s_f = p_f \chi_f \sqrt{GE_2 GE_{2f}}$$

where: p_f = the correlation coefficient for the f th income source and total income.

$\chi_f = \bar{x}_f / \bar{x}$ = the f th income source's factor share.

$$GE_{2f} = \text{the } GE_2 \text{ index for the } f\text{th group} = \frac{1}{2\bar{x}_f^2} \hat{\sigma}_f^2$$

Note that the degree to which an income source can be said to promote inequality depends on the size of the share variable s_f / GE_2 : if this equals zero or is low, then the income source has a negligible impact on overall inequality (or alternatively has an "equality-promoting" role), conversely if this share variable is high then the income source is playing a strong "inequality-promoting" role (see Kanbur 1984, Shorrocks 1980, Cowell and Kuga 1981, Shorrocks 1984).

Annex 6: Silviculture and management of miombo woodlands to improve livelihood outcomes

C.M. Shackleton⁵⁸ and J.M. Clarke⁵⁹

ABSTRACT

Miombo woodlands are home to around 50 million, mostly rural, people. They supply multiple goods and services critical for local livelihoods. The harvesting of wild resources and miombo-dependent arable cropping and animal husbandry together can provide for as much as three-quarters of household consumption in many miombo households. Miombo-dependent households use a variety of active and passive management approaches and techniques to optimise the yield of miombo resources. There has been relatively little research into the silvicultural practices of local communities or how different miombo products and habitats are locally managed. Most formal research has been restricted to managing high value timber species, even though the value of the miombo products used by rural households far exceeds that earned by government agencies from high value timber. Consequently, there is a pressing need to examine scientific and local knowledge about the management of miombo and miombo products and to use that knowledge strategically to design relevant interventions focused on optimising the productivity of miombo in support of local livelihoods. This paper provides a summary overview of recent silvicultural literature and identifies areas needing greater understanding.

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29 Introduction

29.1 What is miombo?

Miombo woodlands (hereafter referred to as miombo) cover a vast area of south and central Africa. Stretching from the northernmost tip of South Africa up to Tanzania, and from Mozambique in the east to Angola in the west, they cover approximately 3.2 million km² (Scholes & Biggs 2004). They are the most widespread fire-adapted, closed-canopy woodlands in southern and central Africa. Whilst comprising of several sub-types, the defining characteristic of miombo is its occurrence on nutrient poor soils and the dominance of three woody plant genera, namely *Brachystegia*, *Julbernardia* and *Isoberlinia*, with an under storey of grasses and herbs. The density and biomass of the woody and herbaceous layers is dependent upon local patterns of rainfall, grazing, fire and use by humans. The overall appearance of the miombo changes seasonally in response to the marked concentration of rainfall into only 5 - 7 months of the year, which results in most of the woody layer being deciduous and the herbaceous layer dying back in the dry season. More detailed descriptions of miombo and how it is differentiated from other savanna or forest types are provided by Huntley (1982), Chidumayo (1993) and Frost (1996).

29.2 Land-use patterns in miombo

Given their enormous expanse, it is not surprising that miombo is home to between 45 and 50 million Africans across seven countries, over 80 % of which are rural dwellers. These resident populations obtain the majority of their livelihood needs directly or indirectly from the goods and services provided by miombo. This includes cropping, grazing, collection and sale of a variety of woodland resources, as well as benefits from the ecological services such as water provision, nutrient cycling, and carbon sequestration, and cultural and spiritual value from places and species in the miombo, for rural and urban dwellers. Consequently, there is large spatial and temporal variation in land use patterns and practices, which require that generalizations are treated with caution (Campbell et al. 1997). Nonetheless, the primary land use patterns are those of the rural sector inscribed by small-scale farmers in pursuit of their livelihoods. This has resulted in a landscape mosaic of rural dwellings and arable fields within the background matrix of miombo woodland which has been opened up to a greater or lesser extent. Small-scale arable cropping systems are around the homestead and fields for staple carbohydrate sources (maize and cassava), intercropped with groundnuts, vegetables and fruit trees, and sometimes tobacco or cotton as a cash crop. Large and small domestic stock are maintained under free-range conditions around the dwelling and within the surrounding miombo. Besides animal fodder, the surrounding miombo is used for the collection of multiple natural resources for energy, construction, nutrition, medicine, decoration and cultural or spiritual needs. Interspersed into this small-farmer dominated mosaic are a range of protected areas and eco-tourism initiatives that seek to minimise human impacts on miombo and maximise biodiversity (especially of large mammals) and ecosystem services, and forestry enterprises harvesting miombo hardwoods as well as plantation timber. An assessment of the Zambezi basin in 2000 indicated that overall, approximately 90 % of the miombo was relatively untransformed by urbanization or monoculture agriculture (Scholes & Biggs 2004). The Global Landcover 2000 assessment indicated less than 9 % of the miombo as under permanent cultivation whilst recognizing that the small-scale and shifting nature of

cultivation in many countries makes such estimates difficult and hence somewhat inaccurate (Scholes & Biggs 2004).

The composition and structure of miombo at any time or place is thus largely determined by the intensity and duration of the different land uses and practices (which themselves are influenced by local rainfall and soil types (Wilson 1990, Frost 1996, Campbell et al. 1997, 2002)), which override the inherent relationship of woody plant biomass and basal area with rainfall evident for relatively undisturbed miombo (Frost 1996, Banda et al. 2006). In areas of low intensity use, miombo is approximately 8 – 20 m tall with more-or-less 100 % canopy cover, and a well established herbaceous layer and a low biomass of domestic or wild animals. In contrast, intensively used areas have a dispersed canopy of largely isolated trees of favoured species in fields or homesteads, between which is a scrubby bush land of harvested but coppicing stems, and large numbers of grazing animals. In this respect they present a stark contrast to more intact miombo, with a different physiognomy, structure and biomass. Several authors have contrasted the structure of old and regrowth miombo at a number of sites (Trapnell 1959, Strang 1974, Guy 1981, Chidumayo 1993, 2002, Luoga et al. 2002, Banda et al. 2006). Whilst the precise values for the different attributes differ widely between the studies (reflecting differences in climate, soil, landscape position and human impacts), the qualitative trends are similar (Table 1). The attributes of regrowth stands are generally intermediate between these two extremes. There is typically a gradient of use intensity radiating out from major transport routes or human settlements (Vermeulen 1996, Chidumayo 2002, Luoga et al. 2002, Schwartz & Caro 2003, Malimbwi et al. 2005), and hence a change in miombo structure with distance away from nodes of human activity.

Table 1: Contrasts in the general attributes of intensively and lightly used miombo

Attribute	Intensity of Miombo Use	
	Lightly used/old growth	Heavily used/1st regrowth
Woody plant density	High	Low
Coppice density	Low	High
Stem height	Tall (12 – 20 m)	Short (2 – 4 m)
Basal area	High (+ 7 – 25 m ² /ha)	Reduced (3 – 15 m ² /ha)
Above ground woody biomass	High (50 – 90 t/ha)	Reduced (20 – 50 t/ha)
Peak herbaceous biomass	Low (+ 2 t/ha)	Highly variable
Woody plant species richness	Relatively similar (although species identities might differ)	
Herbaceous species richness	Relatively similar (although species identities might differ)	

Source: Extrapolated from data sources at different sites from Trapnell (1959), Strang (1974), Chidumayo (1993, 2002), Frost (1996), Vermeulen (1996), Banda et al. 2006)

It is noteworthy that although human use inevitably alters the appearance and size class profile of miombo, and potentially the productivity, several some studies have shown that there has been no significant decrease in woody plant species richness (Vermeulen 1996, Malimbwi et al. 2005, Banda et al. 2006), although some have (Mwase et al. 2007).

29.3 Local livelihoods and resource use

The millions of people resident in miombo engage in a range of livelihood strategies, but most are directly dependent on miombo for land and the products on it for home consumption and for income generation. At any one site several hundred species are used, across two dozen or more resource types supplying energy, nutritional, construction, fibre, medicinal and livestock needs.

The importance of different resources or species varies from place to place, as measured by either the proportion of households using them, volumes extracted or monetary value. But more often than not, resources used by > 80 % of households include fuel wood or charcoal, construction timber, wild fruits and honey (Luoga et al. 2000, Lynam et al. 2003, Bwalya in prep.). Medicinal plants have been found to be extremely important elsewhere, but most livelihood surveys exclude them because of the difficulty in quantifying so many different species and plant parts (leaves, bark, roots). Similarly, water quantity and quality is a key resource supplied by miombo, but has never been included in valuation studies of miombo products.

Recently there have been some attempts to value the contribution of miombo resources to local livelihoods. This is fraught with methodological challenges (Campbell & Luckert 2002, Gram 2001, Vedeld et al. 2004), such as what resources are included and which excluded (especially fodder), how to deal with the absence of farm-gate prices, whether or not collection time or costs of labour are deducted, depreciation functions of vehicles and equipment used in harvesting, and so on. Consequently, many findings are not directly comparable to one another. Moreover, none of the studies have considered the contribution of environmental services to livelihoods, such as water yield, water quality, pollination, nutrient cycling, and the like. Nonetheless, the results are informative, especially if one refrains from comparing the different studies.

For example, Cavendish (2000) reported results from two sites in Zimbabwe, on what he described as the boundary between miombo and mopane woodlands. In an extremely detailed survey every three months for two years of all livelihood income (cash, gifts, in-kind) he found that income from the miombo resources (excluding gold panning) constituted approximately one-third of total household accruals. Adding in returns from livestock, cropping and craft sales, increased this by a further 11 %, providing a total of over 40 % of all livelihood sources coming from miombo and land cleared of most trees.

Campbell et al. (2002) conducted a similar exercise in another region of Zimbabwe, also on the transition between miombo and mopane woodlands. They reported that gross returns from miombo goods were 12.6 % of total livelihood accruals. With cropping and livestock included this jumped to 73.8 %. The draft report by Bwalya (in prep.) reports on a survey of 435 households sampled at eight sites throughout Zambia (therefore miombo and non-miombo localities). The draft analysis indicates that approximately 40 % of total livelihood accruals come from forest resources (cash and consumption), and agriculture comprises 37 %. The national value of charcoal and fuel wood to the GDP is approximately ten times greater than the contribution of commercial logging. Also in Zambia, Mutamba (in prep.) compared the contribution of miombo resources to local livelihoods in communities close to major markets, and those well divorced. At both sites miombo resources contributed by far the greatest proportion to total incomes (cash and consumptive), approximately 54 %, and was higher at the accessible site because of the income derived from trade in miombo products.

Lynam et al. (2003) used a range of innovative ranking procedures to index relative value of different sites and resources to two villages in Mozambique, one of which (Nhanchururu) is located in miombo. The community provided a list of 26 basic needs required for an adequate standard of living and life, of which many of the most important ones were from miombo

products or services, namely housing (1st), food (2nd), water (3rd), fuel wood (6th) and sleeping mats (12th). The first four mentioned here were rated higher than schooling, employment or livestock. The food component included crops, wild and cultivated fruits, and wild foods. The various landscapes around the village were also rated in terms of their contribution to different livelihood strategies of cropping, livestock and collection of non-timber forest products (NTFPs). Thereafter a botanical inventory was conducted in each landscape. Subsequent statistical analysis indicated a significant correlation between the community ranking and the number of resources per landscape.

29.4 Purpose of this paper

It is clear from the above that close to ten percent of all people on the African continent obtain significant value from miombo woodlands in the form of goods and services in support of their livelihoods. The miombo plays a major role in shaping the livelihood options available to them, and the magnitude of income streams they secure. Simultaneously, the actions of local populations shape the miombo, changing its structure and relative composition, enhancing the flow of selected goods and services, and constraining others. Support to rural people from government agencies and NGOs throughout the miombo takes relatively little cognisance of this intimate relationship between rural people and their surroundings. Conventional support structures and extension agencies focus on western models of agriculture, livestock husbandry and forest practice. Knowledge regarding the production rates and sustainable harvesting levels of most miombo products is vested in local communities and currently little documented. Conventional research and extension has focused on a few species of high value for external markets, with yield tables underpinned by a timber production paradigm. Yet these species and products represent only a small proportion of the total standing value, and form a minor component of peoples' livelihoods. Consequently, the purpose of this paper is to synthesise existing knowledge on the production and management of the, up till recently, ignored products from miombo that are used to support and build local livelihoods of the miombo dwellers. In time, such a paradigm shift may require a total reconsideration of terminology and conventional classifications of miombo types so that they are based on local knowledge and uses (e.g. Wong et al. 2007).

By definition, such a synthesis will be limited and incomplete because (i) there are so many different products and species, and (ii) there has been relatively little research to date regarding what have been seen by conventional research and management agencies as products of little value or concern. Indeed, Campbell and Byron (1996) commented over a decade ago that “surprisingly little research has investigated possible silvicultural tools”, especially as related to the context of small-scale farming endeavours and rural livelihoods, and yet relatively little has been done in the intervening years. But with increasing commitment globally to devolution of forest policies and management to local level (e.g. Turyahabwe et al. 2007), including in the miombo region (e.g. Kowero et al. 2003), it is important that the necessary first steps are taken. In making the first attempt, we hope to stimulate interest for those who will come after as well as identify gaps for immediate research. We approach the task by presenting an overview of current use and management practices, and secondly use this as the basis for assessing the growing body of technical and practical recommendations emerging from research and project based work on improved management of miombo in communal lands. At the end these are brought together in a suite of conclusions and research considerations.

29.5 Approach

The broad approach to compiling this paper was to review relevant literature identified via: key word search on the Scopus and Science-Direct international databases, author name search for people known to be relatively active in miombo research, and personal contacts to researchers for less accessible literature. In all instances we placed emphasis on locating information from 1990 onwards, although not confined to that period. Our assumption was that key information available prior to 1990 would have been covered in a few important synthesis works of the mid 1990s, namely Chidumayo (1993) and Campbell (1996). Once literature was identified from any of the above sources, a secondary search was instigated of the reference list in each of the sources.

30 Existing use and management of miombo

A considerable body of work has built up, much of it over the past decade or so, on the complex and diverse relationships between local inhabitants and the miombo woodlands on which their lives so closely depend. In this section we provide an overview of use and management practices, attempting to foreground features that form the basis for interventions aimed at improved management. In particular, we highlight the plethora of ways in which users manage both the supply of goods and services as well as demand for these resources.

In considering current management practices and uses it is necessary to recognise the significant variation across the region. Whether or not local communities (as a collective), households or individuals deliberately engage in activities to promote the growth and productivity of woodlands and individual trees depends very much on the local context, being influenced by aspects such as governance structures, availability of common pool resources, land availability for cropping, links for wider economy, population density, opportunity costs of labour and time, and relative wealth. Arnold & Dewees (1995) commented that as the relative abundance of common pool tree resources diminishes greater will be development and implementation of strategies to enhance local abundance and productivity, invested in private space around the homestead and arable fields. Thus, in reality there is a continuum of local management situations from the relatively passive (such as maintenance of existing trees in field) to the relatively active (such as seeking out, digging up and transplanting a seedling of a desirable from the wild into the home space). Generally, the greater the pressure on the resource, the greater the incentive to develop active management practices.

30.1 Woody resources

Woody resources typically comprise the most significant value stream to local communities and households. Key products from woody plants include (i) fuel wood or charcoal, (ii) construction timber and (iii) wood for handles (axes, hoes, etc.). There are both gender and wealth related differences with respect to what miombo timber resources are considered as key (Abbot 1997, Fortmann et al. 1997, Lynam et al. 2003), but when the household is considered as the unit of analysis, most households make use of the above resources to some degree. There are other woody resources, but of less significance when measured by the proportion of people using them, or the volume of products extracted. These include browse for livestock, bark for laths, kindling, and walking sticks.

30.1.1 Fuelwood and charcoal

Much has been written about fuelwood yield and harvesting approaches in miombo. It is the primary energy source throughout the region, for both rural and urban populations, other than the urban rich. Across the miombo as a whole wood production exceeds consumption, but there are nodes and local level situations where the opposite applies (van Jaarsveld et al. 2005). There are considerable trade networks moving the wood, or more usually the charcoal, from the rural areas to supply burgeoning towns (e.g. Campbell et al. 2003, Brouwer & Falcão 2004). Thus, it represents a source of cash income for many, and consequently, proximity to markets and transport routes is a significant factor in the harvesting levels and resultant impacts on miombo structure and productivity (Chidumayo 2002, Luoga et al. 2002, Malimbwi et al. 2005). Commercial demand also poses a challenge to local communities since entrepreneurs not necessarily resident in the rural community undertake much harvesting for markets, and these individuals do not participate in local management plans or objectives.

At the local level and for largely domestic use, there is little active management on the production side for fuelwood or charcoal. Traditionally and historically wood was in adequate supply in most areas, and so supply side management was not required. Three practices are common that served to augment supply, but in passive manner, namely (i) selective maintenance of particular trees when land was cleared for arable fields and homestead plots, (ii) nurturing of self-seeded recruits and (iii) planting and maintenance of live-fences.

On the demand side a number of strategies have been reported across various regions. We characterize these in three ways: harvesting strategies which are determined by local governance priorities; selective harvesting, and individual tree management. The question of how local governance priorities affect harvesting (such as harvest seasons for certain species, sacred or taboo species, sacred or taboo areas, harvesting permits, harvesting quotas), is beyond the ambit of this paper.

Selective harvesting. In areas or times when demand is low relative to wood availability, then harvesters generally demonstrate a degree of selectivity for places, type of wood, species and size classes. However, as demand increases, either domestic or commercial, the opportunity costs associated with selection increase, and so it decreases, resulting in more clear-fell harvesting. Selectivity for harvesting areas is usually based on (i) proximity, (ii) ease of access and (iii) amount of wood available at one site relative to another (Abbot 1997, Malimbwi et al. 2005).

Selectivity for type of wood refers to the marked preference for dead wood over live timber (Abbot & Lowore 1999, Luoga et al. 2000). Dead wood has a number of desirable traits relative to live wood, including that it is easier to harvest, drier and so can be used immediately, lighter to carry, and usually does not require permits or permission to collect. Annual yields of deadwood in miombo have not been determined. Luoga et al. (2002) recorded a standing stock of dead wood of $336 + 57 \text{ kg ha}^{-1}$ at Kitulanghalo Forest Reserve in Tanzania which had about 40 t ha^{-1} biomass. However, the forest reserve was harvested to some degree and thus these dry wood stocks cannot be viewed as representative of intact miombo. Frost (1996) present figures from three different sites, which range between 3 and 7 t ha^{-1} . Clearly there is need for yield studies from a number of sites throughout the miombo. In the drier savannas, Shackleton (1998)

indicated that annual dead wood yield was approximately 1.7 % of standing biomass. When live wood is cut, it is usually dried for a few weeks before use (Abbot & Lowore 1999).

Selectivity for species is generally marked but diminishes as harvesting demand increases. Typical attributes of a species regarded as good for fuelwood or charcoal are medium to high wood density, low moisture content, long-lasting coals, low smoke yield, absence of thorns and absence of unusual fumes or smells (Abbot & Lowore 1999, Luoga et al. 2000). Highly regarded genera include *Acacia*, *Brachystegia*, *Combretum* and *Julbernardia*.

Selectivity for size is also marked, but is influenced by the end purpose for the wood and use of stoves. Collectors of fuelwood for household fires typically target branches and stems 3 – 8 cm diameter (Abbot & Lowore 1999). Harvesters who have stoves, or for charcoal and commercial reasons will include larger stems and branches (Abbot & Lowore 1999, Abbot & Homewood 1998). Smaller kindling of < 2 cm diameter is collected opportunistically.

Individual tree management and harvesting. Having selected the place, species and size of tree to harvest, the harvester can then influence its regrowth in terms of how it is cut as well as the height.

Rarely are whole trees cut because they are too large, and it takes too long to fell them and cut the wood into manageable sizes. The exceptions are when trees are cut for commercial charcoal production and for land clearance when establishing new fields. Thus, when cutting does occur it is usually of small stems or smaller branches of a large tree, i.e. pollarding. The tools used to cut also influence regrowth; a clean cut with a saw results in a greater number of regrowth coppice shoots, than a jagged cut from an axe.

Lastly, the greater the height at which the stem is cut, the greater the number of resultant coppice shoots (Chidumayo et al. 1996, Shackleton 2001, Luoga et al. 2004, Kaschula et al. 2005). Subsequent to cutting, the coppice regrowth can be managed according to conventional silvicultural practices, although rarely is. There will be a trade-off between number of coppice shoots maintained and subsequent height regrowth. The more coppice shoots that sprout from the cut stump, and maintained, the greater will be inter-shoot competition and the longer it will take for re-establishment of apical dominance. Thus, one would have many short and thin shoots for a longer period. If the number of coppice shoots is reduced, either by thinning, browsing or fire, then apical dominance will be re-established sooner, and height regrowth will accelerate. In such a situation there will be fewer shoots per cut stump, but longer and thicker. Consequently, the objectives of the local users, and the rotation period they would like to optimize would dictate whether or not coppice management is required and worthwhile (Shackleton 2001), relative to other demands and restrictions on their time. Regrowth rates are likely to be influenced by site characteristics (soil fertility, rainfall), but this has never been studied in miombo. Post-harvest management (fire, browsing, and coppice control) and species characteristics will also influence regrowth rates, but there is very little information in this regard. Regrowth rates for standard-sized poles (3 – 8 cm diameter, 2 – 4 m long/tall) were reported as approximately five years (Abbot & Lowore 1999) at a relatively moist site in Malawi. Luoga et al. (2004) reported higher coppice response from stumps in communal land compared to a nearby reserve. They attributed this to less competition in communal lands because of the thinning effects of tree harvesting.

In terms of supply side management key aspects affecting fuelwood and charcoal are largely those impacting the broader landscape, namely harvesting pressures, fire and browsing. Yield per unit area is highly variable because of differential harvesting rates and consequently biomass of harvestable timber per hectare. Relevant work has been done on the regeneration dynamics and growth rates of selected species, albeit mostly in controlled conditions (e.g. Boaler 1966, Ernst 1988, Chidumayo 1991, Munyanziza 1994, Munyanziza & Oldeman 1996). Such information would be useful in the event of the need to undertake projects on enrichment planting in stands of miombo, or plantations and nurseries.

Outside protected areas re-establishment rates have been determined for some sites. Clearly, a heavily harvested site will take longer to return to the pre-harvesting condition than will a lightly harvested site due to death or removal of rootstocks (Prins & Kikula 1996). Malimbwi et al. (2005) report on potential charcoal yield along a harvesting gradient between a major transport route and a protected forest reserve. Adjacent to the road the estimated yield was 1 bag (56 kg charcoal) per hectare, whereas 10 – 15 km away from the road the yield was 125 bags per hectare. They concluded that miombo forests in that region could be harvested for charcoal approximately every eight years and maintain the standing biomass at approximately 70 % of that in the protected site.

Overall, the seemingly robust re-establishment rates of miombo underlie its renowned resilience. This is largely because regrowth after harvesting is from cut stump coppice, root coppice and a large regeneration bank of suppressed saplings (Chidumayo 2004). Consequently, in shifting cultivation systems, the longer they have been cultivated the longer is the re-establishment period after abandonment because a greater proportion of the stumps, root-stock and suppressed seedling bank have been removed (Prins & Kikula 1996).

30.1.2 Construction timber

The dynamics around use and management of timber for construction purposes mirrors that of fuelwood or charcoal. Most households use construction timber to some degree, for housing and/or fencing. There is marked selectivity regarding the size and species used (Vermeulen 1996, Luoga et al. 2002), which imposes a degree of area selection regarding where best to harvest the right size and species. Different species are required for different components of the construction. For example, Luoga et al. (2000) reported the key differences in species used for wall poles, beam poles, roofing poles, and withies.

There is both competition and complementarity in use of miombo trees for fuelwood and construction. Typically construction needs require thicker and longer poles than what is preferred for fuelwood (Luoga et al. 2002). Consequently, the bulk of construction timber is obtained via felling of the main stem, rather than lopping of branches or collection of deadwood as is the case for fuelwood. Felling of these larger pieces produces offcuts that can be used for fuelwood (Abbot & Lowore 1999). Another example of complementary use is the widespread practice of recycling timber as firewood, when the time comes to replace structures such as cattle kraals (Grundy et al. 1993). On the other hand, because construction timber is of larger diameters, if offtake is significant it can alter the size-class profile of the standing stock in favour of smaller

stems (Abbot & Homewood 1998, Backéus et al. 2006), which if sustained over long periods would reduce the overall sustainable yield of fuelwood into the future.

30.1.3 Wood for handles and implements

A surprising number of small household and agricultural implements are made from locally available miombo timber. These include pestles and mortars, kitchen spoons, bowls and stirrers, walking and fighting sticks, handles for hoes, axes and machetes, cattle ploughs and yokes, and musical instruments. Without these inputs, agricultural production and domestic processing would be constrained. In most places factory produced alternatives can be purchased, but their lesser quality and price deter use. Each implement differs in the need for woods of varying strengths, durability, flexibility, propensity to splinter, and even colour (Clarke et al. 1996). Consequently, there is marked selection for specific species for each type of implement. There is also an active market for these implements in tourist and craft shops, along with wood-carvings of animals and figurines (Sunderland & Ndoye 2004, Cunningham et al. 2005).

Most pieces will be made from wood collected after felling of a tree for construction timber, or removal or a single branch from the required species. The thicker branches are then used to make wooden utensils. Consequently, demand for wooden implements probably has relatively little impact on miombo structure and productivity. However, in areas frequented by tourists the demand for crafts of such household implements and carvings of animals can have significant impacts on local stocks of specific tree species (Cunningham et al. 2005) From a silvicultural perspective not much is done by local people to ensure an adequate supply of timber for wooden implements. In some areas selective retention and/or enrichment planting of key species in commons or fields might be considered worthwhile to ensure a stable size class structure for certain implements. Local co-ordination of users might be useful to ensure that when larger trees are felled for construction timber that the branches are available for other purposes other than just fuelwood. For species with high craft market value a suite of strategies are typically advocated, including (i) better governance systems (ii) education of the tourists on which woods to buy and which to avoid, and (iii) substitution of key species with faster growing ones.

30.2 *Non-wood products*

30.2.1 Medicinal plants

Use of plant material for physical and psychological ailments and spiritual rituals and observances is common (Brigham 1994, Cunningham 1996, Luoga et al. 2000), both through self-collection and use, as well as via traditional healers. In some areas there is also significant trade in medicinal plants, with rural collectors supplying traditional healers and markets serving urban areas. A variety of plants parts are used, including leaves, roots and bark.

Many studies have documented that historically harvesting of bark was generally regarded as sustainable. Traditional healers would take care to ensure that a single tree was not re-harvested until the scars of the previous harvest were healed, and that subsequent harvests were on different sections of the tree. In such a way mortality induced by bark harvesting was minimised. However, with both reduced stocks of trees due to land clearance and felling for other reasons, along with increasing commercial demand for medicinal bark in expanding urban centres, the

traditional care in harvesting is being undermined as less informed actors enter the stage to supply the urban markets. This includes export of material to large metropolises in neighbouring countries (Botha et al. 2004, Williams 2004). Consequently, rates of ring-barking are increasing, resulting in mortality of trees that are over-harvested. Twine (2004) showed that regrowth rate of bark was inversely proportional to the area removed. A number of interventions have been proposed in response to the increasing over-harvesting (e.g. Geldenhuys 2004, Mander 2004), albeit much of it concentrated in South Africa, neighboring the miombo region. Interventions include:

- Increased law enforcement, especially for listed endangered species.
- Working with harvesters and healers to promote sustainable practices and establish oversight institutions or associations.
- Working with communities to manage and police use of local resources.
- Cultivation of key species, at homesteads, enrichment planting, community nurseries or commercial nurseries.
- Substitution, of key species with more abundant ones, or of bark products with leaves.

Most of the options mirror those for supply-side responses to declines in favored species for wood-carving in the region as outlined by Cunningham et al. (2005). The additional ones are simply to expand the harvesting area (Mandondo 2001), i.e. travel further afield or increase poaching from private, State or protected areas. Both these options become increasingly viable for harvesters as scarcity drives up prices obtained in urban markets. A further option, as mentioned above, is greater co-ordination between harvesters of different products. In this instance, felling of large trees for construction timber could potential yield significant amount of bark for local and/or commercial uses.

30.2.2 Beehives and other products from bark

Lynam et al. (2003) describe how bark is much sought after as a resource for making bee hives. However, they comment that usually harvesting is destructive, resulting in the death of the tree due to the removal of a large ring of bark from the central trunk. In contrast, Smith et al. (1996) describe the use of hollowed out logs as beehives in Tanzania. Various studies report on measures to reduce impact of bark hives, including promoting the use of bark from timber harvested for other purposes, and provision of “modern” beehives.

Dovie (2003) summarises a number of reports on the use of bark from *Adansonia* as a fibre for mats and ropes. He concludes that there is a distinct threat of over-harvesting as a result of urban demand, and that growth of commercial markets has attracted people with limited experience and knowledge resulting in poor harvesting practices.

30.2.3 Wild fruits

Miombo is known for its richness of tree species with edible fruits (Clarke et al. 1996). At a sub-continental scale of the whole region south of the Zambezi (including miombo and non-miombo regions), O’Brien (1988) demonstrated that the number of species with edible fruits increased with mean annual rainfall, as indexed as maximum monthly precipitation. The varied patterns of

community phenology result in some species being found in fruit during almost every season, such that fruit production spans most of the year (Wilson 1990, McGregor 1995, Chidumayo & Frost 1996, Abbot 1997). This represents a significant source of nutrition including during the non-agricultural period. Indeed, peak consumption is during the dry season (Campbell 1987, Wilson 1990). This is particularly important for poor households (Wilson 1990, Abbot 1997, Mithöfer & Waibel 2003, Cunningham & Shackleton 2004) and children (Campbell 1987, Wilson 1990). Additionally, greater proportions of poor households engage in selling wild fruits than do wealthier households (McGregor 1995, Mithöfer & Waibel 2003, Shackleton & Shackleton 2006). The labour and economic analysis of Mithöfer & Waibel (2003) concluded that the returns to labour from collecting and selling wild fruits was significantly greater than that gained through livestock husbandry or arable production, a strong demonstration of the importance of wild resources in local livelihoods and the need for research and extension agencies to give wild resources as much recognition to them as they do to arable and livestock production.

Many indigenous fruit species contain higher levels of vitamins and some minerals than domesticated species (Peters & O'Brien 1981, Fox & Norword Young 1982, Malaisse & Parent 1985, Saka & Msonthi 1994). The high regard for large-fruited species (such as *Adansonia*, *Azanza*, *Diospyros*, *Ficus*, *Partner*, *Sclerocarya*, *Strchynos*, *Uapaca* and *Ximenia*) means that they are selectively retained when woodland is cleared for fields or heavily cut for charcoal. This results in their relative abundance increasing, although absolute densities remain the same (Campbell 1987, McGregor 1995). Typically there is some localized planting of favoured species within the homestead area or the arable fields, or along the boundaries between fields (Deweese 1993, Grundy et al. 1993, Abbot 1997). This might be from transplanting seedlings, planting of truncheons, nurture of wildlings or deliberate discarding of fruit seeds in these areas (Mwambo 2000). Indeed, Cunningham & Shackleton (2004) suggest that the distribution and density of several favoured fruit species throughout the sub-continent are probably greater now than several millennia previously due to the actions of humans. Further, there is evidence that fruit trees retained within fields and around homes have fruit more frequently and have higher yields than those in woodlands, probably due to less competition (Chidumayo et al. 1996, Leakey et al. 2005a).

Several practices for managing or increasing fruit yield per tree have been documented. Seedlings or transplants within the homestead plot may be watered with waste water from domestic activities (Gerhardt & Nemarundwe 2006). Typically young trees are also protected from browsing, either because they are within the larger fenced homestead area, or individual trees may be protected via wire fencing, stacks of cement blocks, old tyres, thorn bushes and the like. Once trees are taller than browsing height such protection is removed and the tree receives little other care. Trees in arable fields will benefit from any application of fertiliser or manure that might occur. Rarely is there any systematic pruning or disease control. There is some suggestion that fruit set may be less than optimal due to reduced populations of key pollinators, especially bees, as miombo woodlands are fragmented and replaced by human-dominated landscapes. For example, Leakey et al. (2005b) suggest that the mean number of kernels in marula (*Sclerocarya birrea*) nuts is less than the potential maximum due to inadequate fertilization, either because of insufficient male trees (removed for fuelwood and carving) and/or pollinators. This requires investigation for other species, but if substantiated, then the role of

local households in honey production needs to be emphasized. So too the importance of maintaining adequate densities of male trees for dioecious species. Several authors have reported that removal of trees, especially male trees, has been, if not still, advocated by agricultural extension officers when clearing new fields and gardens (Campbell et al. 1991, Chivaura-Mususa et al. 2000, Shackleton et al. 2003). This needs to be addressed in the curricula of training institutions.

30.2.4 Wild leafy vegetables

Wild leafy vegetables are a significant component of rural peoples' diet throughout Africa, including the miombo region (Fleuret 1979, Malaisse & Parent 1985, Zinyama et al. 1990, McGregor 1995, Keller et al. 2006). Dozens of species are harvested, with marked regional variations. Predominant genera are *Amaranthus*, *Bidens*, *Chenopodium*, *Cleome*, *Corchorus*, *Cucumis*, *Momordica* and *Sonchus*. Many species are most abundant in disturbed sites (although not restricted to them), particularly at the edge of fields, and even amongst crops. In a conventional sense they are often viewed as agricultural weeds, but locals frequently retain them in the field or garden. Most commentators report that there is very little active management, but McGregor (1995) does note that some species are actively planted. As a food source they are richer in minerals and vitamins than domesticated crops, such that their role in food security and combating mineral deficiencies is beginning to be recognised (e.g. FAO 1988, Frison et al. 2006, Msuya et al. in press.). For example, *Amaranthus* typically has 200 % more vitamin A and carotenoids than cabbage and ten times more iron (Schippers 2000, Kruger et al. 2005). Moreover, they are relatively high yielding without much care and are better able than domesticated crops to survive periods of low rainfall. These advantages have also resulted in them being regarded as important safety-nets for times of household stress caused by unfavourable climate, economic situation or illness (Shiundu 2002, Barany et al. 2004). Yet overall, there is a strong perception in some areas that consumption of these vegetables is a sign of being backward, and once people are able to grow or purchase domesticated crops, they do so at the expense of these wild leafy vegetables (McGregor 1995, Weinberger & Swai 2006). The World Vegetable Centre regional office in Arusha is attempting to reverse such declines.

30.2.5 Wild mushrooms

Mushrooms are also widely relished throughout the miombo region (Wilson 1990, Clarke et al. 1996). For example, Lowore et al. (1995) reported that locals used 26 species of edible mushrooms from communal lands around a village in Malawi, and McGregor (1995) found a similar number (21 species) at a site in Zimbabwe. Mushroom season is during the rains, usually from November until April, which coincides with the time when food stocks from agriculture are low. Mushrooms are mostly consumed fresh, but a portion of the harvest is preserved and stored for use throughout the year (Lowore et al. 1995). There is no active management of mushrooms, other than minimizing disturbance to termitaria, which is the site where several species are found. Some households dry freshly collected mushrooms for use in the dry season.

30.2.6 Edible insects

Edible insects are another important source of nutrition from miombo woodlands and the rest of sub-Saharan Africa (van Huis 2003). Whilst a wide variety of species are consumed, a small

suite comprises the bulk of local intake (McGregor 1995, Cunningham 1996). The review by DeFoliart (1999) mentions that 65 species of insects are consumed throughout the DRC, 60 in Zambia and 40 in Zimbabwe. As with wild leafy vegetables, the consumption of insects has been undermined by western society's distaste and thus it is probably a declining practice (DeFoliart 1999). Historically, some active management practices were recorded (Wilson 1990, Cunningham 1996), but these rarely apply nowadays. Populations of many species are deemed to be declining as a consequence of fragmentation of the miombo woodlands.

30.2.7 Bushmeat

Another source of wild protein is obtained through hunting of small mammals, ranging from small rodents to small antelope (Wilson 1990, McGregor 1995). Larger species may also be trapped or hunted, but populations are very low in regions with high human population densities, and so the smaller species comprise the bulk of the bushmeat intake. In some sub-Saharan countries wild animals constitute over 50 % of all animal protein consumed (Panayotou & Ashton 1992). In many countries it is also a form of recreation with young adolescents hunting small birds and rodents, before graduating to larger game as they mature into adulthood (McGarry & Kaschula in press). Once again, there is limited active management of these populations. Some rodent and bird species benefit from cereal crops in fields and stored around the homestead, as well as lower population densities of their natural predators (e.g. Caro 2001).

30.2.8 Fodder for livestock

Livestock play a critically important role in rural production systems and are valued for a wide range of economic and cultural purposes. Miombo woodlands provide the basis for extensive grazing as well as browse. The production of fodder in miombo is a complex interplay of a number of factors which can be managed individually or in tandem. The primary ones are rainfall, stocking rate, fire frequency and woody plant cover. There is a positive relationship between herbaceous production and rainfall, and a negative relationship with stocking rates, fire frequency and woody plant cover. The slope of these relationships is altered by site factors, most notably soil nutrient status.

Obviously rainfall cannot be managed by local farmers, but they can be opportunistic in their application of other management strategies in relation to the timing and amount of rainfall. For example, whether to burn before or after the spring rains will influence the heat of the fire and immediate post-fire rate of regrowth. Whilst stocking rate and woody cover influence herbaceous production, there is little active management of these variables towards that goal, other than in some areas a portion of land may be designated as reserve grazing for use in the dry season or during drought years. This, and the management of burning frequency and season, are the primary management tools used to actively manipulate fodder production. However, the interplay of fire characteristics with the other variables results in a multitude of potential combinations beyond the ambit of this review. There are several seminal works on fire in miombo or neighbouring savanna types, including Trollope (1984), Chidumayo et al. (1996), Desanker et al. (1997), and Mapuare (2001).

Throughout much of the miombo the main application of fire is in the late dry season; typically to stimulate an early flush of fodder for livestock. However, many fires are also simply

accidental or negligent because at this time of the year the risk of runaway fires is extreme due to high air temperatures, low humidity and low moisture content of the litter and necromass. Thus, many areas are burnt annually or biennially, whether by design or accident, and any silvicultural management system needs to adapt to this. Burning at the end of the dry season usually results in relatively hot fires (depending on fuel-load, which is a function of the period since the last fire, and herbivore stocking rates) which result in greater mortality of woody stems than do cool fires. Frost (1996) provides a succinct flow diagram of the role of hot, cool and no fire in facilitating or retarding the regeneration of miombo after clearance for cultivation or heavily harvested for timber or charcoal.

The high fire frequencies combined with high stocking rates of domestic livestock results in many areas being dominated by less palatable grass species (Cauldwell et al. 1999). Thus, even if productivity is high, the nutrient content of these unpalatable species is low, resulting in sub-optimal growth rates and/or condition of domestic stock. However, meat production is rarely the primary reason that households keep livestock, and hence the slower growth rates or reduced adult mass is not an issue of concern to most households. They rather maintain their herds for a variety of goods and services, of which draught power, transport, milk, manure and savings are significant (Campbell et al. 2002). Draught power and manure are important inputs into the household arable production systems.

30.3 Service functions of woodlands

30.3.1 Shade

Shade is not a direct consumptive use of miombo trees, but is an important product that is appreciated by most households. Typically trees retained or planted in the homestead, home garden or arable fields are there primarily to provide fruit or spiritual reasons, but the resultant shade also provided is well appreciated. Workers in the fields rest under the shade of strategically placed trees during the heat of the day; the season-end harvest might be stored under the trees; specific crops might be planted within the shade relative to the non-shaded areas of fields or gardens; the leaf litter is used to enrich soils. The main species are both indigenous and exotic fruit species, such as *Diospyros*, *Mangifera*, *Parinari*, *Uapaca*. Generally it is only high value species that are retained or planted in fields as this off-sets the negative impacts resulting from competition for light, water and nutrients.

30.3.2 Cultural and spiritual benefits

Most focus on use and management of miombo species has been on the utilitarian aspects, which belies the significant spiritual and cultural dimensions associated with particular species, places and vegetation types as described by Mandondo (1997). Some of these may be of significance to single households or clans, often differentiated by status within traditional structures. Others may be recognised and revered by communities. The maintenance and respect for burial sites and sacred areas can result in markedly lower rates of transformation than adjacent non-sacred areas (Byers et al. 2001), and presumably has biodiversity and ecosystem services benefits which spill out into neighbouring transformed landscapes (e.g. pollination services). However, there is some suggestion that these belief systems and values are being eroded with modernisation and migration of people into areas with which they have no ancestral ties (Byers et al. 2001).

30.3.3 Land and nutrients for arable production

The arable production activities are intimately linked to miombo. All fields and gardens are established on land from which much of the miombo shrubs and trees were removed, other than perhaps useful fruit and cultural species. The miombo soils thus provide a nutrient source for arable production. This is often enhanced or maintained through collection and application of miombo leaf litter on the fields (Wilson 1990, Nyathi & Campbell 1993, McGregor 1995). The fences around fields and gardens are usually constructed using miombo timber, and the yolks for ploughs and handles of agricultural implements are also made from local timber. Thus, without these inputs from miombo, agricultural production would be diminished, or would have to be supported by importing commercial substitutes.

31 Emerging themes in the management of miombo woodland

Section 2 has revealed the diversity of use practices in miombo, and has provided an overview of a wide range of active and passive resource management measures practiced by local users. Use and management practices, as we have seen, show considerable spatial and temporal variation, as well as intra-community specificity. The diversity of use, and the variability of use practices underscore the need for location specific interventions and the limitations of “one-size-fits-all” management prescriptions. Furthermore, the evidence of local agency points to the need for participatory approaches that acknowledge the primacy of users as managers and decision makers. This is in contrast to conventional technical wisdom, with its narrow single-product emphasis and a tendency to impose and prescribe rather than work with and assist. On the other hand there is a danger that valuable silvicultural expertise and research findings built up over more than a century be lost, as a result of the failure to effectively apply it in a communal land context, and a pendulum swing towards participatory forestry.

Although the importance of miombo woodlands to local livelihoods has long been recognised, it is only in the past two decades that the focus of research has been extended to look at improved management of woodlands in the context of community use. Prior to the 1980s, the focus of research was mainly on ways of managing woodlands for conservation and yields of valuable timber species, totally ignoring local livelihoods dependent upon the miombo. Fire management prescriptions and silvicultural systems for timber harvesting were developed through long-term trials and land use comparisons during this period. In this section, we provide a synthesis of literature on miombo silviculture, and attempt to better link the information to existing use and resource management practises. The section is organised to reflect broad categories of management.

31.1 Support for indigenous practices and institutions

The lack of responsiveness on the part of external agencies to existing realities of local users, and a lack of appreciation of indigenous resource use and management practices, is a widespread constraint throughout the region. Emphasis is still placed on mono-cropping within commercially orientated systems. The benefits of woodlands and agroforestry systems are well appreciated by local households, but are undermined by those extension officers advocating single species systems. The role of trees in local livelihoods and production systems needs to be better addressed within the agricultural curricula throughout the region.

As described in Section 2 above, miombo in settled areas comprises a dynamic mosaic of woodlands and cleared and semi-cleared land used for homesteads, gardens and fields. The spatial and temporal heterogeneity of farming landscapes within the miombo zone plays a critical role in sustaining livelihoods, providing a variety of key resources, including grazing and woodland products (Scoones 1990, Campbell et al. 2002). It follows from this that silvicultural and other interventions aimed at improving the management of miombo need to look beyond the woodland, to the trees, and groups of trees, scattered within the farming landscape. Technocratic and top-down approaches to land reform, land use planning and villagisation often fail to encompass the age-old wisdom of selective clearing, resulting in wholesale land clearing with negative consequences for future resource availability (Grundy et al. 1993).

One of the foremost recommendations to emerge from miombo management studies and projects is the need for improved partnerships between local people and service agencies. Various projects in the region, both within miombo and other forest and woodland types, have shown the effectiveness of working with harvesters and users to promote sustainable practices and put in place or strengthen oversight institutions or associations (Kajembe et al. 2003, Geldenhuys 2004). The majority of existing resource use and management practices are mediated through institutions of governance underpinned by cultural and spiritual traditions. The challenge of improved resource management, therefore, relates directly to wider challenges of cultural change and the transformation of institutions of governance at local and national levels. Other papers in this series cover this topic in greater detail.

Throughout southern African savannas local communities are usually powerless to prevent harvesting by outsiders, especially where there is a high external demand and good prices paid for a certain product in urban markets (Twine et al. 2003), as is the case for charcoal, medicinal plants and crafts. In such situations there is a need for local community control supported by traditional and conventional law enforcement agencies. Working closely with local policing or resource management institutions is recommended as a means to strengthen local controls and improve effectiveness of law enforcement.

31.2 Management through fire and grazing

Optimising for grazing and wood products. Bush fires are an endemic characteristic of miombo, and have long been used as a management tool in southern Africa. Farmers use fire mainly to improve the quality of grazing within the woodland (Lowore & Abbot 1995). Late dry season fires are favoured, as this is the time when the grass is dry and unpalatable and the effects of fire are deemed to be most beneficial. Late dry season fires have however been shown to be damaging to trees, in particular young trees, than cooler fires early in the dry season or after the rains have begun (Chidumayo 1993). Late season fires burn at higher temperatures than fires after the end of the rains when there is still moisture in the grass and there is less dry leaf litter. Mortality of woody plant seedlings and coppice regrowth is therefore higher as a result of late dry season fires. For this reason, protection from fire during early stages of regrowth, and early season cool burns are usually recommended as a management tool for optimal timber production. As we have seen, however, miombo woodlands are valued for a wide range of goods and services, and management prescriptions need to take account of this. Given the interaction between the woody component and the grass layer, and the importance of both these products to local livelihoods, prescriptions are needed that seek to optimise productivity of both.

Managing woodlands for optimal production of grass, browse and wood products requires a balancing act that takes account of several dynamics. Opening up the canopy through felling trees or lopping branches increases the amount of available grazing. However, this also increases the risk of fires, and frequent fires can reduce grass growth. Species composition may also be adversely affected by removing tree cover, with less palatable grass species becoming dominant in cleared areas (Chidumayo et al. 1996). Removing tree cover also reduces availability of browse. Leaf flush in miombo woodlands coincides with the period of lowest grazing productivity – the late dry season, and therefore potentially provides some protein to livestock at this time (Scoones 1990, Nyirenda 1995, Gambiza et al. 2000), although much is immobilised due to the high tannin content of many species.

Regenerating woodlands require a measure of reduced impacts from browsing and fire in order to promote growth of woody plants whilst they are still within fire and browsing height. On the other hand, livestock depend on access to grazing and browse in the woodlands, especially in the late dry season. The standard recommendation for regenerating woodlands is annual early burning, and a rotational grazing system that gives protection to coppice for at least the first growing season after cutting takes place (Chidumayo et al. 1996). Thereafter, high stocking levels are recommended as a way to both reduce the risk of late season fires and improve grazing. Grazing can even replace the need for early burning in woodlands, provided the regrowth is beyond the reach of livestock (Chidumayo et al. 1996).

Depending on the type of product required from the woodland, trees can be pollarded above two metres, so that the coppice is out of reach of livestock. Where there is need to cut below this level, a conventional coupe system could be introduced until effective institutional control; a year of cutting followed by a year of protection from grazing. Thereafter, regeneration and grazing can take place together until the next harvest. Where grazing pressure is insufficient to control the risk of late season burns or to remove the moribund layer of grass, a system of rotational early burning, or even late burning (which is more beneficial for herbage production) can be considered by local users. The latter, however, should be avoided in regenerating woodlands for at least 10-15 years after cutting (Chidumayo et al. 1996). Patch burning, traditionally practiced in miombo, is a practical way to provide a range of environments for production of grass and the regrowth of trees (Chidumayo et al. 1996, Forestry Department 1996). The removal of dry wood, grass and leaves from around tree seedlings and coppice regrowth before burning reduces damage to these vulnerable stages.

Fire and non-timber products The productivity of mushrooms is largely unaffected by fire. The main factor influencing availability is the density of tree rootstocks, and as we have seen, miombo rootstock is very resilient. Only after destumping do mushroom populations decline.

Many other non-timber forest products, are however, negatively affected by fire, and where these products are locally important, specific measures need to be taken to protect them. For example, in an area of Zambia where edible caterpillars of Saturnidae family are widely consumed, the local community, with support from service providers, adopted early burning to reduce the risk of late season fires that destroy the caterpillar eggs. Populations of caterpillars increased noticeably, an example of how technical knowledge, applied specifically, and placed in the hands

of local communities can lead to improvements in resource availability. Fire also has negative impacts on herbaceous plants consumed by households, including leafy vegetables and the highly regarded chikanda, a tuber of a species in the Orchid family. Specific interventions to mitigate the effects need to be developed and local communities equipped to implement these, as in the example of the caterpillar eggs. Conversely, other species are well adapted to fires, such as bulbous medicinal herbs, and require periodic burning to promote flowering and regeneration.

31.3 Promoting regeneration and increased productivity

31.3.1 Woody plants

The remarkable regenerating capacity of miombo is key to its ongoing productivity. After tree cutting there is rapid regeneration from coppice, root suckering and the large bank of suppressed saplings, known as suffrutices (Boaler 1966, Strang 1974, Chidumayo 1993). These forms of regeneration allow for much faster re-establishment than regeneration from seed, and provide a degree of protection from fire and grazing (White 1976, cited in Pearce, 1993). When conditions become favourable, such as after harvesting when the canopy opens up, and there is a measure of protection from fire and browsing, these suppressed saplings are able to rapidly increase their above ground biomass as a result of their already well established root systems.

Regeneration from coppice is influenced by a number of factors. Firstly, harvesting methods play an important role in stimulating or retarding coppice growth. A clean cut with a saw results in more vigorous coppicing than a jagged cut from an axe. Certain species coppice better if the rim of the stump is nicked (Lowore & Abbot 1995). The height of cutting also influences coppicing. The greater the height at which the stem is cut, the greater the number of resultant coppice shoots (Shackleton 2001, Kaschula et al. 2005). Regrowth on stumps cut higher than one metre above ground will be better protected from fires and browsing animals (Lowore & Abbot 1995).

Subsequent to cutting, coppice regrowth can be managed according to conventional silvicultural practices, that is, thinning the number of shoots to enable those that remain to grow more vigorously. There is a trade-off between number of coppice shoots maintained and length and thickness of the shoots. The more shoots the greater the inter-shoot competition and the longer it will take for re-establishment of apical dominance. If the shoots are not thinned, there will be more shoots, but they will be shorter and thinner than if thinning took place. If the number of coppice shoots is reduced by thinning, browsing or fire, then apical dominance will be re-established sooner, and height growth will accelerate. In such a situation there will be fewer shoots per stump, but longer and thicker. Coppice thinning is seldom practiced by local users because of high mortality rates of shoots due to fire and browse, and because of the high demand for small diameter wood for various purposes (Abbot & Lowore 1995). If, however, large diameter poles are required by users then the conventional silvicultural approach of reducing to one or two shoots would be beneficial in most situations (Department of Forestry 1996). Thinning can be staggered to produce a range of sizes of small diameter stems on a continuous basis. The objectives of the local users, and the rotation period they would like to optimize would dictate whether or not coppice management is required and worthwhile, relative to the other demands and restrictions on their time. Regrowth rates are also influenced by site factors such as the amount of light available to the regenerating plants and soil moisture levels (Lowore & Abbot 1995). Fire and browsing pressure negatively affects rate of growth, especially in the first

year after cutting. Trees cut during the dry season dormancy period regenerate better than those cut in the growing period. Some species regenerate better than others, and young healthy trees coppice better than old and senescent trees (Lowore & Abbot 1995).

The suppression of saplings is caused mainly by light competition; when canopy trees are felled the saplings begin to shoot up rapidly and contribute significantly to the stock of additional trees in the stand. Regrowth from coppice and the growth of suppressed saplings usually results in very high stocking rate in young regrowth. For this reason, enrichment or replacement planting of seedlings is seldom practiced or required (Chidumayo et al. 1996). Enrichment planting is however a means to alter the species composition of the woodland, or to ensure regeneration of certain high value species (see below).

31.3.2 Non-timber products

The need for further research into factors affecting fruit production was highlighted in Section 2. In general, the existing management of non-timber products is largely passive. There is therefore much scope for innovative and participative research approaches to seek ways to optimize productivity of these multiple resources and species, but it has to be within a framework of local users priorities, and an acknowledgement that not all resources can be optimized simultaneously. In promoting some, other may be negatively affected.

31.4 *Silvicultural systems*

Three basic silvicultural systems are commonly advocated for the purposes of harvesting miombo woodlands: complete coppice or clear cutting; coppice with standards; and selective cutting. Of these, selective cutting most closely resembles existing practices of local users (other than commercial charcoal production where clear felling is the norm) and is the most suitable for the provision of a wide range of wood and non-wood products. The other two systems are better suited to the production of larger dimension wood products, including commercial firewood, large poles and saw-timber.

31.4.1 Clear felling

Clear felling produces the highest rate of regrowth of the three systems, and is best suited to timber harvesting operations where there is little species selectivity and total volume is of greatest importance. This system is applicable, for example, when harvesting firewood for charcoal industries. Basically, all timber above a certain size is harvested, and the plot is completely cleared, save saplings and undergrowth. Regeneration is rapid, and can be managed according to the products required.

31.4.2 Coppice with standards

The coppice with standards system, where selected trees are left to grow whilst others are clear cut, is better suited to the production of a range of timber products. It also has the advantage of retaining a portion of tree cover and protecting site from erosion and sun scorch (Department of Forestry 1996). The system is suitable for the production of timber from certain high value species that only comprise a portion of the woodland biomass. The high value timber species are left to grow until they reach maturity, whilst the other species are clear cut and the regeneration

is managed to produce a range of small dimension wood products such as firewood and poles. The system has also been proposed for use by small- scale farmers, as a means to maximise the production of firewood and poles whilst retaining high value species that produce non-wood products and other services, such as fruit trees and trees with spiritual significance (Lowore & Abbot 1995).

31.4.3 Cutting cycles in miombo

The standard silvicultural practice of rotational harvesting is recommended for both clear cutting and coppice with standards systems. The basic idea is to divide the woodland into enough blocks to allow for a continuous cutting cycle to be established; by the time the last block, or coupe is cut, the first is ready for re-harvesting. The number of felling coupes, then, is equal to the number of years it takes for the cut trees to regenerate and reach harvesting size, also known as the cutting cycle. Cutting cycles for miombo woodland are difficult to determine because of (i) site variation across the region, (ii) the wide range of species harvested, and (iii) the variety of products required. Cycles will also depend on the type of product to be harvested. Some general guidelines for certain products have however been developed from trials in different countries. Based on results from a relatively moist sites in Malawi, cutting cycle of between 3-5 years is recommended for the production of firewood and small poles, 10-15 years for medium sized poles and roofing struts, and 25 or more years for large poles and timber, and 40 or more years for saw log timber (Department of Forestry 1996, Abbot & Lowore 1999). Malimbwi et al. (2005) report on potential charcoal yield along a harvesting gradient between a major transport route and a protected forest reserve. Adjacent to the road the estimated yield was 1 bag (56 kg charcoal) per hectare, whereas 10 – 15 km away from the road the yield was 125 bags per hectare. They concluded that miombo forests in that region could be harvested for charcoal approximately every eight years and maintain the standing biomass at approximately 70 % of that in the protected site.

31.4.4 Selective cutting

Selective cutting follows a different approach to the management of woodland use, one that is more closely allied to current practice and requirements of local users. It is also the system widely practiced throughout the world in old growth indigenous forests with multiple age or size classes. Specific products or species, are harvested through felling, coppice thinning or lopping of branches. In its simplest form, harvesting under this system is not restricted to a single cutting period or areas (coupe) as is common with the other two systems, but is ongoing and takes place throughout the woodland, or the areas zoned for utilisation. Natural regeneration takes place through the usual means of coppice, sapling growth and reseedling, whilst those trees that were not cut continue to grow. Regeneration rates are linked to the extent of canopy clearing, hence the slower regeneration rates under this system compared to clear cutting and coppice with standards systems. Sustainability can be promoted through selectivity, i.e. if only certain types and sizes of wood are harvested from particular species, and trees are left to grow until they reach the required dimensions. This approach provides for harvesting of multiple products, and relies on simple observation for determining when re-harvesting can take place. This does away for need for information on harvesting intervals; information that is difficult to come by because of the wide range of products and variability of production rates.

A more formalised approach to selective cutting is to include forest zonation and a system of rotational cutting compartments as in the other two silvicultural systems. Zonation is used to segment the forest or woodland area into different categories of use and management, such as conservation areas, recreation areas and areas where harvesting takes place. Cutting cycles may be introduced for planning purposes and to guard against over exploitation, but are worked out for each species and product and according to a range of site variables.

In addition to harvesting for specific products, selective thinning may be practiced as management tool to remove dead and dying trees, and improve growth rates of the remaining trees (Department of Forestry 1996). Pruning of unwanted branches is another management practice to aid growth and improve form of individual trees.

31.5 Systems and practices for multiple use

The emphasis of silvicultural systems is on wood products, traditionally timber, but recently extended to incorporate other wood products such as firewood and poles of various sizes (Lowore & Abbot 1995, Abbot & Lowore 1995). It has been proposed that coppice with standards and selective cutting systems be used as the basis for multiple use systems that include non-wood products, but information on trade-offs and how to manage these is still lacking. Likewise, very little research has been done on harvesting rates for non-wood products. Information is limited to a few studies that have looked at sustainable harvesting levels for certain products and species. Products that are seasonally available such as fruits do not require harvesting limits. Provided no damage is done to the trees during harvesting, the impacts from fruit removal seem small. Emanuel et al. (2005) modeled harvests of *Sclerocarya birrea* subsp. *caffra* at a site in South Africa, and concluded that 92 % of fruit could be harvested without impacting the size class profile of the *Sclerocarya* populations. Their review of the international literature indicated that very little work has been done internationally on impacts of fruit harvesting from indigenous trees, but of the few studies to date, most concluded a similar robustness, i.e. over 80 % of fruits can be harvested with seemingly little effect.

Harvesting of bark for various products including medicine, rope fibre and for making beehives can be highly destructive and result in increased tree mortality (Chidumayo et al. 1996). A number of methods for reducing the negative impact of bark harvesting have been proposed and tested, including: obtaining bark from woody material that has already been cut for other purposes, improved harvesting methods that prevent ring barking and reduce fungal infection; substitution such as the use of leaves to obtain medicinal products rather than bark, and the provision of timber beehives as an alternative to the use of bark for making beehives.

Improving co-ordination amongst harvesters has been recommended as a means to optimise use of different products, and prevent wastage in any given harvesting operation. For example, rope fibre can be obtained from coppice thinnings harvested for roofing (Lowore & Abbot 1995), and the example cited above of obtaining bark for medicinal purposes from harvested timber.

31.6 Domestication

Enrichment planting in woodlands and the cultivation of useful tree species around homes and within fields and gardens is widely practiced. Propagation methods include nurturing of self-seeded individuals, direct seeding, planting from cuttings and truncheons, and nursery produced

seedlings (Deweese 1993, Grundy et al. 1993, Abbot 1997). Research into the domestication and artificial propagation of miombo species has revealed that many are difficult to propagate using conventional seedling nursery and planting out techniques (Pearce 1993). High mortality rates and slow growth of seedlings has been linked to root damage in the nursery and during planting out, the absence of the required root symbionts, and the natural suffrutex habit that results in minimal above ground growth for the first 10-15 years of a seedlings life (Lees 1962, cited in Chidumayo 1993, Pearce 1993). Most of the work done in the region on propagation of miombo species relates to fruit trees. Propagation techniques for a range of high value indigenous fruit trees (Parinari, Sclerocarya, Strychnos, Uapaca) have been developed through field trials implemented by NGOs, forestry colleges and universities throughout the region (e.g. Maghembe et al. 1994, Prins & Maghembe 1994, Maghembe 1995, Mwabumba & Situbi 1995, Akinnifesi et al. 2006) and a new book is imminent (Roger Leakey pers. comm. 2007).

Recently Magingo & Dick (2001) reported successful propagation of two miombo species (*Brachystegia spiciformis* and *Pterocarpus angolensis*) via leafy stem cuttings, as a technologically simple and relatively inexpensive approach for propagation of clonal material. A more common form of vegetative propagation is planting of truncheons, often in the form of live fences (Clarke 1995). Certain species grow well from truncheons, including *Pterocarpus angolensis*, *Kirkia acuminata*, *Sclerocarya birrea* and species of the genera *Erythrina* and *Ficus* (Epstein 1992).

The misplaced emphasis placed by Forestry departments on tree planting, to the exclusion of improved management of existing resources, should not however, go without comment here. As we have noted, miombo species are extraordinarily resilient and artificial propagation and establishment notoriously difficult. Returns to labour of protecting and managing existing resources far exceed those of woodlot establishment, which still forms the backbone of most rural forestry extension efforts. Furthermore, the planting and early care of tree seedlings is very labour intensive, at the busiest time in the agricultural calendar (Abbot 1997). So although there is a role for strategic interventions towards domestication of high value species, the current emphasis on tree planting by extension agencies needs to be reassessed.

31.7 Substitution

Demand management is a natural response to increasing scarcity, and there are many examples from around the region of how local households curb their use of scarce resources (Chidumayo et al. 1996), some of which have already been highlighted in Section 2 above. Methods include improved protection of the resource, more conservative use, recycling, and substitution. Substitution is another important demand management strategy becomes more common with increasing scarcity. Ways to support and augment demand management practices are needed, for example through the provision of acceptable substitutes (such as Eucalyptus fence posts) or improved technology that reduces consumption (such as improved cook stoves). Potential substitutes for deriving medicinal ingredients currently obtained from bark, such as leaves or bark from coppice shoots needs urgent attention.

32 Conclusions

Traditionally, because of the low levels of use, high degree of selectivity, high rates of woodland regeneration, and respected and responsive community structures there was little need for

conventional silvicultural sustainable yield regulation systems, or other external management interventions in miombo woodlands. In Section 2 we presented a summary of the range of ways in which local users of miombo actively or passively facilitate ongoing supplies of essential products through selective clearing, highly selective harvesting practices, seasonal, cultural and spiritual harvesting controls and a wide range of demand management measures. Studies have shown that woodland use and management practices are highly responsive to resource availability (e.g. Arnold & Dewees 1995, Campbell et al. 2002, Mutamba in prep.), suggesting that in many areas at least, there is still considerable scope to stay within sustainable harvesting limits merely through providing additional support to these practices. The advantages of such an approach are that minimal changes are required and therefore they are therefore more likely to succeed, and they have potential to strengthen local capacity for management through building on existing practices and institutions. There is a growing body of success stories from throughout the region, where local communities have been assisted to improve the management and productivity of their woodlands through small but effective changes to the status quo.

It follows that the type of support and intervention required will vary from place to place, and comprise a number of different elements, depending on the specific opportunities that exist there, and key constraints faced. Likewise, a step-wise sequential approach is advocated, beginning with the most obvious and pressing interventions, and progressing to more complex interventions as the situation demands. Where institutional change or support are unlikely or difficult, for example, planting of key tree or non-tree species on land allocated to households, such as in fields and near homes, is likely to be a better option than community-type initiatives.

Despite a fairly large body of literature calling for the introduction of conventional silvicultural systems for miombo management (Hofstad 1993, Werren 1995) backed up by technical recommendations from silvicultural systems trials, there are no reports of such practices having been successfully implemented within communal lands, which comprise the bulk of the miombo region. Whilst the principles and techniques of conventional silviculture have much to offer in terms of improvements to current harvesting practices, the application of these to the complex social and multiple use systems that exist within communal lands has yet to be explored.

Current models and recommendations are limited to the harvest of a narrow range of wood products, and there are still very little known about multiple harvesting systems, trade-offs, complementarities and sustainable harvesting levels. Research agencies (with a couple of exceptions) seem to be stuck in a narrow technical paradigm focusing on a few resources and have failed to contextualize resource use within dynamic models and understanding of how people actually use and rely upon the miombo for their very existence. We have presented stark number in this report indicating the significance of miombo products to rural livelihoods, which constitute a compelling case for the broadening and reorientation of the silvicultural research agenda in the miombo region. Some illustrative examples include (i) up to one-third of livelihood incomes come directly from miombo products, (ii) the contribution of GDP to charcoal is almost ten times that derived from commercial high value timber, and (iii) the returns to labour from harvesting and sale of wild fruits are greater than those to either agriculture or livestock husbandry. There are many other examples beyond these, which service as a more than adequate rationale for greater attention to be directed at the full range of miombo products and species and the means to optimise production and reduce negative consequences of trade-offs. There is a

need to make the resource users key stakeholders in the research and management processes. Adaptive, participatory research approaches need to become the norm (Sayer & Campbell 2004).

The very fact that miombo provides so many goods and services, and in significant amounts, to local livelihoods is also the primary management challenge for both local and government institutions. We have demonstrated above that there are both complementarities as well as competition in the supply of different resources. For example, complementarities include how the provision of construction timber also makes available wood for implement handles and fuelwood; maintenance of trees for fruits in arable fields provides litter as fertiliser; the thinning process resulting from continuous harvests results in faster regrowth rates. On the other hand competition is evident in managing for increased woody cover, which results in decreased forage production; harvests of large rings of bark for bee-hives results in tree mortality meaning other products from that tree cease; burning for fodder production impact on woody plant recruitment. Research and management needs to seek avenues to enhance complementarities and minimise competition. This will require extensive local stakeholder consultation and participation because the relative “importance” of different goods and services differs between communities (Lynam et al. 2003).

Whilst recognising that local residents engage in a range of passive and active approaches to enhance the sustainability and productivity of key miombo resources, much of this is at the household scale. Traditional management approaches at a larger scale, for tracts of miombo and land around villages, are eroding in many areas with modernisation, growing resource commercialisation increasing human population densities, and increasing vulnerability to external shocks and stresses. Commercialisation is particularly virulent as in many instances it involves outsiders supplying urban areas. Outsiders may have little interest in long term measures to minimise any decline in resource productivity. Although the wider social and economic drivers of resource use and management have not been the focus of the preceding sections of this paper, their overriding significance needs to be acknowledged. Unless local residents have adequate governance and enforcement structures and mechanisms the most likely long-term scenario is one of declining resource supply and increasing vulnerability, irrespective of resource management know-how. Recent innovations in developing institutional alternatives to common property regimes, many of which are in transition to open access systems, need further attention (Kowero et al. 2003).

Control of resources by local communities also requires that they undertake basic monitoring of trends in resource supply and use, and when necessary adjust local regulations to meet the needs of local users but in a sustainable manner. Typically, rural resource users do monitor in an informal fashion and thus are well aware of changes and trends in the supply of key resources. But this individual monitoring is rarely institutionalised, and so there is no collective response when trends are discerned. Once again, this requires that functional and effective governance structures are in place.

The usefulness of any research programme aimed at facilitating informed and sound management options for miombo can be measured to some extent by the degree to which it is based on a dynamic understanding of what constitutes “a livelihood” for most miombo dwellers, and how such livelihoods evolve and adapt in response to a number of macro and micro drivers.

A research and management approach seeking to prescribe static and mechanistic activities to provide a prescribed volume or amount of a particular good ad infinitum will be outdated before it has even commenced. A number of modeling initiatives have been developed over the last few years from the qualitative or conceptual to the quantitative (Campbell & Byron 1996, Gambiza et al. 2000, Campbell et al. 2000, 2002), providing varied insights into the dynamic nature of livelihoods, and the primary drivers. In terms of overall livelihood vulnerability, the seminal work of Campbell et al. (2002) showed that the three major drivers were the state of the macro economy and people's links to it, rainfall, and the effectiveness of community institutions. Relative to these three, all other variables were negligible. The first two are beyond the control of local people and management agencies, but research can assist in developing and demonstrating approaches and policies to minimise adverse livelihood impacts in times of low rainfall or poor macro economic performance. The third one is definitely locally based and is within the hands of local people and communities.

It is telling that only in the last couple of decades has there be meaningful and systematic research conducted on the nature and dynamics of rural livelihoods in the miombo region (Campbell 1996, Campbell et al. 2002). Only now are integrated portrayals of livelihoods and their adaptability emerging, providing the impetus for greater understanding of traditional silvicultural approaches and thereby identifying potential synergies with conventional ones. But whatever this picture and understanding may be, it is already being clouded by the inexorable progress of climate change and ravishes of HIV/AIDS. Much of the miombo, already characterised by strong seasonality of rain which limits options during the dry season, will get warmer and even drier, although some areas may become wetter (Scholes & Biggs 2004). In those areas that will become drier, farmers and foresters will face further limitations to agricultural and miombo productivity, potentially undermining existing livelihood options and exacerbating vulnerability, especially of the poorer sectors of rural society. It is important that current and near-term future silvicultural research and intervention programmes immediately begin to take this into account. One avenue requiring thorough investigation is the potential for carbon credit payments through avoided deforestation. Indeed, greater understanding of the flows and value of all ecosystem services is required, facilitating improved examination of trade-offs between different land uses, and hence the context within which evaluation of new silvicultural practices and approaches can be gauged.

In overall conclusion, this paper has shown that despite there being a significant amount of ecological and silvicultural research from the miombo region it is of narrow content and geographic focus. Only in the last decade or two has there been a growing contextualization of management orientated research towards user needs. Whilst this shift is to be welcomed, and this review attempts to collate such work, it is readily apparent that enormous knowledge gaps remain to be addressed. Yet it is abundantly clear, that the greatest gains are likely to be in the realm of institutions, governance and co-operation rather than silvicultural guidelines. But for those agencies involved in silvicultural research a welcome shift to examine the growth rates and responses to harvesting of a wider suite of species and products would be welcomed, including non-timber species. Key focus products and species for such a research efforts should be those most used by rural communities rather than just high value timber species. At the habitat or community level, the impacts of current management systems and harvesting practices on

biodiversity of all taxonomic groups, and trade-offs with the delivery of other ecosystem goods and services would be informative.

33 References

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Annex 7: Improving policy outcomes for the management of miombo woodlands

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ABSTRACT

This paper reviews policy options for improving the management of miombo to meet household needs. There is a particular need to recognize the social protection function of miombo and to build this into social welfare planning. Given ongoing decentralization processes in the region, the benefits of miombo for need to be accounted for decentralized planning initiatives. Miombo produces a wide array of goods and services; honey and some marketable non-timber products have potential where there is an accessible urban market. Local value-adding or improved processing efficiencies would improve returns. Growing the rural economy may increase options for local trade. Ways of bringing money into local economies, such as payments for environmental services or remittances are examined as is the potential role of the private sector. Many constraints and their solutions are extra-sectoral and require integrated, cross-sectoral approaches. The governance conditions – the legal framework, including clear land and resource ownership, the institutional landscape within which policy instruments operate, including stronger civil society to counter elite and state capture of benefits – are overlying aspects that need to be sufficiently conducive for policy options to have any impact at all.

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34 Introduction

This Annex focuses on how policies interact with risks and vulnerabilities of the poor in the miombo region. We recognise that ‘the poor’ of the miombo region are highly differentiated and often measured by their relative ability to cope with stress and uncertainty. In the countries of the miombo region this includes food insecurity, income-earning opportunity, asset and land ownership and use of woodland resources (e.g. Devereux, Baulch, Macauslan, Phiri, Sabates-Wheeler 2006; Hegde R. 2007). These characteristics are dynamic: they may be temporal (e.g. seasonal), social (e.g. voice), structural (e.g. culture) or spatial (e.g. geography) and are what makes up the relative vulnerability of a community; household or individual (Box 1). The ‘coping strategies’ employed are mediated both by a household’s individual response and policy interventions (Devereux et al 2006).

People can protect themselves against the risk that a stress situation (e.g. drought) will undermine their livelihood by drawing on savings, diversifying their livelihoods to spread risk, drawing on their natural asset base (e.g. miombo), building social networks that can provide informal social assistance in times of need, and so on. The most vulnerable have the least ability to draw on alternative strategies, they adopt low risk – low return strategies that keep them in the “poverty trap”.

The policy implications of vulnerability are broader than efforts to reduce poverty. According to Devereux et al. (ibid.) policy interventions to manage vulnerability can either aim to reduce or spread risk, or to strengthen resilience. In the absence or failure of these measures, public interventions need to deliver safety nets and other forms of social protection to those affected by shocks and processes that they are unable to cope with unassisted.

For the purposes of this paper, we assume that the “rural poor” currently use or have the potential to use miombo to reduce their livelihood risks. We also assume that the sustainable management of miombo, instead of its conversion to other potentially more productive land uses, is an appropriate strategy for the poor. The Social Protection function of miombo is well documented:

Box 1: Dynamic Vulnerability

Vulnerability and poverty are not synonymous; specifically, vulnerability is a broader concept than poverty, in at least three ways:

- (1) The non-poor are also vulnerable to future poverty (some definitions of vulnerability refer to people whose income is within, say, 20 per cent of the poverty line).*
- (2) Vulnerability incorporates various non-income aspects of ill-being, such as insecurity, social exclusion and political marginalisation, while poverty measures focus on income and assets.*
- (3) Vulnerability is a dynamic concept, which is both forward-looking and constantly changing, while poverty is a static concept that measures proxies for well-being at a point in time.*

Source: Devereux et al 2006

Insecure access to miombo increases vulnerability of the poorest (Abbot 1997; Hegde 2007). Miombo is very good at providing a social protection function at the subsistence level (e.g. Bwalya 2007; Campbell et al 2007). Investment in improved management should enhance its contribution to risk reduction and poverty reduction and this paper explores what can be done to help take that next step?

34.1 Approach

Following a brief description of the methodology and analytical framework used in the paper, a description of the current institutional landscape is presented. This provides an important basis for understanding how current policy processes affect the way the poor can access and benefit from miombo.

Drawing on the published and unpublished (grey) literature, the current policy options for influencing household livelihoods are outlined within the context of opportunities and barriers for miombo use and management. The next section then pulls together implications for development policy. Policy intervention options in relation to risk and vulnerability are subsequently revisited in the concluding section.

The paper builds an analytical framework around the opportunities and barriers for the sustainable use and management of miombo, identified in this project by Campbell and others (Campbell et al. 2007). Evidence from the policy research literature is used to review options for strengthening or mitigating the opportunities and barriers respectively. An approach that acknowledges the complex inter-relatedness of policies and their impact is adopted. The framework is developed following the description of the institutional context.

The paper employed a broad review of the aid policy literature to draw on experiences and developments in the agriculture, environment and rural development sectors. Empirical evidence from the miombo region was used where it could be found. The paper relied on extracting data from information available in the public domain: time and resource constraints limited the depth of grey literature that could be brought into the scope of the review.

There is an extensive literature, both published and unpublished on the use and management of miombo by the rural poor. However, more recent material related to policy, poverty and forestry has tended to focus on the moist forest regions (Congo Basin, C. & S. America, S.E. Asia) and therefore related to high value forestry (in timber and biodiversity sense. E.g. Smith, Colan, Sabogal & Snook 2006; Sunderlin, 2006; Sunderlin & Huynh 2005; Joshi, 1998; Chomitz; Wertz-Kanounnikoff; Thomas; De Luca & Buys 2007; Nguyen 2007; Muller, Epprecht & Sunderlin 2006.) This is, in part, a response to the focus of donor agencies on the forests of these regions over recent years. Many of the instruments being tried and tested in such areas do still have relevance to the miombo biome, albeit in modified form in some cases.

Trends and themes emerging from the research and empirical literature were identified and cross referenced if possible for triangulation.

34.2 Understanding the barriers to the sustainable use and management of miombo

Is miombo not already contributing significantly to the livelihoods of the poor? Evidence from Malawi (Coote et al. 1993a,b, Lowore et al. 1993), Mozambique (Hegde 2007, Salomão & Matose 2007), Zimbabwe (Mukamuri et al 2003), Zambia (Bwalya, 2007) and Tanzania (Monela et al 1999) indicate that it is. However, these and other studies (e.g. Kowero, Campbell & Sumaila 2003) have identified there are constraints that limit the livelihood contributions the poor extract from miombo, and with deforestation continually diminishing the available resource, the problem appears to be that current policies and policy instruments are not tackling the problem – or at least not tackling it in a way that provides “routes out of vulnerability” for the rural poor. Campbell *et al* (2007) have reviewed these constraints and grouped them into eleven barriers to the sustainable use and management of miombo by the poor (Table 1). They also identify four opportunities that may provide new ways of strengthening the role of miombo in rural livelihoods.

Most of the barriers may be influenced – by a greater or lesser degree – through policy-level intervention. This may be through policy reform, improved policy implementation, development of policy instruments (such as legislation or incentive mechanisms) or reform of policy delivery mechanisms. A few, such as issues of woodland productivity, are most likely to be resolved through technical developments or interventions but may also need to be viewed through a different lens than the traditional technical-scientific one and thus have a policy relevance.

Table 1 also implies that the situation is complex in that the issue has – in most cases – to be dealt with at a range of levels (from local to regional) and will often have to involve sectors well beyond forestry. This complexity presents, if not a barrier, then a further challenge to leveraging national and international finance and influence to strengthen the access of the rural poor to the benefits of improved miombo management.

To enable us to navigate through the policy analysis, the next section will map out the current institutional landscape within which policy and its instruments has to operate.

Table 1: Opportunities and barriers to managing miombo woodlands to meet household needs

Issue	Policy Relevance	Geography	Indicative Sector Relevance
<i>Economic barriers</i>			
Low inherent productivity	Technical	Regional Context	Forestry
Elite and external actors capture values	Policy	National and local	Law, government
Restrictive regulations reduce access and increase transaction costs of producers and traders	Policy	Regional, national and local	Land, environmental, forestry
Limited support for local forest enterprise development	Policy, markets	National and local	Trade, finance, local economic development
The lack of strong local organization	Policy, social capital	Local	Government, social development, law
A legacy of armed conflict	Policy, sociological, technical	Regional and national	Social protection, infrastructure, law, government
<i>Sustainable Use Barriers</i>			
Low resource rents – high management transaction costs	Policy, market	National and local	Infrastructure, land, trade, finance
Weak local institutions	Policy, social capital	Local	Rural development, law, government, land
‘Forestry’ is marginalised	Policy	Regional and national	Forestry, finance, economic development
Domestication of high value species reduces importance of natural forests	Technical and policy	Regional and national	Agriculture and Rural Development
Cash constraints	Policy and markets	National and local	Finance, economic development
<i>Opportunities for improving management</i>			
Forests are still a valuable resource at household level	Policy and markets	Local	Land, trade, forestry,
Resource rights are shifting to rural people	Policy	National and local	Law, government, land, local economic development
New integrated conservation-development approaches are emerging	Policy and market	Regional, national and local	Environment, finance, tourism
New product and service markets are expanding and emerging	Policy and market	Regional, national and local	Water, environment, energy, finance

Source: Campbell et al. 2007

35 The institutional landscape

35.1 *Developments in the international aid architecture*

The past decade has seen considerable changes in the delivery of international development support with repercussions on how the policy reforms needed to reduce barriers to access and use of miombo by households can be delivered.

Many of these changes stem from disappointment by the 1990s with technical assistance projects and the rather blunt instrument of aid conditionality (DFID 2003). Greater demands for aid efficiency improvements and greater country ownership led to calls for greater aid harmonisation and an increased demand for monitoring and accountability.

New output, or result-oriented, modalities that relied on achievement of benchmarks to trigger further support, were developed (World Bank 2001a) and by 2005, a new agreement on aid harmonisation, alignment and ownership was reached called the “Paris Declaration” .

The new aid architecture of harmonisation, HIPC relief and budgetary support now emphasises (DFID 2001):

- Improved Aid Management – donor harmonisation, reduced transaction costs and alignment to national priorities in delivering the MDGs
- Improved policy ownership, coordination and implementation by beneficiary country through the development and implementation of a poverty reduction strategy.
- Stronger institutional capacity and government leadership of aid to improve sustainability. Improved expenditure management (usually reflected in the use of medium term expenditure frameworks) and more equitable service delivery.
- Enhanced public-private interface including involvement of civil society on consultative policy processes.

However, for budgetary support to be effective it requires partnerships for the provision of untied budgetary resources and the use of predictable, transparent methods for external finance. It is not suited to all country situations, nor to every sector and so the international community still uses a number of aid instruments to complement each other, the balance depending on the level of earmarking; the state of financial management procedures; the entry point and level of interaction (State, line ministry, local government, NGO) (ODI 2006a, DFID 2003). This maintains flexibility of response related to need.

35.2 *National policy developments*

35.2.1 Revised national policy instruments

Policy developments have evolved rapidly in the countries of Eastern and Southern Africa that comprise the miombo eco-region countries over the past decade. New forest policies and laws have been gazetted to replace outdated (even colonial) ones, new organisations have been formed, governments have changed, and the instruments of development support have evolved. Table 2 outlines the current status of a range of relevant variables in four miombo countries (Malawi Mozambique, Tanzania and Zambia). The findings in these countries are indicative of

broader changes in Southern Africa, influenced initially by the outcomes of the 1992 Rio Convention and the NFP processes, as well as peace and democratisation in the region, and more recently, by donor harmonisation and alignment to national processes in support of the MDGs.

A key driver of the past five years has been the establishment of Poverty Reduction Strategy (PRS) processes. The PRS is usually the overarching policy instrument for guiding poverty reduction. According to Evans (2006) a key achievement has been linking these national planning processes to budgets (through development of Medium Term Expenditure Frameworks – required for General Budget Support). This has had a variable effect on rural productive sectors such as forestry and forests which are multi-sectoral. Details in Table 2, drawn from country-led strategies or policies and statistical or other returns by countries shows the range of state actors in the forestry environment.

In fact, actors include private sector companies, commercial estates, rural and urban communities, individuals as well as the government agencies – parks, forestry, land, livestock, agriculture, water resources management. The overlapping sectors and mandates add to the complexity with respect to the governance environment. Whilst PRS's draw on participatory consultative processes and are cross-sectoral in scope (DFID 2001) they tend to focus on supply side interventions and delivery through the government budget, whereas growth in forestry and rural development also requires broader regulation and off budget enabling actions (World Bank 2005d).

35.2.2 Decentralisation

Linked in to the introduction of the PRS processes is decentralisation as a key mechanism for its implementation. The PRS processes in Southern Africa as elsewhere in Africa (Evans et al 2006), envisage increased government withdrawal from direct intervention in production and marketing activities, reflecting an increased expectation at a macro-economic level for growth led development where the private sector plays a stronger role.

As part of this process, there have been various attempts at reforms in the Public Forest Sector in Southern African Countries: Malawi, Mozambique, South Africa, Tanzania and Zambia have all designed plans to devolve services to lower spheres of government where they are often designed to be delivered in an integrated manner designed to improve accountability and improve service delivery.

These have had a varied response and impact in the countries of the miombo (e.g. Cross & Kutengule 2001 and Kayambazinthu & Locke 2002 for Malawi; James, Mdoe & Mishili 2002 and Wily 2001 for Tanzania; Blaikie, 2003 for Botswana). There has often been resistance in national forestry institutions to initiatives that undermine their traditional sources of power (Box 2). This is complicated by the institutional space which is crowded with a number of public agencies often with overlapping mandates involved with forests and their stakeholders (communities, entrepreneurs etc). Evans et al (2006) found that this often results in conflicting policy and institutional mandates with respect to the role of state, leading to a lack of clear direction in terms of that role.

Another problem may be the limited analysis of poverty dynamics in the forestry context (WB2005c). Although the forestry-poverty linkage is established (e.g. Chomitz et al 2007, Shackleton et al 2007), and even the link established between NFPs to PRSs in more recent cases (Geller & McConnell 2006), how aid and private sector finance contributes to, or creates, opportunities for people to exit poverty in a sustainable way, especially when a range of things may be needed simultaneously in a number of related sectors, is not articulated in the country-level processes.

Referring to community miombo management in Malawi, Blaikie (2003) calls this 'black-boxing' as the benefits of community management are small scale dependent and as PRS and GBS processes work at the macro-scale they do not consider local conditionalities that reflect whether community management will

Table 2: Policies and Institutions in the Miombo Region

Country	Zambia	Tanzania	Mozambique	Malawi
Forest cover (1000 ha)	48 144	63 815	60 931	3 896
Forest ownership	92% public; 8% other	>99% public	100% recorded as public	Assumed all public
Estimated deforestation rate (%)	1.0%	1.1%	0.3%	0.9%
Forest policy and legislation	1998 National Forest Policy 1999 Forests Act	1996 Zanzibar Forest Resources Management & Conservation Act 1998 Forests Policy 2002 Forest Act	1997 Forest and Wildlife Policy 1999 Forest and Wildlife Law 2002 Forest and Wildlife Regulation	1996 Forest Policy 1997 Forest Act
Other relevant legislation	1990 Environmental Protection & Pollution Act 1998 Zambia Wildlife Act 1996 Timber Export Policy 1995 Mining & Minerals Act 1999 Lands Act	1997 National Environmental Policy 1974 Wildlife Conservation Act <i>In prep</i> National Parks Act 1992 Land Tenure Act 1984 National Land Use Planning Commission Act	1997 Land Act 1999 National Water Policy	1992 National Parks & Wildlife Act 1996 Environment Management Act 1998 Local Government Act 2002 National Land Policy
Relevant government ministries and agencies	Forestry Department – Zambia Forestry Commission Zambia Wildlife Authority	Forestry & Bee Keeping Division, Ministry of NR and Tourism, Wildlife Department, (under Ministry of NR and Tourism) TANAPA TAFORI	Forestry Department, Wildlife Department Economic Planning Department, Law Enforcement Department, Legal Cabinet Community Management Unit Forestry Research Centre (all under Min Agriculture and Rural Development)	Department of Forestry, Department of Environmental Affairs (both under Ministry of NR and Environmental Affairs.) Department of National Parks and Wildlife (under Ministry of Information & Tourism.)
NFP and NBSAP	1999 Zambia Forest Action Plan 2006 NBSAP	1990 Tanzania Forest Action Plan No NBSAP	1998 National Forests & Wildlife Program as part of PARPA 1997 NBSAP	2001 NFP 1999 NBSAP
Poverty reduction strategies	2002 PRS 2006 FNDP	2000 PRS 2005 NSGRP	2001 PARPA I 2006 PARPA II	2001 MEGS 2006 MGDS

Source: Information extracted from FAO statistics, State of Forests Report 2007, World Bank PovertyNet website (www.worldbank.org/poverty)

work in any given situation (Ellis, Kutengule & Nyasulu 2002). Additionally, as the PRS and GBS tend to facilitate nationally driven processes, they risk the recentralisation of decision

Box 2: Resistance to Decentralisation and Devolution in Malawi

Malawi is characterised by a neo-patrimonial state, namely a clientelist political system operating within the guise of a legal rational bureaucratic framework. The roots of the system are deep and as such a genuine internal commitment to decentralisation, including an informed and involved citizenry, effective representation and financially empowered local government, is absent. Decentralised forest management threatens the control of valuable resources by political elites and threatens to interrupt the flow of patrimony from local sources via chiefs to the centre. Participatory or community forestry imply both a movement of power from the central to more local levels and participation in decision-making, including transparency in transactions, downwards accountability and environmental subsidiarity.

Source: Cross & Kutengele 2001, Blaikie 2003

making and top-down planning; creating a paradox with reforms designed to implement decentralised and integrated implementation (Coyle & Lawson 2006). Hopley (1996) refers to the phenomenon as ‘centralised decentralisation’ in that forestry departments often formalise de-facto (traditional) use rights of villagers to forests, and establish their own structures, so drawing the central forestry department deeper into the locale than they had been before so-called decentralisation. The formalisation of these rights under the banner of PFM or CBNRM can often lead to a decrease in benefits and a loss of local decision making, reducing the capacity to respond to local heterogeneity, local risks and local vulnerabilities (Hopley *ibid.*, Salomão & Matose 2007).

35.3 Revisiting the analytical framework

35.3.1 The complex institutional landscape

To support the coping strategies used by rural households in overcoming risks to their forest-based livelihoods, policy responses may be required at the international, national and local level (Peskett et al 2006, Devereux 2006). At each level there are a range of institutional actors that can impact on those policy responses (Table 3). At the same time, households themselves adapt their livelihood responses as they manage their risks. Their responses exhibit characteristics of complexity: they are dynamic, multi-dimensional, openly interact with the surrounding environment, and the poorest often have weak relations to social and capital assets, and the natural resource assets too, which mean small changes in conditions can have big impacts on their vulnerability.

Table 3: Some variables of the institutional landscape that affect policy options in the Miombo

Geographical Arenas	National Socio-Political Actors	International Actors
International – Global	The State (central/decentral)	INGOs
International – Region	The Legislature	International treaties,
National	Judiciary	Multinational commerce (particularly the growing influence of BRIC countries).
Sub-national	Civil Society	
Local	Traditional Leadership Business The People	Donor conditionalities

In this situation, interventions premised on simple cause and effect policy responses will result in trade-offs that need to be considered and managed (Chomitz et al 2007). A range of responses may be needed simultaneously in a number of related sectors at a number of levels. Barriers and opportunities for the poor are often linked; in many cases an opportunity for some may present a threat or barrier to others: a basic paradox of the complex relationships.

There are many different policies at different levels that apply to poor miombo woodland users; when they combine they can generate new outcomes that may not have been expected. They are often overlapping and incongruent (e.g. land and forest policy in Mozambique.) It means that solution it is not just a case of implementing better forest policies – forest policies may not be the problem it may be other policy/institutional constraints (Box 3 explores one case by way of illustration).

35.3.2 The analytical approach

Unsurprisingly, approaches to analysing the effectiveness or appropriateness of the policy response have been varied. Chomitz et al (2007) and Sunderlin, Dewi & Puntodewo (2007) argue for a spatial and scale based approach (international, national, local), although this may be less relevant in the miombo woodland biome where there lies a closer relationship between the woodland (which is generally coarse grained, naturally subject to regular disturbance and incredibly resilient) and the prevalent farming system. Others have used the aid modality (e.g. Foster and Leavy 2001) GBS process issues (alignment, harmonisation, ownership – te Velde et al 2006) conditions for change (e.g. laws, incentives, people, policies (Seymour 2000)) or focus of change (e.g. capacity, decentralisation, monitoring, civil society – DFID 2003). In all approaches, it is as much about the location and scale of intervention as it is about the modality, the process and the conditions: they are all relevant and meaningful.

The poor do not exist in a vacuum but in a particular institutional landscape and they have a particular set of assets as a basis for the livelihoods. Because of their vulnerability, for the poor, this initial mix is particularly important in determining policy impact and the principle is relevant at different scales, whether at the local level (what Blaikie (2003) termed the small scale dependants) or at the macro-scale (national and international). We need to consider the mix of policy instruments and their relationship to the variety of groups known collectively as the rural poor, and: under what mix of conditions does the mix of instruments work. Empirical evidence shows that when the conditions are right, the miombo can generate substantial benefits for the poor (e.g. Bwalya 2007, Jumbe et al 2007, Monela & Abdallah 2007). However, conditions are not static, but co-evolve: whether these benefits can be sustained (or indeed are currently sustainable) remains dependent on that co-evolution.

The importance of setting the right mix and their sequence or phasing therefore becomes key and suggests that a contingency approach is required: “no one size will fit all”. This also implies that, as conditions change new options may then be applied, in an iterative way.

The opportunities and barriers identified by Campbell et al (2007) delimit the analysis and the scope is restricted to those key policies, institutions and processes identified by the literature reviewed.

36 Getting the mix right: policy options for the Southern African dry woodlands

36.1 Forests are still a valuable resource at household level, but...

36.1.1 The problem

The cry that forestry is marginalised is one not only heard in the countries of the miombo biome. However, forestry is not being singled out: rural development and environment sectors generally have seen declining fiscal and ODA contributions for the last decade (Madhvani 1999, World Bank 2005a, ODI 2006a). Forestry has been one of the least responsive however: this is partly a result of slow reforms to the old-style forestry administrations and the fact that forestry is cross-sectoral, with mandates overlapping on a range of agencies, and impacts from economic and social processes outside of the sector (Bass et al 1998). In reference to this, the World Bank (2007d) notes that dealing with the problems in forests through incentives and institutional issues within the [forest] sector may be insufficient to address the problems, because many of the major decisions are made in agencies that have little or no involvement in forest issues, and who are relatively rarely contacted by those who do.

What conditions are needed to get the local value of miombo recognised nationally and given the resources it deserves? Several conditions are commonly cited as falling into the mix: Making forestry relevant in eyes of the key strategic ministries; getting forestry mainstreamed in other sectoral ministries (e.g. health and energy) but also getting it relevant at a decentralised level (Geller & McConnel 2006); generating evidence to demonstrate the relevance of forestry to macro-economic policy priorities (Geller & Thornber 2005), and to manage the combination of interacting policies on the ground to maximise pro-poor impact (Bess et al 1998). Finally and related to the subsequent sections, forestry itself needs to respond to the new macro-economic growth and poverty reduction agendas by redefining its relation to poverty (Hobley 2007).

Box 3: The multi-dimensional landscape: example of charcoal

Charcoal production is a very important use of miombo, particularly as a livelihood activity for the very poor and energy source for urban populations. It is often seen as a “forestry problem”. But is it? Forest is the resource being exploited, but it may be as much about energy and energy pricing, infrastructure, an inefficient value chain or tax regime, lack of technical knowledge, ineffective market representation or group organisation, or, effective regulation and problems of corruption and/or elite capture, or, all of these things. The charcoal problem is identified because it is blamed for massive deforestation in countries like Malawi and Zambia. What elements of the value chain are responsible? Who is dealing with the “charcoal problem” in Tanzania, Zambia, Mozambique and Malawi? Is it the Forestry Departments? Who is benefiting most from the Charcoal trade both through the formal value chain and informally through rent seeking and the flow of patrimonial benefits? What is civil society doing about the issue, what evidence do they have to pressure higher authorities for change?

Source: Chidumayo 2001, Mwampamba 2007 and Kambewa 2007.

36.1.2 Clear policy frameworks

The forests sector needs processes that simplify the complexity of its institutional landscape so that it can ‘plug into’ the PRS processes at all relevant levels – whether in relation to, say, traditional health, soil reclamation, infrastructure or industrial production. Analysis by Evans et al (2006) suggests that a more comprehensive coordinated and nationally owned policy framework for rural development sectors like forestry would enable them to respond to the wider changes and influences derived from the PRS processes and the shift towards budgetary support, civil society reform, decentralisation and the increased private sector participation. A clear policy framework that provides clarity on role of the state in forestry and in poverty alleviation is seen as vital for forestry to compete successfully with other policy priorities on the development agenda (Cabral 2006, ODI 2006a). This framework needs to influence other sector processes, raise the profile of forestry priorities, and mainstream forestry into planning and M&E processes.

The NFP process has been touted as the approach to developing a comprehensive, coordinated and nationally owned policy framework for the sector as a whole and a tool for raising the profile of forestry (Geller & McConnell 2006). However, the success of NFPs in this is limited. For example, whilst the Malawi NFP process was considered relatively strong on consultation and explicit with respect to prioritising livelihood, poverty and equity concerns in community forestry (Bekele 2001), major challenges remain for realising this intent: the political vision for community forestry remains fundamentally controversial; there are problems with the basic institutional and policy framework; the process itself is stalled in practical terms; the impact of and linkages with broader policy and political change in Malawi are ambiguous (Kayambazinthu & Locke 2002). They argue that the Malawi NFP has not, despite good intentions, engaged directly with the broader challenges raised by the changing face of poverty, including HIV/AIDS, food security, land and livelihoods. Similarly Monela (nd) assesses that the Tanzania NFP has been unsuccessful in tackling the key constraints to miombo management which are multi-sectoral and multi-level (national and local) in nature.

If NFPs are not capturing the full range of issues related to the household use and management of miombo and presenting them in a way that provides a clear policy framework, it may be necessary for either the process or the instrument itself to be reviewed. One approach may be to go local in order to go national (notwithstanding the issues with decentralisation discussed later): the production of a general national framework that allows for local flexibility or the development of regional or sub-national frameworks that can feed into integrated planning and implementation at the decentralized level may be relevant (James et al 2002, Hopley, 1996).

Sub-national profiling of the role of miombo by drawing it into the integrated development planning processes of local or regional government levels provides the opportunity for delivering forestry objectives or outcomes through the development plans of other sectors, improving efficiency of resource use. The social protection role of forests can be quite context specific for example, and difficult to define nationally (Farrington et al 2004), but at a local level it should be possible to link it up to social protection programmes if the policy space is created nationally for this to happen. . This approach has found success in South Africa, where forestry has been incorporated into Provincial and District development planning through a process of mapping, profiling and stakeholder engagement (DWAF 2003).

This may also be relevant if miombo management is not prevalent in all areas of the country; so whilst its national profile may be low, it can be important at a sub-national level. Additionally, opportunities in Miombo are strongly determined by their biogeography (as illustrated for Zambia by Bwalya 2007) so to capture the locally-relevant value of the dry woodlands requires frameworks that capture the value of miombo in its local context.

36.1.3 Upstream analysis

The development policy dialogue at the macro policy level can provide an opportunity to engage finance and social policy sectors in dealing with some of the wider, cross-sectoral issues of forestry and as such mainstream forestry into the PRS and related development policy planning processes. However, Lawson et al (2005) found for Tanzania that this opportunity was often not grasped – government capacities for cross-sectoral working were weak. In turn it could enable issues impacting on local forest use to be dealt with by a much broader target base than a sectoral programme. It may be that it was the narrow sectoral focus of forestry in the past that led to its marginalization: it needs to make itself relevant to other sectors it influences or is influenced by. Driving a participatory process that is not [Sector] Ministry-led that can draw in perspectives from a wider range of stakeholders, that can consider options off-budget as well as on-budget processes may be most appropriate. This may require a representative stakeholder body to take the lead.

Donors should ensure forestry is mainstreamed into their assessment processes whilst the forestry sector – state, private and civil society – needs to generate the evidence that demonstrates the importance of miombo to relevant policy priorities. This is explored further in 3.1.4 below.

36.1.4 Monitoring and information generation

As has been mentioned above, researchers are now generating information on the relations between miombo and poverty. One of the problems has been that the quantification of household values is context specific, irregularly collected and difficult to aggregate nationally (Campbell et al 2007). Forestry has to improve its evidence generation and the systems it uses to effectively feed information back up to policy makers in a way that is digestible to them. The World Bank (2005c) suggest that countries establish a national index (forest governance, contributions of forestry to the economy, forest conservation linkage, forest-poverty linkage) that can provide a useful monitoring tool in the context of General Budget Support (GBS).

The GBS process does provide the opportunity to establish indicators and milestones to monitor progress and provide benchmarks that can raise the profile of forestry and its relationship to broader institutional reforms in a country, bringing it to the attention of Ministries of Finance, even if no direct support is provided to forestry through the instrument (World Bank 2007d). The effectiveness of these conditionalities has been found to be variable however; Seymour & Dubash (2001) found they were most effective when linked to other programmes – such as civil society development programmes – that helped build a string momentum for change in a particular country. That said, sectoral planning processes of the GBS-PRS-MTEF framework seem less able to cope with the cross-cutting issues faced by forestry (Cabral 2006). Table 3 summarises the references made to forestry in the most recent PRSs of three miombo countries

(Zambia, Tanzania, Mozambique) and the findings imply that forestry is often poorly (or simplistically) understood in terms of its contribution to the country's growth and poverty alleviation.

Findings from the review shown in Table 3 suggests that the PRSs closely associate local (community) exploitation, particularly for energy, with deforestation, although no data is presented to confirm this. Some other observations are:

- Linkage to other policies and processes are limited (except in Tanzania with land tenure security)
- Local government is scarcely mentioned in relation to forestry: communities and forestry agencies are the main foci, although all the documents stress decentralisation as a main pillar of the implementation process.
- Technical forestry and technical solutions remain central to management responses to conservation and sustainable management.
- None explicitly recognised the social protection function of forests; the economic importance of forests was recognised in Zambia (likely to be the plantation sector) and the livelihood role in Tanzania (although here the income generating potential was the main focus.)

Table 3: Forestry as mentioned in the most recent PRSs for Zambia, Tanzania and Mozambique.

Forest Policy Issue	Zambia FNDP 2006-10	Tanzania NSGRP 2005-2010	Mozambique PARPAII 2006-2009
Decentralisation Local Government Community management	To build up local forest governance through decentralisation and community based forest management Formulate joint forest management plans and appropriate legal frameworks	Village titling to secure tenure and promote PFM Establish village forest reserves and support CBNRM scale up PFM for income generation	Local communities have role in environmental management
Regulations	To develop a conducive policy and legislative framework for enhanced contribution of the sector to the national economy		Collection of public revenues from NR Oversee compliance with natural resources legislation;
Forest Enterprise Development	Encouraging the involvement of local people and the private sector in forest businesses and strengthening commercial forestry; Promote forest sub-sector financing and investment	Value addition from processing primary forest products	Plantation industry important industrial sector
Recognition of role of forestry In economy	>3.7% GDP recognised		Forests a core support for agricultural productivity

Table 3: Forestry as mentioned in the most recent PRSs for Zambia, Tanzania and Mozambique.

Forest Policy Issue	Zambia FNDP 2006-10	Tanzania NSGRP 2005-2010	Mozambique PARPAII 2006-2009
In rural livelihoods	The growing population implies that the number of people who exploit natural resources as a means of sustaining themselves will also increase.	Link between forest degradation and increased vulnerability is linked to a need to check deforestation Recognise forestry as one of the main rural non-farm incomes Aim to increase contribution of forestry to rural communities,	Forest conservation and food production linked
Conservation and environmental service functions	Maintain Protected Area Network Strengthen forest resource protection and monitoring.	Environmental conservation and protection, maintain protected areas network, support catchment management	
Access to resources			Improve equitable access by communities and individuals to natural resources for sustainable use and management
Sustainable management Forest & NR	To strengthen management systems for sustainable utilization of natural resources		Ensure sustainable environmental management of natural resources, including new technologies Prevent and control uncontrolled burning of lands; Develop forestry care systems to establish and enrich forest species and formations.
Energy	Significant charcoal market in Zambia	Link energy and deforestation, assume women collecting firewood is unsustainable Concerned with forest exploitation and plan to secure energy supply (forests charcoal)	Curb use of forest for biomass fuel; Increase access and sustainable use of biomass fuels
Central State functions	Enhance capacity of forestry & wildlife departments		Sustainable NR management Promote information service on existing natural resources; and Improve oversight of the exploitation of these resources.

Table 3: Forestry as mentioned in the most recent PRSs for Zambia, Tanzania and Mozambique.

Forest Policy Issue	Zambia FNDP 2006-10	Tanzania NSGRP 2005-2010	Mozambique PARPAII 2006-2009
Forest Governance		Environmental awareness and public awareness of legislation	Public awareness of forest policies and laws. Consolidate and publicize legislation on access to natural resources; Recognise Civil society role in envtl management Implement a strategy to manage the people - animals conflict;

36.1.5 Policy harmonisation

Local evidence from the field suggests that overlapping or unclear mandates, incongruent or ill-matching policies and a lack of information on legal roles and responsibilities create inefficiencies and disincentives for sustainable use. Policies should be mutually supporting, by generating evidence through monitoring, the relevant agencies should work to resolve policy conflicts. Even if the problem is structural (for example where legislation requires amendment) there is sometimes sufficient flexibility to allow locally-relevant responses to be piloted. Donors can often support the testing of new policy approaches and the feed back of evidence in to the planning process.

At the national level, cross sectoral or cross-ministry engagement for policy harmonisation may be facilitated through MDBS-PRSP process where donors are working with central ministries. Donors can support these central agencies to manage the dialogue leading to a level of cross-sectoral complementarity in terms of policies and programmes programmes (for example the role of donors in facilitating emerging national processes in the case of Tanzania (Lawson et al 2005)). This can then be fed through to integrated implementation. The most important areas of policy conflict in the miombo appear to be:

- Land and natural resource tenure
- Natural resource, agriculture and land-use policy; and
- The alignment of mandates between Forestry, Wildlife and Agriculture.

36.1.6 Institutional reform

As has been mentioned, most forestry departments in eth region are in the process of reforming, to better enable forestry as a sector to both account for itself nationally whilst enhancing value of miombo at the household level. We look here at two aspects, that of institutional and policy reform. Clear policy frameworks, if they have been developed through participative stakeholder engagement and have sufficient scope, often have the legitimacy to initiate and guide the changes required. Two aspects of change are identified:

Aligning functions

- Central government (policy, regulatory oversight)
- Local government (integrated, locally appropriate policy interpretation guiding service delivery)

Policy Harmonisation

- Aligning 'old' forestry departments with the updated policy and legislation, and monitoring function
- Aligning 'old' forestry departments with their a new set of clients = the rural poor.

Even with these frameworks in place, there has been considerable resistance from Forestry Departments in countries of the miombo regions. Whilst this is compounded by the slow pace of decentralisation (discussed in the next section), the resistance to external (international) pressure for change and the inherent clientism of the neopatrimonial system means the drive for and ownership of reform has rarely come from within (Hobley 1996, Blaikie 2003). Forestry Departments in the miombo are traditionally growers of plantation (large or small) and protectors of state forest reserves. Capacity for revenue collection is often weak, rent seeking is a problem. In Malawi for example, as charcoal is moved from point of production to the markets, traders incur costs that amount to private taxation by public officials. These officials include people on duty at roadblocks, Traffic Police and the Police 997 Emergency Service. Kambewa et al (2007) has found that such bribes account for 12-20% of the final price of charcoal.

In other countries (such as Ghana and Cameroon where forestry represents a significant economic contribution) GBS has been effectively used with benchmarks that trigger payments to influence the way the state forestry institutions reform themselves. Because the influence can be made through the central budget ministries, the potential for facilitating change is enhanced (World Bank 2007d).

36.1.7 Intervention options

The proposed options are based on the need to mainstream forestry into development planning at both local and national levels and the need to safeguard the safety net value of the miombo for the poorest. A lesson from the literature is that getting forestry into PRSPs isn't necessarily about getting forest policies/strategies into macro-planning but making sure that the policies/processes that are in there work together to eliminate the barriers for forestry to work for the poor. The options for intervention include to:

- Work with decentralised government to generate the local evidence base that aids in understanding:
 - The role of miombo in the needs of the poor, the trade-off risks for implementing new development interventions.
 - The services and resources required to secure the basic needs, and build on the current benefits miombo generates.
- Use the evidence generated to strengthen the empirical base of advocacy organisations that tackle livelihood vulnerability or rural development.
- Make sure Miombo is recognised as a safety net and managed as such and incorporated into Risk and Vulnerability planning through Social Welfare departments; don't keep it to

‘forestry’. This function is particularly relevant during or after conflict when other means (such as agriculture) are not in place.

- Feed the local evidence base into upstream analyses so that PRSPs and MDDBS processes (CSP, CAS) consider the dynamic poverty-forestry relationship in plan design.
- PRSP Monitoring should include benchmarks/ indicators that monitor key drivers of the vulnerability-forestry relation.
- Recognise that it is not (only) forestry policies, it is about the way the landscapes/arenas/actors interact to affect how the poor relate to miombo.
- Map civil society in relation to poverty and forestry as part of the upstream analysis – to understand its potential for raising the profile of forestry in national development planning.
- Making sure institutions responsible for miombo management work together: e.g. that agriculture does not introduce new tobacco varieties that demand large volumes of wood or result in new woodland clearances that impact negatively on the access and use of forests by the poorest.

36.2 Resource rights are shifting to local people, but

36.2.1 The problem

The ongoing trend in public sector reform is towards decentralisation of service delivery, with national agencies focusing on their policy and oversight functions and the strengthening of civil society capacity to support and monitor (Ribot 2004, World Bank 2007d). Rural resource rights are shifting to local people, often not as individuals but in terms of communities or user groups (ibid). In many cases, laws regarding land or resource ownership or the rights to benefit from them, have not kept pace with this change, resulting in people being handed responsibilities without rights or resources to carry them out (Arnold 2001). Without sufficient institutional support to strengthen local institutions to cope with their increased role, they lack organisation to manage their legal jurisdiction and promote development, and risk becoming dominated by elite who capture what value there is in the resource they are responsible for (Campbell et al 2007).

It is suggested here that this does not demand a forestry response per se: the use of community institutions for supporting policy implementation is an issue for most rural sectors (e.g. agriculture, wildlife, health, water resources) and as such should be organised through the local government institutions responsible for integrated implementation and for coordinating sector interventions in any given area. In Tanzania this is the village, and Wily (2001) notes that this legal recognition has empowered the village to successfully establish its accountability over its jurisdiction in many cases. This reform of forest tenure is the other main success factor that is brought out through the literature as key to effective decentralisation, particularly in the assigning of rights and responsibilities from the state to communities.

36.2.2 Decentralisation: part of the problem or part of the solution?

Opinion is divided as to whether decentralisation of control and management of natural resources will lead to a more efficient, equitable and sustainable resource use (Box 4 presents some observations about the issue). The right national and locally specific conditions are required for it to stick successfully. Ribot (2002, 2004) outlines a set of conditions that need to exist or be

established to enable decentralisation to occur in a way that is beneficial to the management of natural resources (Box 5).

As can be seen even from the brief observations in Box 5, many of these conditions are often just not in place. However, the process, sequencing or phasing of decentralisation also seems to be important (cf Ellis et al 2002, Cross & Kutengule 2002 for Malawi). A step wise approach may then be taken to iteratively pass along the continuum of decentralisation. Cross & Kutengule 2002 state that the first step has to be enfranchisement and empowerment at the grassroots, arguing that it is this which has to drive the administrative reforms of state machinery, not the reverse process.

Fiscal decentralisation (not mentioned by Ribot – Table 4) is identified by a range of commentators (Hobley 2996, Ellis et al 2002, Cross & Kutengule 2002, James et al 2002, Smoke 2000) as a final step, but remains contentious in terms of its impact, as giving additional resources to sub-national governments that are not politically, managerially and technically prepared to use them responsibly can create enormous problems (Smoke *ibid.*). Generally, rural Africa has very low levels of local revenue raising and the provision of tax raising powers to local government threatens to impose severe burdens on the relatively small monetized economy in rural areas (Ellis et al 2002, James et al 2002).

Box 4: Potential Risks from Decentralisation: Opinions from the literature

“... Superimposed on the precarious status of rural livelihoods comes the advent of decentralised local government with its idealised projection of participatory processes in communities enforcing good governance on the part of district assemblies, and effective service delivery by public agents at local levels. In the Malawi context, it is difficult to see how this can do anything other than make things more difficult for rural poverty reduction.” (Ellis et al 2002).

“... Whilst in principle decentralisation [in Malawi] is desirable, the prerequisites for making this work are absent. Decentralization, as currently undertaken, is unlikely to succeed because it is misconceived - or, at best, that it has been misphased. Current policies seek to ‘reform’ public sector institutions and behavioural norms based on a notion that the state is failing because of a reversion to a lingering ‘traditionalism’, and that the political class has been insufficiently diligent in pursuing their often proclaimed goals of the effective construction of a Western type of multi-party democracy” (Chabal, 1998)

“... Arguments advanced in favour of decentralization [in Malawi] are that it promotes better service delivery and more efficient government; promotes political stability; and assists in interjurisdictional and other forms of equity. In theory, yes. But the prerequisites are that local government is both more capable and more constrained in its patrimonial instincts than central government; that the promotion of local political party bases is not viewed as a threat by the centre; and that imbalances at both the meso- (rich districts subsidising poorer ones) and microlevels (affirmative action for women) are genuinely addressed. These pose major difficulties.” (Cross & Kutengule 2002)

“... A sense of realism about the limitations of decentralised local government [in Tanzania] and its place in the wider policy space is needed. Significant capacity, accountability and resource constraints are identified, which may limit the degree to which the decentralisation process will achieve the goal of meaningful participation. In addition to the challenge of ensuring quality local staff and politicians in remote districts, much will depend on the degree to which officials and politicians are downwardly accountable to their constituents. In many cases a culture of disinformation exists which is not conducive to successful local government. A shift in the values of rural citizens away from the expectation of ‘development from above’ toward a greater sense of ownership and active citizenship is required.” (James et al 2002)

Domination of decentralised institutions by the ‘Elite’, often considered a barrier to local involvement, may not always be a bad thing noted Ribot (2004). In neo-patrimonial societies such as Zambia, Zimbabwe or Malawi, the power and role of traditional authorities remains strong in social organisation and cohesion, and the traditional authority system managed to negotiate sufficient space to retain their legitimacy with the people through the political changes (Maliro 2001). It can be argued that this is less so in Tanzania where strong social engineering re-ordered the rural economy in the 1970s. Olowu (2001, 57 in: Ribot 2004) reminds us that the local elite are required for the success of local government systems - they bring resources, knowledge [and] networks that make these systems become fully operational and effective. Ribot (2004) also argues that elite capture does not necessarily mean that all of the benefits of a reform go to the elite. Evidence from Mansuri and Rao (2003) suggests that the poor are also likely to benefit.

However, the more unequal the society, particularly when members of the elite concentrate their powers, the less effective are efforts to target the poor. Improving governance at the local level can deter elite capture, by making local leaders down and up accountable. A thicker web of reporting and accountability relationships backed up by simple regulations, checks and balances will help. The role of NGOs in holding actors to account has been debated (e.g. Carothers 1999)

and in a decentralised context, it is vital that there is a three way relationship, between the NGOs and both local, and, central governments.

36.2.3 Strengthening civil society organisations

Hobley (2006) makes a case for enhancing the participation of the poor in existing political and associational institutions rather than setting up new, sectoral ones. She argues that civil society can play a key role in supporting the poor to do this. Hussein (1999) similarly notes that farmer participation in research and development delivers policies and technologies more relevant to their needs, and in this way farmer institutions can emerge as service providers for their members. Bukula & Memani (2006) argue that these groups can be particularly helpful when developing small forest-based enterprises (discussed further under 3.3) where there is often a need for processing, marketing and technical inputs that are scale dependent.

Organisation through such civil society groups can, in part, address the limited opportunity or resources the poor have to sustain participation in processes that may otherwise be captured by elites. “It is difficult for poorer people to maintain a high level of mobilisation even for issues that may profoundly affect their livelihoods. Starting with those interventions that focus on securing people’s livelihoods and allow them to move beyond sometimes coercive relationships based on patronage but which provide immediate security to those where they have a degree of independence from patronage systems will help to develop a more effective capability to participate in decision-making processes” (Hobley 2006: 33).

36.2.4 Forest tenure reform

Ribot (2002) refers to the transfer of powers as secure rights not as privileges. Certainly whilst

Box 5: Conditions for successful decentralization

For successful decentralisation of natural resource management, the following conditions are a prerequisite:

- *Elected and accountable local governments*
- *A set of environmental subsidiarity principles to guide the transfer of appropriate and sufficient powers to local authorities.*
- *An effective separation and balance of executive, legislative, and judiciary powers in the local arena.*
- *The transfer of powers as secure rights not as privileges*
- *Support for equity and justice, through central government intervention if necessary.*
- *The establishment of the enabling legal environment for organizing, representation, rights, and recourse so that local people can demand government responsibility, equity, and justice for themselves.*
- *Minimum environmental standards established that can facilitate ecologically sound independent local decision making.*
- *Fair and accessible adjudication and local dispute resolution mechanisms.*
- *Local civic education of peoples rights, including educating local authorities of their rights and responsibilities to foster responsible local governance.*
- *To develop indicators for monitoring and evaluating decentralization and its outcomes and provide feedback*

Source: Ribot 2002

responsibilities are often transferred, the [central] State often retains allocatory powers and revenues over more valuable forest areas (Hobley 2006, Chomitz et al 2007) and in the miombo region, regulatory provisions for use and access of centrally-controlled state reserves are considerably higher than for customary land forests. Local governments are rarely involved in these arrangements. Hobley (2006) makes the point that current customary land tenures that grant usufruct rights over land can be exploited by new elites if the value of certain forest products rises, or in some cases is monetised. Blaikie (2003) argues that increasing community rights over miombo threatens control of resources hitherto controlled by political elites, especially when land tenure reform is on the CBNRM agenda but also that the flow of patrimony from local sources, via chiefs and other local leaders to the centre, is potentially interrupted, allowing new political [rent-seeking] entrepreneurs to enter at the local level. This has particularly serious implications for women's land and resource rights and those of the poor (Tsikata 2003 in: Hobley 2006). Tsikata (ibid) argues here that the central government has a role even in decentralized forest situations, to protect the rights of the chronically poor through legal and policy provisions (the "support for equity and justice..." condition from Box 5).

36.2.5 Implementation options

Effective local institution can only be built from the bottom up, albeit within an effective supportive environment (such as legislative reform or support to law enforcement). The balance of responsibilities, powers and resources at each level of government needs to be sufficient to allow it to implement its mandate. This goes for devolution to community institutions: the group most unlikely to have the technical management and marketing skills (and possible financial resources) required to manage the forest resource and the group most susceptible to outside influences. Even when resource rights and responsibilities are clear, decentralisation risks the externalising of risks or liabilities to local people.

Issues of local institutional development in the context of decentralisation are cross-sectoral: to ensure they are not marginalised they could be brought in at indicator level in the PRS and CAS processes so that they are monitored. Evidence of tangible results related to decentralisation, capacity (e.g. evidenced by local integrated development plan implementation), legal reform, may be cross referenced to those on forest cover or forest law enforcement. The options for intervention include to:

- Ensure decentralisation of forest management is undertaken sequentially and with consideration of the local conditions. Consider implications of fiscal decentralisation for income generation from miombo and the rent-seeking 'value chain'.
- Ensure local government has greater downwards accountability (to the citizens) and local legitimacy
- Decentralisation/Devolution needs to be the whole 'package': rights, responsibilities, capacity (and resources) and recognise that support will be needed to facilitate delivery of the responsibilities.
- Strengthen the voice of the poor
 - This does not necessarily mean through local 'forestry' institutions, which may be the structural problem

- Examine local (new/indigenous) institutions: are they reinforcing structural poverty; ensuring local institutions are legitimate, but, enabling.
- Enable access for the poor to the right information,
- Constituency representation through stronger parliament and CSOs,
- Government and/or civil society providing effective watchdog of local elites
- Effective legal and regulatory back-up from support agencies (state/CSO) for local institutions to manage their responsibility
 - Land and complementary resource rights secured
 - Legal capacity to establish locally relevant rules
- Establish simple regulatory frameworks or requirements retention in scale with the resource capacity and its value. [Miombo has little high value timber – it is a low value woodland (financially) with important subsistence value, which has low intensities of management applied (fire/fuel management, coppice management)]
 - Management planning, licensing requirements
 - Manage benefit sharing, revenue generation and retention and be aware that benefit sharing mechanisms in the miombo states will attract ‘rent-seeking entrepreneurs’.

36.3 New integrated conservation-development markets are expanding and emerging but ...

36.3.1 The problem

There are new market opportunities emerging for products and services from the miombo, but there remains limited financial or technical support for forest enterprise development.

Traditional products suffer low margins and transaction costs often make their commercial viability marginal. Ecotourism and NTFPs can motivate conservation and raise incomes but is difficult to maintain such IGAs in the long-term. Also creating alternative livelihoods outside of forests does not mean reducing pressure on forests (Chomitz 2007).

Domestic private sector participation is influenced strongly by political stability, macroeconomic policies, political attitudes to foreign direct investment/ involvement of the private sector, levels of savings, and domestic market factors. With decentralisation, tax raising powers developed by district/local governments to raise operational funds create potential disincentives to rural investment. Ellis et al (2002) quote the example of Uganda where not only does local tax revenue impose punitive burdens on monetised activity in rural areas, it is also almost wholly utilised on sitting allowances for councillors and other functionaries rather than providing locally specific services to rural citizens. Given that the miombo-based enterprises are primarily small, itinerant and seasonal (for rural households agricultural production remains, by and large, the mainstay of the rural economy) revenue collection may be difficult to do effectively.

36.3.2 New investment opportunities for miombo

Overall, private sector investment into forestry is substantial and growing. In 2003 private sector forestry investment in developing countries and countries in transition accounted for circa US\$15 billion – 9 times ODA flows whilst the forest and forest products industries generated an annual production of c. US\$750 billion (World Bank 2007d).

Whilst much of this is commercial investment, NGOs and other bodies are also investing, the latter often involved in conservation related activities and small and medium enterprise development. In fact, conservation activities appear to have greatest potential access to innovative finance (Table 5), but many other SFM related activities can also benefit from such mechanisms (UNDP 1999).

The World Bank strategy (2004c) recognises the potential of partnerships with the private sector and engagement with responsible investors. It notes the importance at a national level of good governance whilst Chomitz et al (2007) adds the need for incentivisation at the local level: a good system with incentives is more effective than narrow a regulatory approach (WB 2003). Creating the right environment requires certain policy and market interventions: whilst this will inevitably vary between country and sub-sector, some common policy issues emerge (Chomitz et al 2007, World Bank 2003, 2004c, 2007d, UNDP 1999, Karsenty 2000):

- Policy reform can help reduce and/or make equitable transaction costs, and create the legal space for certain types of investments to operate or markets to become viable.
- Institutional or governance reform can improve transparency in decision-making processes, in law enforcement, in land and resource ownership and tenure; through establishment of credible standards and monitoring systems, can improve accountability.
- As part of trade reform, fiscal and trade policies can be revised to improve forest revenue collection, increase rent capture and ensure benefits are effectively distributed; to establish systems and processes for the financing of or payment for environmental services.
- Conservationist practices can be rewarded through market-oriented certification instruments, although the degree of penetration this offers is often market-limited.

Table 5: Innovative Financing Mechanisms for Sustainable Forest Management

Mechanism	Type	SFM Barrier Addressed	Main sources	Main recipients	Timing	Likely Scale
Portfolio Equity Instruments	Direct financial: equity	Operational (lack of local capital)	Private commercial	Private commercial	Late stage	Global National
Public Private Instruments	Direct financial: equity, debt	Operational (lack of capital, risk)	Public Private commercial	Public Private commercial	Early stage Mid stages	Global National Local
Private Sector Forestry Investment Funds	Direct financial: equity, debt	Operational (lack of capital flows into new investment areas)	Private commercial (public)	Private commercial	Mid stage Late stage	Global National
National Environmental Funds	Direct financial: grants, concessional credit	Operational (potential for structural)	Public Private commercial	Public Private commercial and non-commercial	Early stage Mid stage Late stage	Sub-regional National Local
Debt-for-nature and development swaps	Direct financial: transfer payment	Operational (structural can be included in conditionalities)	Public (bilateral) Private commercial	Debtor government NGOs	Mid-stage Late stage	National Local (site specific)

Table 5: Innovative Financing Mechanisms for Sustainable Forest Management

Mechanism	Type	SFM Barrier Addressed	Main sources	Main recipients	Timing	Likely Scale
Conservation trust funds	Direct financial: transfer payments, concessional credit	Operational (potential for structural)	Public Private	Government agencies, NGOs, CBOs	Early stage Mid stage Late stage	Local Sub-regional
Biodiversity venture capital finds	Direct financial: equity, debt	Operational (risk reduction)	Public Private commercial and on-commercial	SMEs in biodiversity-based businesses	Early stage Mid stage	Global National Regional
Small and medium scale enterprise credit lines	Direct financing: concessional loans	Operational (access to capital)	Public Private	SMEs	Structural (early/mid/late stages)	National Local
Micro-credit	Direct financial: grant concessional loan	Operational (Access to capital; risk) Structural (inadequate financial institutions in rural areas)	Public ODA & locally generated private savings	Private small scale farmers and other land owners	Early stage	Local
Small Targeted Grants	Operational		Public Private (mostly non-commercial)	NGOs, CBOs, communities, research groups	Early stage Mid stage	Local
Bioprospecting fees	Commoditisation: creating meaning for biodiversity use value	Structural (market creation)	Private commercial Some public research bodies	Non-commercial private land-owners and forest users. Some public bodies	Structural (early/ mid/ late stage)	Global
Water Resource Use charges	Commoditisation	Structural (market creation)	Private and public water users	Upstream land owners	Structural (early/ mid/ late stages)	Sub-regional Local
Tradeable development rights	Commoditisation	Structural (legal and policy)	Public Private non-commercial	Private commercial Private non-commercial	Structural (early/ mid/ late stages)	Global National
Marketable forest protection and management obligations	Commoditisation	Structural	Public (possibly private)	Governments with large forests and small protection obligations	Structural (early/ mid/ late stages)	Global
National Forest Funds	Structural (though can be direct financial through targeted payments)	Structural Operational (risk reduction, SFM costs)	Internally generated income ODA grants	Government forest departments Private farmers and land owners	Early stage Mid stage Late stage	National Local
Environmental Performance bonds	Direct financial: incentive for good environmental performance	Structural (high discount rates, high opportunity costs of SFM)	Large private commercial operators	Public sector	Early stage (payment) Late stage (payback)	National Local

Source: UNDP 1999 Annex 4

There is clearly a role for both the public and private sectors, in a range of sectors outside of, but related to, forestry as well as forestry itself. Fiscal, legal and market policy reforms will

influence the role the private sector can play in strengthening miombo management and use by the poor.

There are opportunities for policy to facilitate new modes of partnership between public and private sectors (Table 5) and to support, underwrite or regulate the use of novel financing arrangements that support both national and local initiatives.

36.3.3 Institutional options for forest-based enterprises

The multitude of institutional options available and the parameters regarding their appropriateness for various business development situations, can be roughly separated into four categories:

Those that operate at **community/ village level** as the primary business unit for collection and/ or income distribution. These primary business units are normally associations, cooperatives, local partnerships or companies. Often the main determinant of structure is that form of incorporation that requires the least effort to get a collective bank account opened. However structures that facilitate efficiency, democracy, identification at communal level and transparency in their operation are more important. Some countries have simplified procedures to facilitate a communal “business group” to become incorporated.

Those that operate as a **post harvest, primary storage, processing, forwarding and selling organisation**. Such an organisation can again be an associations, cooperative, partnership or company. They can either be wholly communally owned, or joint ventures with tertiary level organisations. The main distinguishing feature is that they are local intermediaries in the collection/ post harvest/ selling activities and frequently have little control over the added value processing and marketing activities.

Tertiary level organisations that operate with market orientation. This level of institution should understand the importance of meeting/supplying a market need and understands the mix of business ingredients to make this happen. Frequently this means a company structure. Ownership will normally be a mix of the above mentioned intermediaries and primary business units, the in-country private sector, overseas investors, NGOs, and possibly state owned business units.

Service level organisations. This is a more diverse grouping, including private sector business facilitators, government extension services, financing organisations, overseas development assistance agencies, NGOs, legal/ accounting/ technical/ training service providers etc.

The overriding objective when discussing institutions, is to create an enabling environment to encourage the private sector to invest in business development for the opportunities presented. Investment in institutional analysis and development is normally part of the business planning function for each individual opportunity. The wide range of differing institutional factors surrounding each opportunity is beyond the scope of this paper. There is however a generic investment need both at a country or regional level to:

- Research, analyse and document a selection of past economic activities relating to miombo woodlands to identify the critical business success (or failure) features relating individual activities
- Identify and document within each miombo country (and also regionally for those providers that operate regionally) where the most suitable mix of miombo related business extension assistance services are located.
- Recommend capacity building investments to overcome “missing links” in the business development process for miombo related economic opportunities. This could include a wide range of activities, including possibly: selected product market studies, selected product resource availability surveys, subsidised business plan preparation services, capacity building of relevant government/ quasi-government and private extension services, capacity building for miombo related business plan preparation, a contestable fund for business planning/ business establishment, and management training.

The challenges facing the small investor or entrepreneur in the miombo are technical and specific on the one hand (related to the low inherent productivity of the system) but also cross-sectoral and generic to many small enterprises on the other. Sub-national planning and influence may be the tactic to use to draw issues of developing sustainable forest enterprises into national budget processes.

36.3.4 Non-timber forest products

Although many miombo-related income generating activities are just that – a livelihood activity to generate income for livelihoods needs – there are some traditional uses that are more viable enterprises: the non timber forest products honey, mushrooms and wildlife being the main products that represent commercial potential. The challenges for commercialising NTFP demonstrate the institutional and management complexities involved in the miombo. Challenges for commercialising NTFP are typically (summarised from Belcher & Schreckenberg 2007):

- Production is often dispersed and markets poorly developed
- Markets are diverse and faddish, but product development is long
- Volumes are typically small
- There are frequent misunderstandings about the level of technology required to get NTFPs to market
- Barriers to entry may be high, when the product development costs are taken into account. Barriers are particularly stringent for food and herbal or medicinal products. Very few low-income countries have the high degree of infrastructural and institutional development, to implement and maintain the strict quality control and sophisticated supply-chain management practices necessary to enter the international market with a new product.
- Certification is a mixed blessing in that it requires a high level of organisation and technical sophistication from producers, especially with regard to management planning, monitoring, product tracing and marketing
- There are often intellectual property rights issues.

Box 6: Constraints holding back Zambia's beekeeping industry

Zambia's miombo-based honey industry has tremendous potential. A number of constraints through are preventing its further development. These include:

- *Conflict over land access between honey producers and loggers, with the latter seeming to have more rights than the beekeepers*
- *Limited resource base due to existing laws that define honey and beeswax as minor forest products and restrict beekeeping to forests outside national forests*
- *Lack of monitoring and regulation of beekeepers by the Forestry Department due to financial and human resource constraints*
- *Absence of accurate industry data in such areas as production levels, output and marketed volume*
- *Inadequate support for organic certification, which is central to achieving premium export prices, a better and healthier product and better forest management*
- *Uncoordinated industry regulation by different government agencies who oversee various aspects of honey production (e.g. beekeeping as a commercial activity, bees as live animals, honey as a food item etc.).*

Source: www.cifor.cgiar.org/Publications/Corporate/NewsOnline/NewsOnline39/honey.htm

Box 6 provides the case of Honey in Zambia and the constraints broadly echo the generic points above.

36.3.5 Tourism

Tourism is rapidly growing in Africa (ODI 2006b) and is also a growing source of revenue for governments. Southern and Eastern Africa's wildlife-related tourism has benefited from the greatest share of that growth. Often the departments of forestry and environment or tourism are in separate Ministries but have overlapping mandates (see Table 2) in terms of managing a country's forest and woodland resource so although revenues may not always benefit public forestry departments, support for forest-dependent households can be significant, although often localised. It of course depends on the nature of the intervention (ibid.) but new modalities of tourism that strengthen linkage between operators and local economic development households can generate benefit through employment, institutional development, profit or related income share (ibid.).

Tourism is no panacea (see Box 7 for a case from Malawi) and the potential for community benefits depend on the wider conditions for pro-poor growth (Ashley 2006).

- Growth is more likely to be broad-based and involve the poor if they have decent education and training, health care, access to infrastructure and market information, and do not face too many barriers to entrepreneurship.
- The literature on 'pro poor growth' identifies many factors that can make growth (in any sector) less broad-based and inclusive of the poor, including macro instability, low human resources, inadequate infrastructure, asset inequality, gender inequality, and insecurity.¹
- Interventions to increase the human capital of the poor can have a dramatic influence on their ability to participate in the mainstream economy.

36.3.6 Payment for environmental services

The main (forest) environmental services with potential for financing are watershed protection, biodiversity conservation and carbon sequestration. There needs to be a demand, nationally, or internationally for that service and a land-holder that has the rights to modify or cut trees who may be incentivised not to (Chomitz et al 2007). Logistically, it should be possible to cost effectively collect the funds, make payments and monitor compliance with conditions for payment and it must be clear, who is eligible for how much and under what conditions (ibid.). WWF lists three steps for proceeding with a PES scheme:

- First, an assessment of the range of ecosystem services that flow from a particular area, and who they benefit
- Second, an estimate of the economic value of these benefits to the different groups of people
- And third, a policy, subsidy, or market to capture this value and reward landowners for conserving the source of the ecosystem services.

Sanders (2006) raises the following lessons from initial PES transactions that it has had involvement in:

- One size does not fit all
- Identify the services being provided clearly
- Understand and document the links between forests and services
- Begin from the demand side, not the supply side
- Monitor effectiveness
- Design flexible mechanisms
- PES is not a universal solution
- Ensure the poor can participate through the planned delivery mechanisms

There are already instances of PES from miombo forests in Mozambique and Zimbabwe (Hegde 2007). There are many schemes operating worldwide, with either internal government funding (e.g. Vietnam for forest protection) or external donor assistance (Indonesia, Central America, China, Venezuela).

Financing for many environmental services is likely to be international, so regional policy interventions are likely to focus on governance issues such as creating credible international standards (World Bank 2007d), monitoring and information management (Chomitz et al 2007). The importance of national policy should not be played down however. The State itself may be a buyer, or provider, of ecosystem services, but it also needs to ensure the appropriate regulatory conditions are in place (Ravnborg et al 2007:26) to enable:

- The legal recognition of private PES arrangements
- The regulation of the participation of intermediaries; and
- The legal arbitration in cases where external parties wish to criticise a PES arrangement.

There is reportedly limited evidence at this stage of the impact of PES on reducing household vulnerability. The focus has been on the scheme (Ravnborg et al 2007) and Hegde (2007) reports

Box 7: Lessons from nature-based tourism in Malawi

Tourism contributes widely towards the costs of managing protected areas. The Integrated Conservation and Development (ICD) approach builds on the protected area approach by linking conservation and tourism development and by involving the people living in or near protected areas.

However, experience in Malawi shows that while tourism can generate significant revenues, this does not always benefit local communities directly. Liwonde National Park (LNP) is one of Malawi's smaller parks, high in biodiversity and popular among tourists. However, local communities forced to relocate outside the park still experience conflicts with park authorities regarding 'problem animals', such as elephants, which destroy their crops and pose a life threat to community members. The Department of National Parks and Wildlife (DNPW) aims to make Liwonde an example of 'best practice' for protecting the biodiversity of Malawi, whilst ensuring its sustainability through tourist revenues.

Research has found:

- *While tourism has brought in revenue, the park only retains enough to cover operating costs, with the rest going to the government.*
- *Tourism employs 77 people in park lodges and a few small local enterprises. Besides this, there is little local economic impact from tourism.*
- *Local people resent the lack of employment opportunities, which they consider necessary since they can no longer rely on natural resources from the park. While tourism has supported conservation, it has not brought much development locally. The DNPW is looking at ways to generate more benefits and reduce poaching.*

Lessons drawn out are that:

- *Revenues must be shared fairly, encouraging entrepreneurial development and discouraging poaching. The DNPW has been granted permission to split total park revenues between the LNP and the local communities, but nothing has happened so far.*
- *Village Natural Resource Management Committees have been formed, but the lack of empowerment and human resource development among park officials and local people undermines the involvement of key individuals.*
- *Further research should assess community attitudes, particularly after the implementation of the scheme to share tourism revenues.*

Source: IDS 2007

that in the case of Mozambique, payments have reduced the need for forest use as an income generating option.

36.3.7 Carbon and avoided deforestation

Carbon has been pulled out as a specific PES case due to its particular relevance to the forest context and the reported high applicability (Chomitz et al 2007) of payments for avoided deforestation.

The role of forestry in the international market in green house gas emissions is still marginal (Karsenty 2000): the establishment costs, offset assessment complexities, risks of leakage and forest loss and current carbon values – particularly in the voluntary market – give it marginal value (ibid.). Whilst low productivity presents an economic barrier to technical management (Table 1) the scale of miombo coverage (Table 2) and the impact of good management (such as fire management) mean that it has great potential. The voluntary offset market is already using carbon offsetting to co-fund improved miombo management and community utilisation (e.g.

Envirotrade in Nhambita, www.envirotrade.co.uk) but at this stage it remains largely outside the compliance market defined by existing Kyoto Protocol mechanisms, although recent government discussions in Bali have resolved to include forest conservation in future discussions on a new global warming treaty.

Systems based on the 'compensated reduction' approach are apparently among the most favoured as they would allow avoided deforestation to be incorporated into the CDM market mechanisms (Peskett et al 2006). Should avoided deforestation fall under the Kyoto Protocol mechanisms in due course; measurement, monitoring and management will still remain challenging: without defining deforestation and understanding the multiple causes, the distribution of payments and the likely impact of such incentives on deforestation will be complex to calculate.

What does still need to be considered is that enhancing woodland conservation through these new instruments has a trade off by reducing the access the poorest have to miombo for subsistence and commercial use, even if that access is currently leading to resource degradation in the short term. Such instruments would have to be accompanied by interventions that enable rural households to realise their subsistence needs.

36.3.8 Concessional loan finance and livelihoods

Access to concessional lending is seen as virtually essential if communities are to be actively involved either as primary level collectors/ processors or as partners in miombo forestry related business opportunities. Typically concessional lending will be through either a domestic development financing institutions (DFIs) or a micro – finance scheme. For communal resource and communal borrowing situations, some kind of cooperative guarantee arrangement among borrowers is normally necessary to improve credit availability and assure repayments. The micro-finance schemes that have been most successful in Africa have not been those that focus on productive credit, but those that begin with savings (Grant & Allen 2002). From the perspective of the poor, savings are usually more important than credit: Credit increases risk while savings reduces it (ibid.). Since the poor are risk averse, they have greater demand for savings services than for credit. Evidence from Tanzania supports this: in a study of six microfinance schemes Wild, Millinga & Robinson (2008 in prep) found that village savings and loan schemes have proved more successful than financial services associations or savings and credit cooperative societies. These schemes can be undertaken as part of an intervention to support improved forest management and household livelihoods.

Support for development financing/ micro-finance institutions is therefore an important part of the investment package to support miombo forestry related business opportunities. Such support for communal business opportunity lending is invariably more costly in terms of specialised staff time and risks for the institutions involved. The Tanzania example shows how savings schemes linked to forest conservation can improve financial, natural and social assets for the poor. The value added by micro-finance is strengthened when linked to other interventions aimed at improving people sustainable use of resources.

36.3.9 Intervention options

When scaled up to reflect national contributions, the value of miombo to national economies can be impressive (e.g. Jumbe et al 2007). The value of miombo at a household level whilst significant (e.g. Hegde 2007, Bwalya 2007) in terms of actual monetary income generation potential, it is limited. One has to be realistic what monetary benefits can be derived from miombo by individual households: there are ecological limits to production in the natural (in situ) context. Most woodland derived enterprises are likely to be small and part of the miombo's safety net function. In any commercialisation intervention, trade-off risks for the poorest should be considered: the poorest, whose low-risk low-return practices disincentivise entrepreneurial behaviour are the least likely to be involved in commercialisation interventions except as passive participants.

This is no reason not to invest in miombo enterprise: it may require thinking about enterprises differently – small forestry enterprises are numerous but require different support to traditional large scale enterprise, as the objectives are different (e.g. social and financial capital as opposed to economic growth). We should also recognise, argue Mayers & McQueen (2007), that small forestry enterprises work for local development – when rights and policy are favourable. If we serious about forestry for local development we need to turn much forestry governance on its head – and stop rigging the rules in favour of large scale. We should focus new financial instruments on small forestry enterprises and invest in small forestry enterprise information, connection and capacity. Small forestry enterprises can benefit the poor and the forest (ibid) as:

- Wealth accrues locally
- Conflicts due to external resource appropriation are reduced – decisions are made close to home
- Entrepreneurship spreads – ideas move through face-to-face contact
- Service networks develop – through local multiplier effects
- Cultural identity / niche markets are catered for – with products of local relevance
- Local environmental accountability is strengthened – e.g. in patchwork landscapes smallholder producers are more accountable to each other for their actions linked to forest resources

Nevertheless, not everyone is going to want to be a rural micro-entrepreneur – some people just want to have a job. It is the elite that are likely to be at the forefront and the trade offs for the poor (and their subsistence-related risk strategies that rely on woodland access and use) needs to be appraised and their basic needs secured.

More work is needed to identify the viability of potential products and markets for up-scaling [e.g. poles, wildlife, wood energy, carbon and PES]. Where a potential is identified, there will be need to support forestry to engage with the finance and trade ministries to identify and implement appropriate enabling conditions for the development of the forest produce market. Development policy dialogue, focused in the agencies of state finance, can facilitate engagement on such issues. Options for intervention include:

- Supporting producer organisation (e.g. producer cooperatives) to improve economies of scale, marketing and price negotiation. Evidence suggests (e.g. Bukula & Memani 2006) that the key to making small forest enterprises work is the development of effective alliances, confederations, cooperatives and associations:
- Promoting community-private sector linkages particularly for local processing or value addition. Using appropriate modalities donors could support technical advice on specialist processing technologies or niche markets, standards development processes, and support for building local certification and verification capacity.
- Increasing private sector financing (both domestic and foreign) by “selling” forestry opportunities as investment options that are viable and competitive with other opportunities.
- To support the identification of investment need related to financing miombo related business analysis of the existing development financing/ micro-financing institutions, and the “missing links” in the business finance process for miombo related economic opportunities will be needed. This is most likely to result in a recommendation for subsidised assistance packages (with designated “miombo related funding”) to selected DFIs/ NGOs and micro-finance institutions.

The lack of credit terms that meet the cash-flow requirements of forestry investments (particularly long term tree planting) is a problem worldwide and results in the lack of interest in forestry investment by private landowners in both developing and developed countries (Arnold 2001). Options to gain the confidence of the business community, and enhance its strategies for generating interest in forestry investment (Joshi 1998) include:

- modifying traditional biases against forestry investment and credits;
- increasing private returns through financial subsidies and public technical assistance;
- reducing investment risk and uncertainty; and
- eliminating or significantly reducing the cash flow problems associated with long planting and gestation periods. While the first strategy is critical for domestic, mostly local small landowners, the other three are common to both domestic and foreign private investors.
- At the household level, other credit options need to be applied:
- Using low risk forms of micro-financing (not credit, but saving schemes) to generate capital for enterprises. Savings schemes provide a low-risk entry point for the poor to access resources for alternative livelihoods. This may require facilitating engagement between governments and finance institutions.
- At the micro level, there may be need to support the establishment of and over see the running of credit and saving schemes designed to grow financial resources at low risk levels.
- Focus new financial instruments on small forestry enterprises and invest in small forestry enterprise information, connection and capacity.

Payments for environmental services (PES) provides another valuable route to monetising rural communities fortunate enough to own resources important for ecosystem functioning. PES does have possible negative trade-offs for the poorest:

- Requires secure land tenure – poorest often have no access to land
- PES funds when coming in to a ‘community’ risk capture just as with other benefit sharing

- PES places traditional conservationist (often INGOs) and developmentalist (often donors) paradigms on either side of the forest fence.

The investment opportunity to expand the use of PES in relation to miombo forests will present similar issues to those facing more traditional enterprises. Obviously the size, variability and wide range of differing community situations involved in and around miombo forests, will mean careful identification and prioritisation of opportunities that have both the potential for the greatest environmental gains, plus the potential to interest beneficiaries with a willingness to finance environmental services. This could be facilitated by providing greater clarity on the potential financial benefits of environmental services and greater certainty regarding the associated markets.

One area little studied (judging by the information searched) is the relationship between remittances and reduced dependence on miombo. The role of remittances from urban (and mining) jobs in the Southern African rural economy is well documented (e.g. Crush Frayne & Grant 2006) and studies from Malawi (Abbot 1997, Kayambazinthu & Locke 2002) have found that such financial support reduced the vulnerability of the poorest and allowed them to adopt more risky coping strategies, such as investment in rural enterprises. The low monetisation of the rural economy, with little cash in circulation to promote enterprise development, getting cash into the rural economy is one way to kick-start rural enterprise development. The Malawi Social Action Fund (MASAF) and the public works schemes aim to do this and have had generally positive reviews (Booth et al 2006). That said, while urban to rural remittances has been the predominant direction of commodity and cash transfers, benefiting the rural household economy, this dynamic is changing, direct food transfers from rural households to urban households are on the rise as urban poverty increases in countries across the region (Crush Frayne & Grant 2006).

This study did not examine the potential new economic risks and opportunities to the poor brought about by the impact of the so-called BRIC countries on forestry trade. Such a study, in the context of miombo, is urgently required, although the impact is already documented for countries like Mozambique (e.g. Mackenzie 2006).

36.4 Miombo woodlands have low inherent productivity

At the policy level, there may be little direct response that can be taken to resolve issues of productivity. The dry woodlands exist on some of the poorest soils in Africa, previous attempts at 'improving' production, (for example the World Bank wood energy projects of the 1970s that replaced the miombo with wood energy plantations) have often resulted in failure. Obviously there are natural limits to production in a natural system and there is only so much silvicultural management can do to improve productivity (see Shackleton & Clarke 2007 for a comprehensive review of silvicultural options). If a particular plant-based product becomes commercially successful, ex-situ production may be the only viable route for increasing – and securing – production.

The rationale of bringing trees and associated miombo species out of the woodland into the farmland is in many parts of the biome, an oxymoron: the miombo is heavily influenced by man and is part of the agricultural mosaic of southern Africa: miombo trees in farmland will, in all likelihood become trees in woodland fallow at some point, even if only for a short period, and

even if regeneration only occurs after continuous cropping of 20 years (Robertson 1984). In farmlands converted to more intensive agricultural production agroforestry, tree crop plantations and scattered trees on farmland can potentially assist with poverty alleviation while conserving forests (World Bank 2007d). As part of the cross-sectoral nature of miombo management, agricultural policy should consider the role of trees on farms (they already do in terms of exotic fruit and nut trees of course). However, there are other ways to measure the forest's productivity than just its biomass:

- The miombo provides multiple benefits of subsistence and income value simultaneously, the profusion of fruits during the early rains is particularly valuable for the poorest as this is usually the time of greatest nutritional stress,
- It can be managed during the agricultural slack season so reducing the [opportunity] costs of its management,
- Management is simple: fire and grazing control are the two more important prescriptions and the woodland is very resilient,
- It is vast in extent, meaning only a small improvement in productivity can have a huge overall impact on total production.

From a policy perspective, management approaches that prescribe scientific management planning approaches usually developed for commercial or plantation-based forestry need to be debated and critiqued.

One can argue that the notion of community-based, or participatory forestry, based on sustainable natural resource management with communities that incorporating their indigenous knowledge into their management practices as largely meaningless. Sustainable NRM principles (as defined by rational and scientific criteria) are by definition seldom, if ever, community-constructed and yet local knowledge is embedded in particular environmental and social conditions and continuously negotiated on-site and face-to-face (Blaikie 2003). How one reconciles this inherent contradiction is key to the approach of community-based miombo management and the policy space to debate and question the established paradigm should be encouraged.

37 Conclusions

The paper has explored the conditions that constrain the use and management of miombo by the poor through a review of the debate around the barriers and opportunities identified by Campbell et al (2007). The review only referred to the inter-relatedness of the barriers and opportunities in passing: such an exploration was beyond the scope of this paper. The paper started by acknowledging the exposure of the poor to risks, and the dynamics of their coping responses whilst at the same time recognizing the impact the institutional landscape can have on their ability to cope. This means that:

- Policies responses should be flexible enough to be interpreted and deployed appropriately at a local level.
- Strategies need to recognise the need for long-term support to build local level capacity and effective local management.

- There is need for iterative approaches to supporting the miombo-poverty link that learns from evidence and experience.
- It is not necessarily about forestry and its institutions, but rather about how other institutions relate to forestry and its use by the poor.

In returning to the objectives of the review and the question of whether overcoming these barriers will lead to improvements in the sustainable livelihood benefits the poorest households gain from the miombo, we look at the outcomes of the review and analysis from perspectives.

37.1 Access, use and management

Securing access will require a clarification of land and resource tenure, policies and processes that secure and formalise that access, institutions that establish regulations and standards for resource use and delivery of appropriate inputs.

Effective management will require that roles and responsibilities of central and local government, and of the poor to be properly articulated and appropriate. The local specificities of access, use and management need the space to be interpreted. The institutions of management need not be forestry constructs where local organisation already exists and can be used in way that protects the use of miombo by the most vulnerable.

A system of checks and balances maintained by a strong central government function will also contribute to maintaining that social protection function.

37.2 Reducing livelihoods risk

The relationship between forestry and poverty is complex and cause-effect is dynamic, not Newtonian. People have dynamic livelihoods, their relationship with the woodlands depends on their relations with sectors other than forestry.

Understanding the important role of forests in reducing risk for poorest needs to be incorporated into the development process. Local livelihoods are context specific, but this some how needs to be brought up to the point that there can be cross-sectoral integration. This may be nationally or sub-nationally but, in a policy context, is at the point where budgets can be allocated and brought together.

At the national level, the PRS-GBS mechanisms can provide the framework and the structure for miombo to reduce the risk of unsustainable livelihoods. That coping strategies are a result of local context and history means that the framework and structure must allow for local interpretation (such as delivering income into a local area through opening market access without specifying what it should be used for).

37.3 Contributing to rural growth

Miombo woodlands present a limited opportunity for economic growth except in niche markets where investment in service delivery is commercially attractive. But they provide a valuable opportunity for small scale enterprise development and new techniques for production processing or marketing may raise incomes or reduce vulnerability to insecurities.

Given the spatial extent of the miombo, new economic and financing instruments related to payments for environmental services, biodiversity or carbon offsetting, hydrological services or catchment protection show potential but as yet little large scale impact. Design issues still need to be worked out (such as the structure of financing) and access and rights to the land and service for which payments being made must be clear and secure. The alternative, livelihood uses that the most vulnerable depend upon will need to be sustained.

37.4 Governance and institutions

Countries can benefit from development assistance if they have the right governance conditions in place so say Burnside & Dollar (2004) Seymour & Dubash (2000) World Bank (2005b). Countries with sound governance institutions, policies and political will, that have or are able to develop through reforms effective open processes, transparent and fair justice and fiscal systems, freedom of information for accountability and monitoring, political and popular will be those that can.

A thicker web of reporting and accountability relationships backed up by simple regulations, checks and balances will help, with civil society playing a key role in supporting both Government and the poor to do this.

The ownership of national development process, the recognition of weaknesses and a commitment to driving through the changes that will lead to miombo providing real benefits for the poor is something yet to be really engendered in the countries of the miombo, it need to be for the poor to strengthen the benefits they secure from their dry woodlands.

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