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

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ABSTRACT

This chapter 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 chapter 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, Puustjärvy *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 (Puustjärvy *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 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. Below we will

discuss some specific forest products in more detail, drawing on those for which there are significant sources of data.

Table 3: Range of forest-based income in user households in Luapula and Northwestern provinces in 2002[4]

Economic activity	Luapula province Average cash income (Zambian Kwacha)	Active households (%)	Northwestern province Average cash income (Zambian Kwacha)	Active households (%)
Forest-based cash income				
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
Other cash income				
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: Puustjärvy *et al.* 2005

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

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

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.
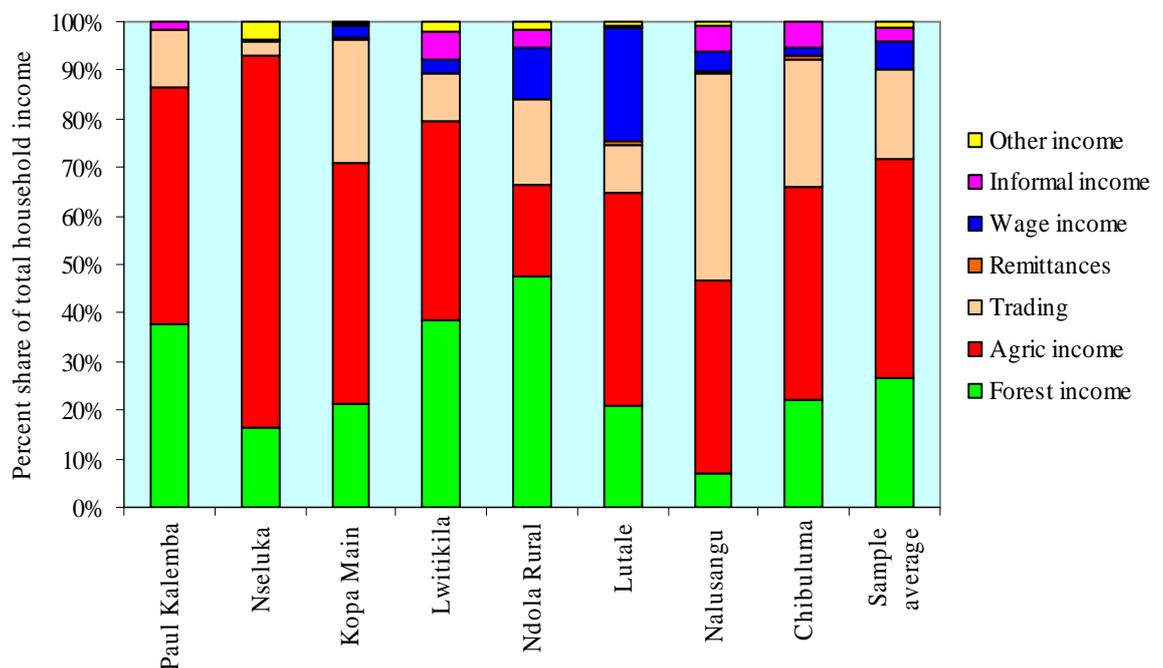

Figure 1: Source of total household income (including cash income and consumption) for eight sites in three provinces of Zambia

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.

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%)
Mumpa caterpillars	721,950 (15%)	45,000 (1%)	144,205 (30%)	136,688 (22%)	54,000 (5%)	0	0	0
Chipumi 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%)

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[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 Kwacha[6]. Values in brackets are the percentage households trading each product, in total population)

Forest product	Paul Kalemba (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%)
Mumpa caterpillars	No data	0	119,040 (21%)	170,400 (8%)	0	0	0	0
Chipumi 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%)

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

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.

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

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

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.

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).
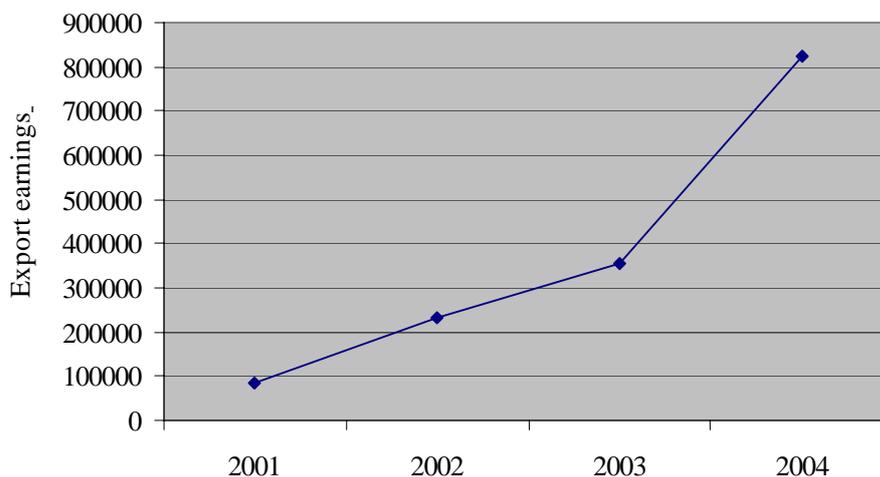

Figure 2: Export earnings from honey and beeswax, in US$ (Kaitisha, 2007)

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, due to the HIV 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 m^3/annum) and from plantation forests (1 million m^3/annum) accounts for only 14% of Zambia's total wood harvest (9 million m^3/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).

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

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)

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 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

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

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 SUMMARY 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.

7 ACKNOWLEDGEMENTS

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