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Research Article

Utilization of Forest Products and Services for Livelihoods among Households in Zambia

[1]Thomson Kalinda and [2]Samuel Bwalya
[1]Department of Agricultural Economics and Extension, University of Zambia, Lusaka, Zambia
[2]Policy and Advisory Unit, United Nations Development Programme, Addis Ababa, Ethiopia

Abstract: The objective of this study was to document the utilization of forest resources for livelihoods in Zambia based on an analysis of data from the ILUA survey. The analysis of the ILUA data in which households indicated the types of forest products and services they obtained from woodlands in their area show that majority households (25%) fetched fuelwood, followed by construction materials such as poles and thatching grass (19%). A good number (16%) derived plant foods such as fruits and nuts as well as mushrooms. Equally, a considerable proportion of households (11%) were harvesting medicinal plants for household use and sale. Some households were producing charcoal (5%), sawn or industrial timber (5%) and wood carvings (4%) from the local forests. A number of households also obtained important animal products such as honey and bee wax (4%) and game meat and other edible animal products (5%). These results from the ILUA survey clearly show that indigenous forests and woodland resources are important sources of household energy and provide other important livelihood products and services for most rural households These findings also indicate that forests and woodland resources are critical to household food security especially during stressful conditions (drought and floods) and they are a "drug store" and 'insurance" for the rural poor and underscore the need to ensure that these forest resources are sustainably managed.

Keywords: Crops, forest products and services, Integrated Land Use Assessment (ILUA), livelihood activities, livestock, Zambia

INTRODUCTION

Over the last decade (2001-2011) Zambia has achieved significant GDP growth of over 6 %, rising from -2 in 1998. The positive growth in the last decade has been driven primarily by high global copper prices and robust investments in sectors such as construction, telecommunications, retail and manufacturing (Central Statistical Office, 2012). At the same time, Zambia has exhibited significant improvement in several key macro-economic indicators; inflation rates in Zambia have been in the single digits since 2009, which has contributed to a significant decline in the cost of public and commercial borrowing. Despite these encouraging signs, poverty rates have remained persistently high. Poverty rates have remained above 60% since 1991. Although significant improvements have been made in reducing urban poverty rates, poverty remains an acute problem for rural people in Zambia, with poverty rates stuck at over 77% for more than a decade (Central Statistical Office (CSO), 2012). Persistently high levels of rural poverty suggest that rural people, who make up the majority of Zambia's population, have not effectively captured the overall improvement in Zambia's economic performance.

Underlying contemporary development discourse and poverty reduction options in Zambia is the question of how forests and woodland resources can be made to play a greater role in mitigating conditions of poverty especially among the rural poor. The role of forest resources can be enhanced through the adoption of good forest management practices, increased investment and value addition to forest products and services harvested from forests and woodlands. There is well documented evidence to suggest that in most cases, forests and woodland resources are important to rural livelihoods and in most forest resource rich countries, forests make significant contribution to national economies and welfare of forest dependent communities.

In order to have an appreciation of the important role forests and woodland resources play in sustaining livelihoods and poverty reduction and indeed, their contribution to the national economy as a whole, the Government of Zambia, through the Ministry of Tourism, Environment and Natural Resources, with technical and financial assistance from FAO designed and implemented an Integrated Land Use Assessment (ILUA) survey in 2005. The ILUA survey compiled a wide array of data on the land-use situation in Zambia. The assessment covered a large range of biophysical

Corresponding Author: Thomson Kalinda, Department of Agricultural Economics and Extension, School of Agricultural Sciences, University of Zambia, Lusaka

and socio-economic variables such as cropping, livestock and related environmental problems and thus provides a broad view of forest resources and related land uses for the country as a whole (Mukosha and Zambia based on an analysis of data from the ILUA survey. An attempt is made to analyze products and services derived from land and forests in order to identify the major livelihood strategies of households and to determine the forest products that are utilized for livelihoods and income generation by households in Zambia.

METHODOLOGY

This study uses data collected in the ILUA survey which covered the whole country and the methodology used is based on nation-wide field sampling. The survey methodology had already been tested and implemented in several countries since the year 2000 (Costa Rica, Guatemala, Philippines, Cameroon and Lebanon) to assess forestry resources. In Zambia, the assessment was extended to other sectors, such as agriculture and livestock (Branthomme *et al*., 2006). The ILUA survey is unique in its extension into livelihood data regarding utilization of land for livestock, crops and forestry. In this aspect of the assessment, ILUA goes beyond forestry status and use data and provides details regarding other land uses that impact forests, obtaining such information as types of crops and income generated from them, income level, household activities, crop production and livestock systems, etc.

Sampling design: The statistical data was acquired through field surveys at permanent sample plots systematically spread across the country. The sampling design adopted for the ILUA in Zambia was systematic. No stratification was applied. The sample density and distribution in Zambia is shown in Fig. 1. This was a systematic grid set across the country at 50km between tracts. Tracts were selected at the intersection of every 30 min of the latitude/longitude grid. It resulted in the selection of 248 tracts nation-wide. The tracts were automatically spread over the surface area of Zambia regardless of the geographical location and topological conditions (Fig. 1). The aim was to avoid biasness in plotting and data collection. Out of the selected 248 tracts nation-wide, the field crew managed to collect data from 221 tracts. This was due to the fact some of the tracts could not be accessed due to constraints like difficult terrain (water bodies, slopes and so on). Other tracts were located in military or mining restricted areas and some were geographically located outside the country's borders. In some cases, the local people refused to allow the field teams to work or access the tracks due to mistrust.

The sampling for the ILUA socio-economic survey was systematically done. At each tract, 15 households were randomly selected in a 5km radius from the biophysical tract centre. Where no inhabitants within the circle were found, then no interview was conducted. If there were equal or less than 15 households, then all households were interviewed. Otherwise, all populated places within the circle of 5km radius were considered, taking the list of inhabitants and applying random numbering to select the 15 households. For all the households selected for the interviews, the households within the tract limits did not have any preference to the other households within the circle of 5km radius. The sampling resulted in coverage of 1,680 household heads who were interviewed in the ILUA household survey (Mukosha and Siampale, 2009).

Data collection process: Data for the ILUA were collected by trained field crews for tracts, plots and subplots. A variety of methods and techniques were used during the data collection process. Biophysical and socio-economic variables were collected during the ILUA. The biophysical data collected mainly concerned assessment of the status of forests. Measurements of forests and trees and other land use practices such as tree diameter and height, as well as forest species composition were made. The socio-economic data was collected from interviews with household heads and local communities in the various parts of the country. Examples of socio-economic variables collected include local people's livelihood activities; agricultural cropping systems practiced; livestock reared; main forest products and services extracted from forests and woodlands and so on. As outlined above, these socio-economic data were collected by interviewing randomly selected households. A structured interview using a questionnaire that was designed was used to collect information at the household level. The field crew also supplemented this data collection with a limited number of focus group discussions highlighting community utilization of forests and other land use related issuesat community level.

Data analysis: The information collected from the ILUA survey was coded and entered into a database. The Data collected were coded and analyzed using Statistical Package for Social Sciences (SPSS) and Microsoft Excel worksheets. The coding and entry was meticulously done and a database was established for further analysis. This study focussed on generating information on the main household livelihood strategies from the ILUA database. The analysis therefore highlights and presents national-level descriptive statistics to provide estimates of household income levels and the types of livelihood activities and the types of forest products and services that are utilized for livelihoods and income generation.

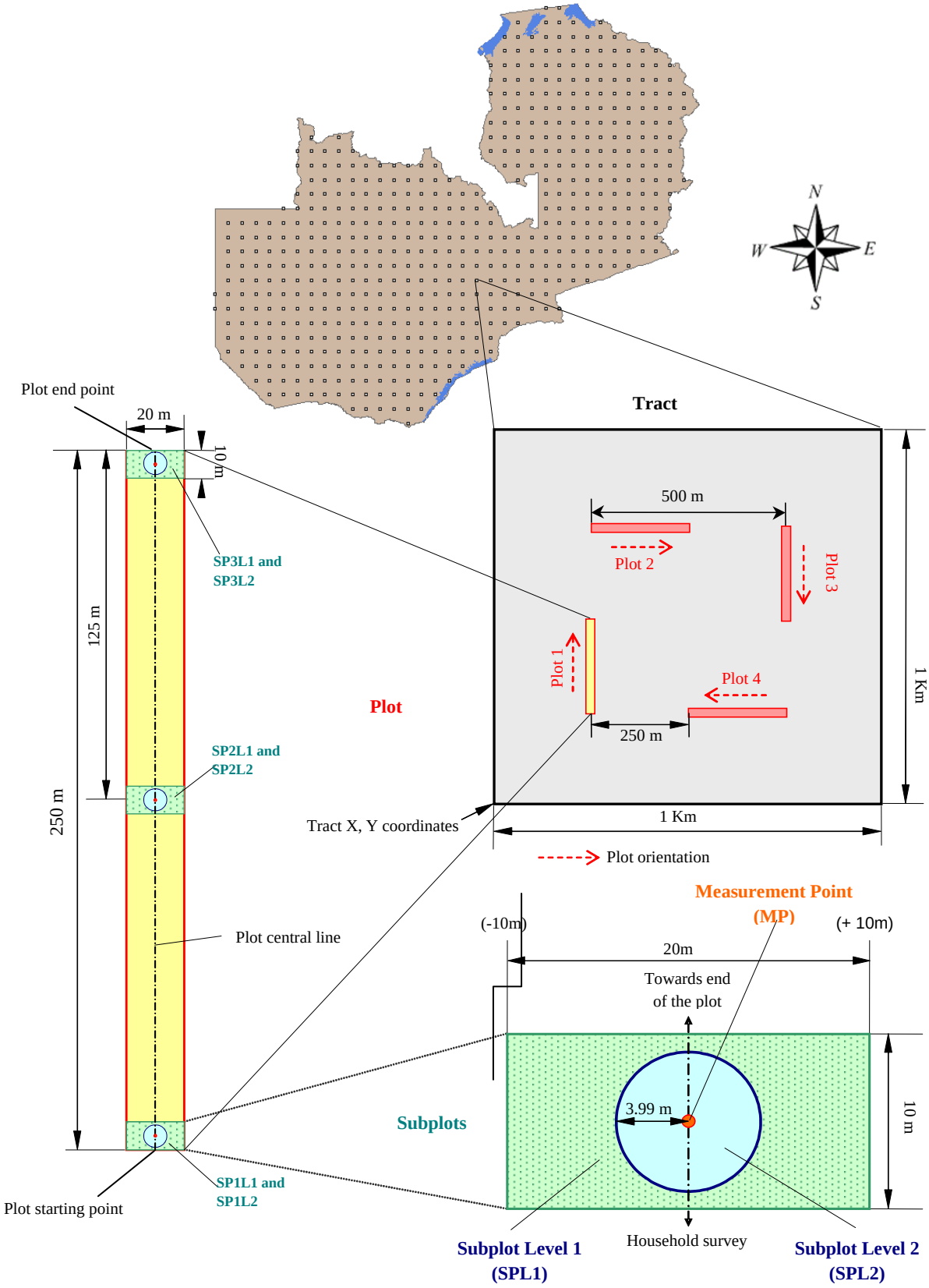

Fig. 1: Distribution of tracts and the tract, plot and subplot design for the integrated land use assessment survey in Zambia; Branthomme *et al*. (2006)

Table 1: Distribution of household heads interviewed during the ILUA survey

Province	Number of household heads	Percent
Central	223	13.27%
Copperbelt	75	4.46%
Eastern	186	11.07%
Luapula	141	8.39%
Lusaka	61	3.63%
North Western	187	11.13%
Northern	376	22.38%
Southern	210	12.50%
Western	221	13.15%
Total	1, 680	100

RESULTS AND DISCUSSION

Household distribution in socio-economic survey: Table 1 presents the distribution of sample households by province. Northern Province had the highest number of household heads (22%) interviewed whereas the Copperbelt Province (5%) and Lusaka Province (4%) had the lowest. This is simply a reflection of the size and development in these provinces. The Northern province is the largest province in terms of area in Zambia and hence, there were more sample plots included during the ILUA survey.

The Copperbelt Province is the smallest in terms of area but it is one of the most developed parts of the country. The province has large expanses of built urban environments and mining operation areas as compared to other parts of the country. Due to the urban built environment and restricted copper mining operation areas, some of the sample tract areas were inaccessible and hence no data was collected from these areas. In some cases of urban built up environments, some households were involved in formal employment and hence were not directly involved in agricultural or forestry related livelihood activities leading to fewer households being included in the socio-economic survey during the ILUA.

In terms of gender distribution, 16% of the household heads were female. The average household size was 6 people. There were 1, 680 households interviewed or assessed over 139 populated tracts accessed by the field crews with an estimated total population of 10, 080 people.

Household income: Respondents in the ILUA survey were asked to give an estimate of the total annual income that is earned by their households. As shown in Fig. 2, most of the households reported that they earn less than K5 million annually (equivalent to US$1,400 or approximately $4/day). These figures have to be taken with caution since it is usually difficult to get accurate income data for obvious reasons.

As will be shown below, the households depend primarily on agriculture for their livelihoods. On-farm income comes from the sale of food and cash crops, livestock, fishing as well as forestry products.

Household livelihood activities: Figure 3 shows a ranking of the different income generating activities of the 1, 680 households covered in the ILUA survey. The

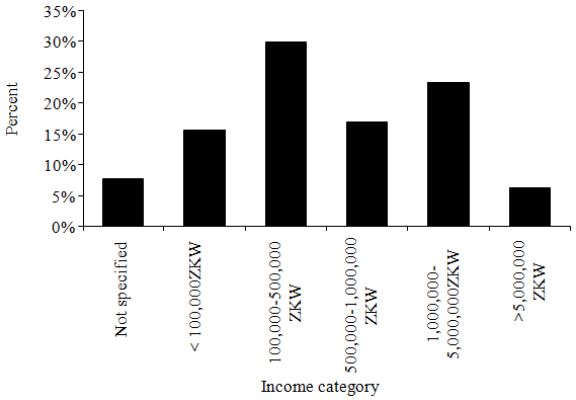

Fig. 2: Distribution of households by total annual household income earned; ILUA data

majority of the people derive income from a variety of sources with the major ones being agriculture, livestock and harvesting of forest products. The income generating activities cited include crop production, livestock rearing, harvesting of forest products, fishing, mining, tourism and cottage industry and formal employment. Of these, crop production was ranked highest (92%) followed by livestock rearing (59%) and then harvesting of forest products (12%). Fishing was ranked fifth at 9%.

Although there is a big gap in the ranking of forest-based livelihoods with respect to agriculture, the CSO's Living Conditions Monitoring Survey of 2004 showed that over 83 % of all households in Zambia depend on wood resources (firewood and charcoal) for their cooking energy and over 97% of rural households depend solely on fuelwood for their cooking energy with only 1.7% having access to electrical energy (Central Statistical Office, 2005). It is therefore likely that forest-based income generating activities were suppressed mainly because of the difficulty in capturing and quantifying forest products harvested at the household level. Below, we focus and analyze the importance of crop, livestock and forest products to households using the ILUA socio-economic data.

Crop production: The main food and cash crop is maize, both local and hybrid varieties, which are cultivated by the majority of the surveyed households. As is illustrated in Fig. 4, approximately 82% of households surveyed indicate that they cultivate maize either on small or large plots. Nearly half of all households surveyed cultivate groundnuts and cassava. Beans (32%), millet (26%), sweet potatoes (23%), sorghum (15%) and cotton (12%) were also mentioned frequently as crop products.

The dominance of maize cultivation has policy implications in terms of promoting appropriate land use, diversification of crops and the provision of research and extension services. Government should

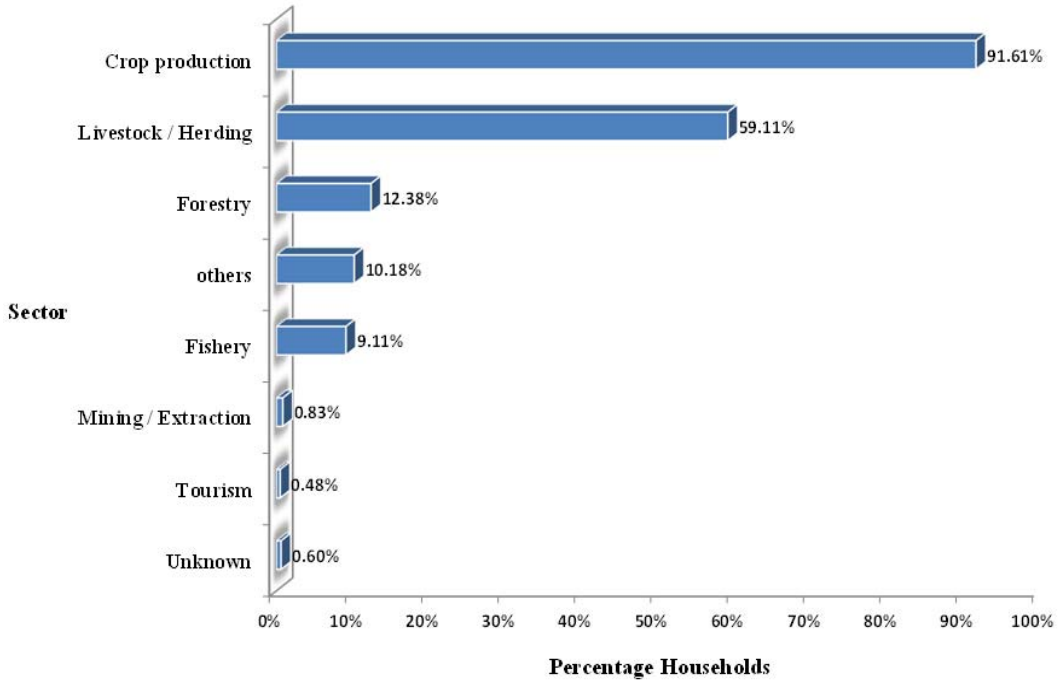

Fig. 3: Overall income generating activities among sampled Zambian households (multiple responses); ILUA data

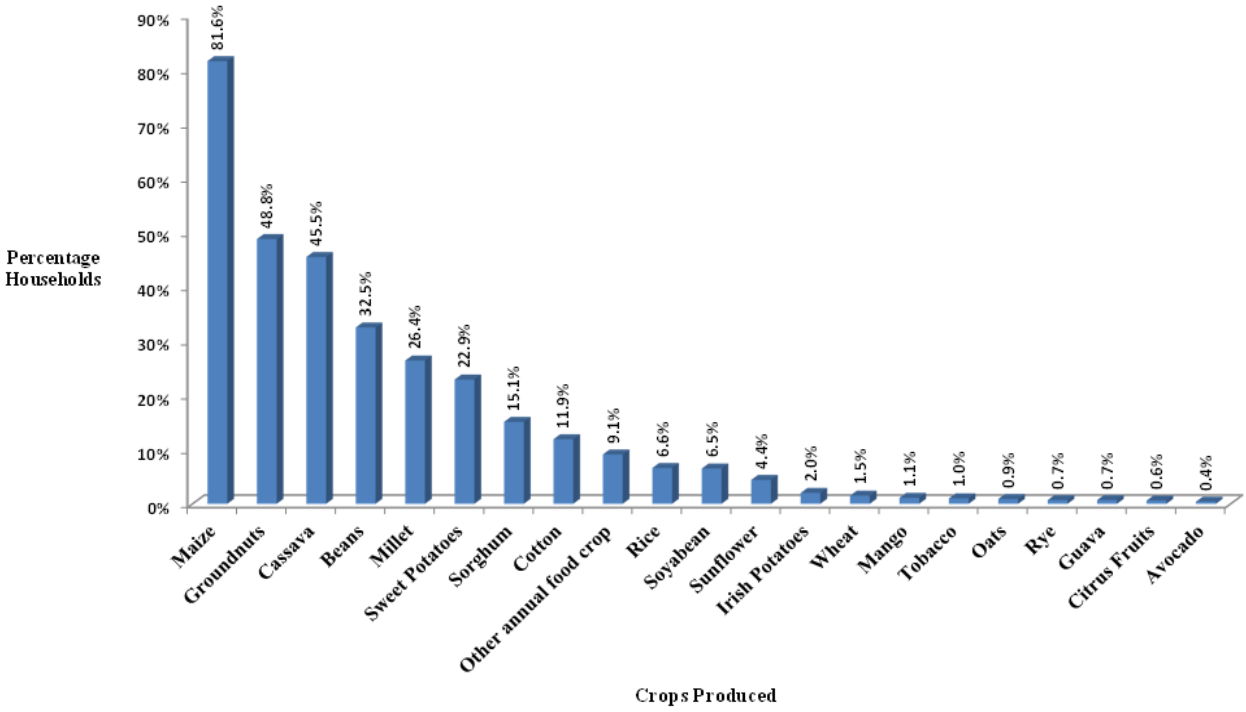

Fig. 4: Proportion of households and cultivated crop products; ILUA data

seriously consider promotion of crop diversification in order to improve food security especially in marginal areas which fail to support maize production, a crop which is highly dependent on high cost inputs like fertilizer. Alternative grains like sorghum or millet as well as tubers like cassava can be promoted for production by smallholder farmers in areas where the agro-ecological conditions support these crops. A good number of (37%) in the country practice some form of multiple cropping, an indication that crop diversification has been accepted and can thus be easily be promoted.

Livestock production: Households keep livestock, especially small ruminants and poultry, in addition to their crop production activities as a livelihood and risk management strategy. Livestock provide meat for direct household consumption and manure for crop production. Additionally, they play various roles in accomplishing social obligations such as marriage ceremonies, etc. House hold livestock ownership data from the ILUA survey is reported in Fig. 5. It shows the relative contribution of the different livestock species to Total Livestock Units (TLU) among the sample households. The Total Livestock Unit equivalence measure was used in order to estimate an aggregate herd size for the sample households and be able to compare different herd types (cows, goats, pigs, etc.). Clearly, cattle are predominant and are a major contributor to the TLU for the households especially in Central, Lusaka and Eastern, Southern and Western provinces where they account for more than 75% of the total TLU.

Based on the LU equivalence measure, we find that among the sample households, on an average, the households which have the largest herd sizes are in Lusaka Province (5.7) followed by those in Central (4.5), Southern (4.1) and Western Province (3.4) and Eastern with 1.4 LU. These survey findings are consistent with what is generally known about these areas of the country in terms of livestock production. Lusaka, Southern and Central provinces are predominantly commercial farming areas with farmers who produce beef and milk for sale along the line of rail or urban centers of the country. Western and Eastern provinces also have many traditional small-scale cattle herders among the local people which support a relatively large animal population. On the other hand, compared to the other provinces, Northern and Luapula also have a large population of traditional small-scale farmers but they are not traditional cattle keepers and are mainly involved in crop production and production of smaller livestock species like goats, pigs and poultry.

Forest products and services: In addition to such wood products as poles, firewood and sawn timber, forests produce many non-wood products (NWFP) which are very essential for the livelihoods of local communities. The NWFPs can be divided into four main categories, namely:

- Plant products such as fruits, nuts, seeds, roots, mushrooms, animal and bee fodder, medicinal plants, etc.
- Animal products such as bee products, meat provided by vertebrates, etc.
- Forest services and benefits such as local employment, environmental services including soil conservation, watershed protection, protection against erosion, ecotourism, fishing as a leisure activity, etc.
- Grazing for household animals

Households were asked to indicate the types of forest products and services they obtained from woodlands in their area. Figure 6 presents the results which clearly show that majority (25%) households

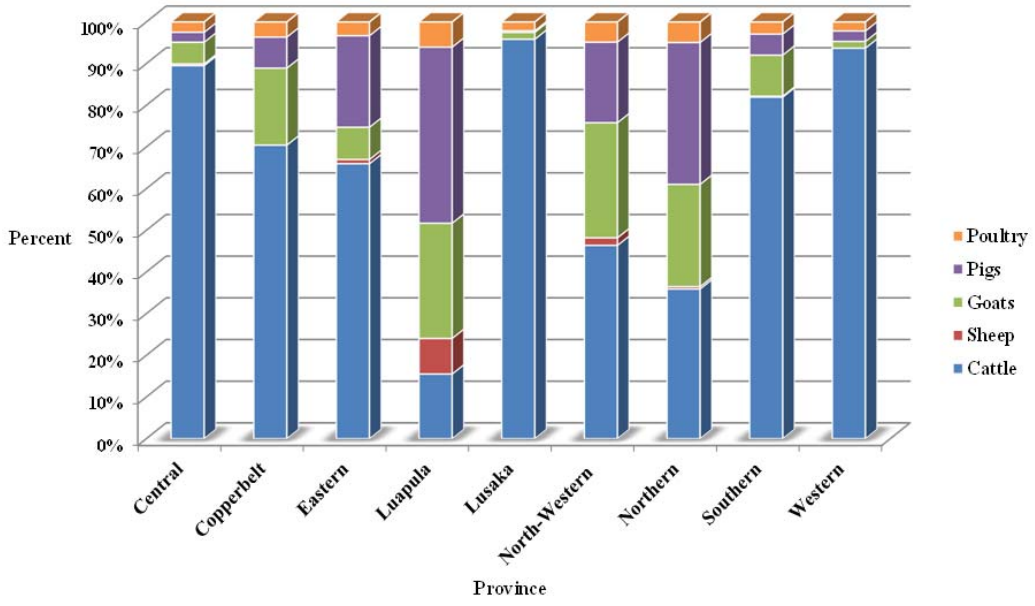

Fig. 5: Contribution of different species to total livestock units in the sample households

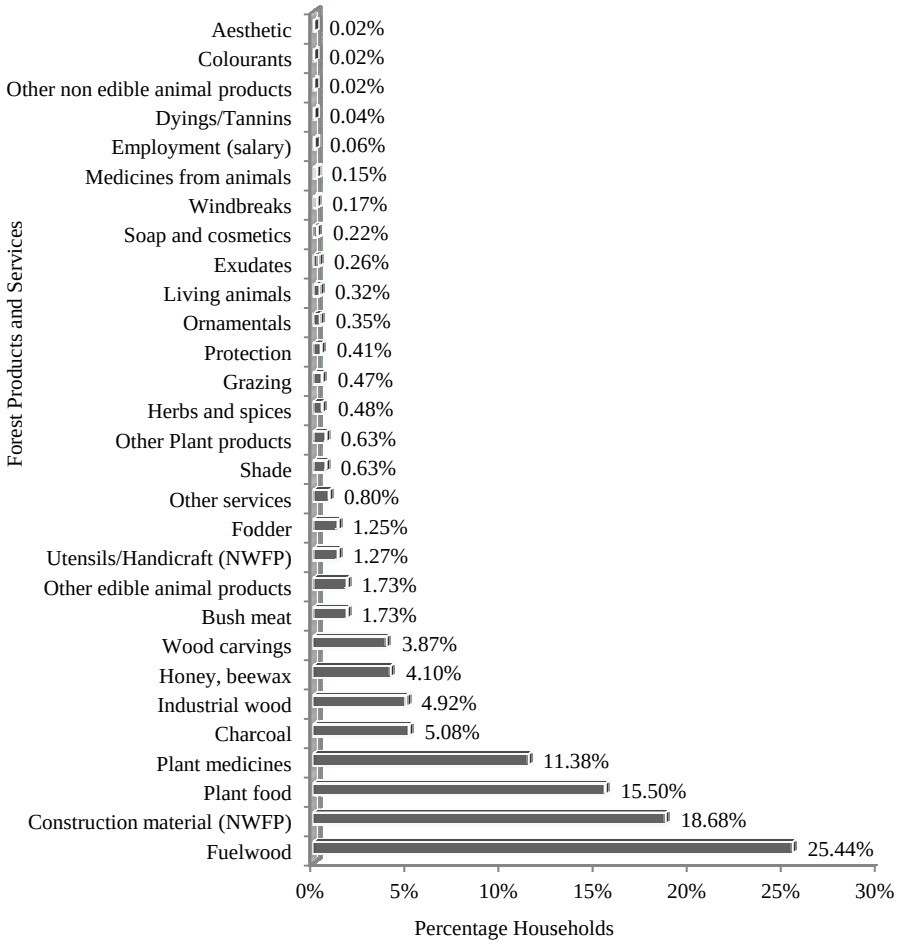

Fig. 6: Percentage of households reporting types of forest products and services derived from woodlands

fetched fuelwood, followed by construction materials such as poles and thatching grass (19%). A good number (16%) derived plant foods such as fruits and nuts as well as mushrooms. Equally, a considerable proportion of households (11%) were harvesting medicinal plants for household use and sale. These survey finding are consistent with a study in Uganda which found that wild plants are increasingly becoming a valuable source of livelihoods for many people through household use and trading as medicine, food or craft materials (Barirega *et al*., 2012). Some households were producing charcoal (5%), sawn or industrial timber (5%) and wood carvings (4%) from the local forests. A number of households also obtained important animal products such as honey and bee wax (4%) and game meat and other edible animal products (5%). As shown in Fig. 6, several other important products and services were derived from forests and woodlands by the survey households.

Almost all rural households depend on forests for fuelwood and construction materials and as important sources of forest products both for subsistence and commercial use. These results confirm that forest and woodland resources are important sources of materials, energy and wild foods that support local livelihoods especially in rural areas in Zambia. These results are consistent with other studies which estimated that 68% of total forest product harvested by rural households are consumed within the household and the reminder (32%) is sold for cash or exchanged for household goods (Jumbe *et al*., 2008).

In order to have a clearer appreciation of the critical importance of forest and woodland resources to local livelihoods, the survey households were further asked to rank the forest products and services they obtained from woodlands by order of importance. Table 2 shows the household rankings of different forest products by household income category. It is clear that fuelwood ranked highest with 37.6%, followed by construction materials (22.5%), medicinal plants (9%) and plant foods (9%). Other highly ranked and important forest products are industrial wood (timber), charcoal, animal products and wood for carvings and making tools.

While generally the same across income groups, it is important to indicate here that significant variations

Table 2: Rank of forest products and services derived from natural forests amongst the households

	Household income group (Income in Zambian Kwacha)						
Forest product/service	Less than 100, 000	100, 000 -500, 000	500, 000 -1, 000, 000	1,000, 000 -5, 000, 000	Above 5,000, 000	All	Rank
Fuel wood	43.9%	34.9%	36.3%	36.9%	35.8%	37.6%	1
Construction material	21.2%	22.6%	23.9%	23.0%	21.6%	22.5%	2
Medicinal plants	9.6%	9.60%	9.8%	9.4%	6.9%	9.0%	3
Plant food (Veg, fruits, beverages etc.)	10.3%	11.3%	7.7%	7.0%	7.8%	8.8%	4
Industrial wood	3.9%	5.8%	6.3%	5.1%	15.2%	7.2%	5
Charcoal	5.2%	5.0%	4.6%	5.4%	5.4%	5.1%	6
Animal and animal products (Meat)	1.3%	2.9%	2.0%	2.6%	1.5%	2.0%	7
Wood products (Carvings, tools, etc.)	1.0%	2.4%	2.1%	2.2%	2.0%	1.9%	8
Environmental services	1.0%	1.4%	2.3%	1.9%	1.5%	1.6%	9
Honey, Beeswax	0.3%	1.1%	2.1%	2.0%	0.5%	1.2%	10
Non-Wood utensils and handcrafts	0.8%	1.6%	1.3%	1.5%	0.5%	1.1%	11
Fodder and forbs (Include. Bees)	1.0%	0.8%	0.7%	2.0%	1.0%	1.1%	12
Other plant products	0.3%	0.5%	0.7%	0.7%	0.0%	0.4%	13
Soap/cosmetics, exudates, colorants	0.3%	0.2%	0.2%	0.4%	0.5%	0.3%	14

ILUA data

do exist across households and communities. For instance, the data suggests that the poorest households ranked firewood and plant foods more highly than did the other three income groups. This is consistent with the fact that the poorest households tend to have fewer livelihood and income options outside of the forest and their opportunity cost of forest collection is much lower than that of their richer counterparts. The poor also tend to be more reliant on forest gathering of firewood and wild foods for sale within village markets or in exchange for foodstuffs and other household goods. They also face critical food shortfalls and depend on forest foods for survival and often to supplement their nutritional requirement. In comparison, the relatively richer households engage in relatively more capital intensive and more profitable forest based income generating activities such as timber production and large-scale charcoal production. This is consistent with the high ranking that the richest income group place on industrial wood (timber). Relatively richer households also tend to have higher educational attainment and can afford better modern health facilities than the very poor. This is also seen in the low ranking of forests as sources of herbs and medicines or simply as a "drug store" for the richer households as compared to the poorer households. Overall, these rankings reveal that forests are a "food basket" and "drug store" for the rural poor and provide critical safety-nets for all households during environmental stressful conditions such as droughts and floods. The results of this study are also consistent with studies done in elsewhere in the region. For instance, a study showed that households rely on consumption of indigenous fruits during periods of food shortage in Kenya. The utilization of indigenous fruits for consumption and sale was found to be higher among the low income earners and contributed to total household food insecurity coping strategies (Mwema *et al*., 2012). A study in Uganda showed that wild plants are increasingly becoming a valuable source of livelihoods for many people through household use and trading as medicine, food or craft materials (Barirega *et al*., 2012).

As noted above, the results from the ILUA survey have clearly shown that indigenous forests and woodland resources are important sources of household energy for most rural households and underscore the need to ensure that these forest resources are sustainably managed. Because rural households lack affordable energy substitutes, such as electricity which has only 2% of the rural households connected to its grid (Central Statistical Office, 2007), increasing scarcity of fuelwood would divert labor from such household activities as food production to firewood gathering thereby reducing food production and increasing rural vulnerability to external shocks. However, ensuring sustainable management of forests for firewood is not easy because open forests are not under any formal management system and are increasingly under threat of over-exploitation and conversion to farmland and settlement. As observed in Bwalya (2000), distance traveled and time taken to gather a head-load of firewood has increased in some villages. On average, it takes about 5 km to go to and from the forest collection area and as much as 2 h to collect a standard 10 kg head-load of firewood. In some areas where firewood is relatively scarce and the opportunity cost of labor low, firewood markets are slowly emerging, with about 5% of the firewood collected by rural household being sold for cash or in exchange for food and household materials to relatively wealthier households within the village.

Wood fuel production is an important economic activity estimated to contribute at least 3% to the country's GDP and accounts for approximately 80% of the total energy household balance in the economy. Wood fuel is mainly consumed by relatively poor households, with about 86% of rural households directly dependent on firewood and the remainder (14%) on charcoal. Firewood production and consumption contributes 0.8% to the country GDP, while charcoal contributes about 2.2% (Central Statistical Office, 2007). It is also estimated that over 50,000 people are engaged in charcoal production on full-time basis and earn a living from charcoal

production. A large number of others are engaged in charcoal production, distribution and marketing on part-time basis, moving into the sector during the slack period when labor is relatively abundant and also when they seek to earn some cash income to meet their household needs or purchase agricultural inputs. The majority of rural households is dependent on firewood, but still produces charcoal and firewood at least for domestic use, especially for space heating, cooking and drying fish and meat. Even those with a stable electricity supply also demand and use charcoal for barbecue as well as to prepare traditional foods, which are believed to cook better on firewood and charcoal. Strong tastes have been isolated as one of the major determinants of charcoal consumption among households with electricity in Zambia (Bwalya, 2000).

Forests also provide a wide range of local and global environmental services, which include prevention of soil erosion, protection of watercourses and moderation of weather patterns and climate change through carbon sequestration. The relatively low ranking of environmental services among the survey households is consistent with our expectations. Conservation of forests for environmental public goods only starts to increase to appreciable levels when per-capita income increases and reaches a certain threshold and Zambia, like most poor countries, is still far from reaching this per-capita income threshold. But even with these poor communities, richer households seem to have greater appreciation of environmental services forests provide than the very poor do.

Overall, harvested forest products make a significant contribution to rural livelihoods and incomes of the rural poor. Forest contribution to rural household income is estimated at 20.6%. However, the contribution of forest products varies geographically and across households with figures ranging from as low as 12% in some locations to 65% in others depending on socio-economic and conditioning factors which include access to markets and spatial and temporal availability of forest products (Jumbe *et al*., 2008).

CONCLUSION

The analysis of the forest sector using the comprehensive ILUA data indicates that Zambia's forests resources have great potential to promote poverty reduction in the rural areas if properly managed and utilized. The ILUA socio-economic data indicates that forests and woodland resources are critical to household food security especially during stressful conditions (drought and floods) and they are a "drug store" and 'insurance" for the rural poor. Over two thirds of all Zambia's forests are located on customary land and most rural households depend on harvesting forest products for their livelihoods. The analysis of the ILUA data in which households ranked various forest and woodland resources to local livelihoods shows that the highest proportion of households (38%) ranked fuelwood as their major energy source. The households also indicated that they derive construction materials (23%), wild foods (9%) and medicine (9%) from forests as part of their livelihood activities. Other important forest products are industrial wood (timber), charcoal and wood for carvings and making tools. The use of Non-Wood Forest Products (NWFPs) is less common than the use of major wood products; however, most households indicated that they use a variety of products from forests, which highlights the importance of multiple uses of forests and the numerous products that can benefit the local communities.

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