

**Consumption of non timber forest products (NTFPs) in
Kakamega forest, Western Kenya: accessibility, role and value
to resident rural households**

By

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Abstract

Dependency on natural resources in the 'commons' still ranks very high among rural communities in many developing countries. Kakamega forest in Kenya is one example of a local 'common' that supports a huge rural population. The forest is a high biodiversity area and for generations has been an important source of local people's livelihoods. The forest is managed by three distinct organizations. The objective of this paper is to investigate the importance of Kakamega forest as a 'common resource' to surrounding households for non-timber products (NTFPs) such as firewood, herbal medicines, pastures and thatch grass for construction and maintenance of shelters by estimating economic value accruing to each household using direct pricing (DPM) and cost of collection (CoC) methods. Results are derived from a survey of 201 randomly selected households that was conducted in October-December 2006. Findings showed existence of a variety of NTFPs that are of great importance to local households' livelihoods. Extraction challenges emanating from the different management approaches of the forest were also evident. The study makes a number of conclusions that can inform policy geared to fostering of collaborative management arrangements that can optimize conservation and sustainable use of Kakamega forest.

Key words: Kakamega forest, common resource, NTFPs, direct benefits, cost of collection method, direct pricing method.

1. Introduction

World forests, and in particular tropical rainforests, have continuously been rated highly by communities living around them due to the important role they play within households. Much research work on natural resource use has demonstrated that substantially high proportions (over 1.2 billion) of rural populations generally depend on common resources for NTFPs that supplement their basic needs (Adhikari et al., 2004; Agrawal, 2007) but exercise very little control over them (Agrawal and Gibson, 1999).

Access and utilization of forest resources bestows society a sense of empowerment since products obtained play a crucial role in the sustenance of livelihoods (Lechappelle et al., 2004). However, ever since the emergence of 'Tragedy of the commons' in the 1960's, management of common forest resources have been taken over by governments, either directly or indirectly through agencies in a bid to protect them (Ostrom, 1990; Mitchell, 2004) by use of exclusive policies. Such policies perceived communities as 'an obstruction to meaningful conservation' (Agrawal and Gibson 1999).

Consequently, many local communities have since then been experiencing difficulties in accessing livelihood items yet these 'common' resources have been shown to be 'safety nets' especially in reducing the impact of poverty (Adhikari et al., 2004). In reaction, most countries especially in the developing world have lately been increasing the area of forest under the management of communities (Agrawal, 2007:114).

Kakamega forest, a National Forest Reserve in Kenya and the research area for this study, is one example of a 'common' forest resource which has been shown to support a high population of resident communities (Blackett, 1994; KIFCON, 1994; Mitchell, 2004). It is also unique since it is the only remaining portion of the once great Guineo-Congolean rainforest in Kenya (KIFCON, 1994). This forest is

currently managed by three distinct organizations, i.e., the forest department (FD), Friends Church Mission (FCM) and the Kenya Wildlife Service (KWS).

Institutionally, forest is managed through two approaches, i.e., inclusive (incentive-based) and exclusive (protective) management models (Mburu and Birner, 2007). These approaches have different implications with respect to benefits accruing directly to the community. Inclusive approach is more flexible and allows limited extraction of NTFPs from the forest by the community for household consumption. Exclusive approach on the other hand forbids gathering any NTFP from the forest. These approaches are implemented by Forest Department/Friends Church Mission (FD/FCM) and the Kenya Wildlife Service (KWS) respectively.

In order to understand the implication of these approaches to accessibility and consumption of NTFPs by the community within the present management context, it becomes necessary that an investigation of the extent to which rural households benefit from the forest be done. This information is crucial in the quantitative establishment of the importance of Kakamega forest as a 'common' resource to local residents.

Few past studies carried out in Kenya, for example KIFCON (1994), Emerton (1996) and Mitchell (2004), only showed qualitative importance of Kakamega forest. From them, it is evident that quantitative documentation of the role of NTFPs in rural households in the study area and in the entire Sub-Saharan Africa region (SSA) is still lacking. This thus necessitates the quantitative study of the importance of such common resources to local households. This study seeks to attain this aim by estimating economic value of benefits accruing to households from the forest. Past studies that adopted the same approach, for example those carried out in Southeast Asia forests (Godoy et al., 1995; Adhikari et al., 2004), Central American rainforest (Godoy et al., 2000) and South Africa (Shackleton and Shackleton, 2006) were able to show quantitative importance of forests.

Through such efforts, society can appreciate more the importance of forest resources to household wellbeing (Godoy et al., 1993).

Specifically, this study seeks to examine the degree to which Kakamega forest is a 'common' resource with special regard to NTFPs access and consumption by the resident community. It also seeks to examine the effect of the existing management approaches with respect to the number of households gathering non-timber forest products (NTFPs) for meeting livelihood needs. The study seeks to answer the following questions: which are the commonly consumed NTFPs and what approach is used to manage the point source in the forest? What role do the extracted NTFP(s) play within households? What is the total value of benefits accruing to the household through consumption of NTFP from the forest?

Specifically, this study seeks to attain the following objectives:

- Identify sources of NTFPs within Kakamega forest and assess the role of consumption within local households
- Quantify NTFPs sourced from Kakamega forest for household consumption
- Assess the extent to which Kakamega forest is a 'common' by estimating economic value of NTFPs directly accruing to resident communities

3. Methods

3.1 Study site

The Kakamega forest is found in the Western part of Kenya. It lies 150 Km west of the Rift Valley at an altitude of 1460-1765 metres above the sea level (Mitchell, 2004). It covers an area of approximately 240km² (MFP, 2002) and is the easternmost extension of the great Congo Basin forest that once stretched across the middle of Africa, but has been fragmented in the last century by human activity (KIFCON, 1994). The forest extends to three administrative districts, i.e., Kakamega, Vihiga and North Nandi districts.

Kakamega forest is a high biodiversity area (MFP, 2002) with over 300 species of birds and 350 species of plants, amongst others. About 10 to 20 percent of animal species found in the forest are not found anywhere else in Kenya.

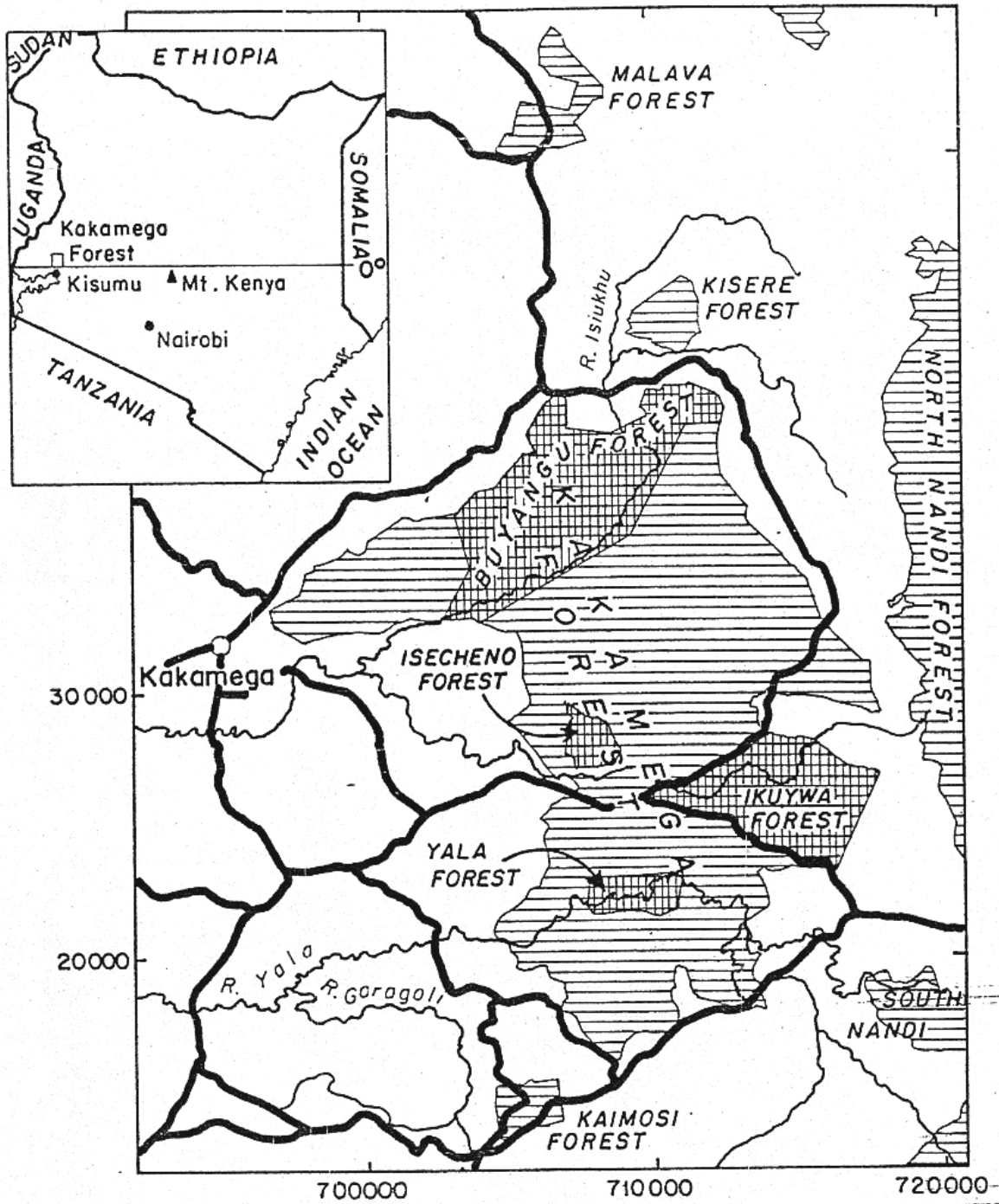
The Kakamega forest is one of the highly dense rural areas in the world with an average population density of 600 people per Km² (Blackett, 1994). Studies have also shown that more than 200,000 people distributed in 57 villages occupy the area adjacent to the forest and are greatly dependent on NTFPs as household items that meet basic livelihood needs (KIFCON, 1994). The forest has thus been an important resource for local people for generations.

Most of the adjacent resident communities are subsistence farmers on small family farms of less than a hectare (MFP, 2002). Due to high population against farms that are constant in sizes, fragmentation has occurred over time and this has led to soil nutrient depletion over time as a result of continuous cropping hence decline in land productivity. The forest has thus played a significant role as a 'safety net' to supplement household basic needs (Mitchell, 2004).

Currently, Kakamega forest is managed by three distinct organizations (Fig.1), i.e., the Forest department (FD), Friends' Church Mission (FCM) and the Kenya Wildlife Service (KWS). The forest department is responsible for the management of Kakamega, Yala, Isecheno, Ikuywa, Malava, North and South Nandi portions of the Kakamega forest whereas Friends Church manages

Kaimosi (Fig. 1). The KWS manages Buyangu and Kisere fragments. The community is allowed access into the forest to harvest NTFPs such as dead wood (firewood), grazing and thatch through sections managed by the FD and the FCM. The protected site is managed by KWS and access by the community for NTFPs is strictly prohibited. No material, living or dead, can be removed from this site. However, collections of prohibited products such as medicinal plants, charcoal production and structural materials have not only been reported in sections managed by FD and FCM but also in the areas run by KWS (Mitchell, 2004).

Figure 1 in the next page shows an outline of the Kakamega forest, its fragments and organizations in charge of their management.



Source: BIOTA E02

Figure 1: Kakamega Forest

3.2 Sampling and data collection

This study was carried within the auspices of Biodiversity Monitoring and Transect Analysis East Africa (BIOTA-EA) project. A random sample of 390 respondents was selected for this study. This was derived from an earlier sample frame created by the project through mapping of households living within 10 Km from the forest edge. This had been made possible with the help of the Ministry of Agriculture and local provincial administration officials. A total of 33,413 households were listed down to form the sampling frame from which the 390 households were randomly picked.

The sample size was however reduced to 201 households who participated in the actual survey. This was based on findings of Guthiga et al. (2006), a study in the same sub-project, which revealed that majority of forest beneficiaries (over 80%) lived within a distance of 5 kilometres from the forest.

Results for objective one are based on 201 households interviewed to provide general data relating to NTFPs consumed by households and their sources in the forest. Objective 2 and 3 only reflects analysis of 186 households who obtained NTFPs from sections managed by the FD and FCM. The rest (15 households) obtained NTFPs illegally from KWS section and were dropped from analysis. In addition, products that were extracted legally (firewood, 'livestock grazing', thatch and cutgrass) are the only products quantified and valued.

Data on occupations of household heads, NTFPs types and quantities consumed, time spent gathering each commodity, duration of consumption, prices of NTFPs in local markets, and organization managing forest close to households were collected. Respondents were also asked to report on difficulties faced with respect to procuring NTFPs from the forest for household consumption.

3.3 Data collection

Semi-structured questionnaires administered by researchers and well trained enumerators were used to collect data from households. Similar approach was applied by Delang (2006a) and Godoy et al. (1993). Pre-testing was carried out in Malava and Buyangu areas to ascertain instrument effectiveness and revisions were thereafter effected accordingly.

Quantities consumed were estimated based on local packaging units (see for example firewood 'headlots' in plate 1). Average unit weights for such products (in kilogrammes) and period of continuous consumption per unit (in days) were measured to facilitate estimation of quantities consumed annually. The study relied on recall ability of respondents for the estimation of frequency of NTFPs use. It has however been argued that reliance on recall ability could result in underestimation (Godoy et al., 1993). This was a challenge to this study but since the study found out that households relied on NTFPs for very basic needs and were consumed almost throughout the year, it became relatively easy for respondents to remember their previous consumption trends. This minimized the vulnerability of this procedure.

3.4 Valuation methodology

The type of forest value⁴ being estimated determines the method best suited for its approximation (Godoy et al., 1993). Estimation of direct use values (consumptive benefits e.g., NTFPs) normally adopt market analysis based approaches (Emerton, 1996). Three main methods have been commonly applied by many scholars in the estimation of NTFP direct value. These approaches utilize market prices and include: i) Direct pricing method (DPM) for commercially traded NTFPs (Peters et al., 1989), ii) Cost of collection method (CoC) that

⁴ Generally, total economic value (TEV) of forests comprises of direct use values (DUV), indirect use values (IUV) and option values (OV). Direct use values refer to value derived as a result of direct consumptive or non-consumptive utilization of the forest (Pearce and Warford, 1992). These values include timber, NTFPs and recreation amongst others. IUV refer to those that attained through the influence of forest existence and include most ecological functions such as modification of local climate or control of soil degradation. On the other hand, option values refer to value derived by holding a premium of the forest for future unknown uses. Bequest (BV) and existence values (EV) also a part TEV (Ibid).

estimates the value of time expended in gathering NTFPs (Delang, 2006a), and iii) Direct Substitutes method (DSM), which infers value based on close direct substitutes that have market prices (Delang, 2006a). This study applies CoC to estimate the value of NTFPs consumed from the Kakamega forest and compares with those generated from DPM.

CoC involves establishment of time spent gathering NTFPs from the forest. Average time starting from the moment one leaves for the forest to collect NTFPs until the time they get back home was measured.

To effectively apply this method, value of household labour time was established. This study used the wage equivalent to infer value on time and main occupations of household heads were established together with their average net earnings per working day (Delang, 2006b). One major advantage of using the wage equivalent method is that the resultant value per hour reflects more on the opportunity cost of labour of households entering the forest to harvest NTFPs. This was thought to be better since use of wage rate could have concealed the variation of income earnings within the sampled households (Delang, 2006b). Income was expected to vary according to the nature of occupation of the household head. The other approach that uses National minimum wage (Peters et al., 1989) was also thought not to reflect the true situation in the ground since there was no mechanisms in the study area that ensured enforcement of national agricultural minimum wage. Furthermore, household interviews revealed that nobody knew the existence of national minimum wage.

CoC method has nevertheless been a subject to critique. It has been observed that the exact time spent gathering particular NTFPs can not be exactly determined since there is a possibility of collectors doing more than one activity in the forest (Hawkes and O'Connell, 1981). This study however found out that specific NTFPs were collected by specific gender, e.g., only women collected

firewood while men mainly herded livestock in the forest or collected thatch grass (See Plate 1 and 3). As also argued in Hurtado and Hill (1990), this gender differentiation enhances degree of measurement of time expended gathering.

The number of hours per day spent in these occupations by each household head was measured since it was necessary in estimating the average earnings per hour. This figure was the opportunity cost of time spent by each household collecting NTFPs consumed. Annual value based on cost of collection was estimated from the product of the average number of hours spent gathering NTFPs consumed by households in day, the average opportunity cost per hour of household and the number of days such household gathered each NTFP in a year.

Cost of collection value was compared with those generated from direct pricing method (DPM). Estimation of the gross annual direct use value involved measurement of quantities of NTFPs consumed and converting those (local units) to kilogrammes. The time a unit of NTFPs consumed lasted each household when used continuously was also noted. Frequency of particular NTFP consumption in the previous 12 months was also recorded. To determine annual gross direct-use value of an NTFP per year, this study obtained the product of the units consumed household⁻¹ in the previous year and the reported mean local retail price per unit of the NTFP in question. This method was similarly applied by Peters et al. (1989).

4.0 Results

4.1 Types of NTFPs consumed, source in the Kakamega forest and role of consumption

Objective one of this study sought to identify NTFPs consumed by households living around the Kakamega forest and their role within households. Plate 1-6 below presents some of the NTFPs consumed from Kakamega forest by the interviewed households.



Plate 1



Plate 2



Plate 3



Plate 4



Plate 5



Plate 6

Legend:

Plate 4: Women carrying head loads of firewood from the forest

Plate 5: Livestock being driven into the forest for grazing

Plate 6: A tree in the forest whose bark had been removed for herbal medicine

Plate 7: A bicycle carrying bundles of thatch grass from the forest

Plate 5: Confiscated charcoal in Lurambi forest office

Plate 6: Overview of adjacent villages showing houses thatched with grass sourced from the forest

Plate 1 shows women from Isecheno fragment of Kakamega forest carrying home head lots of firewood. Plate 2 and 3 show livestock entering Kaimosi forest for grazing and a debarked tree (for herbs) in Kisere fragment respectively. Plate 4 shows a man in Kuvasali area carrying bundles thatch in a bicycle from Malava fragment of the forest. Plate 5 and 6 show confiscated gunny bags of charcoal in Lurambi forest office and overview of the study area showing huts roofed with thatch from the forest respectively.

It was confirmed from household interviews that there were three organizations involved in the management of different fragments of the Kakamega forest (see Figure 1). These organizations were the Forest Department (FD), the Kenya Wildlife Service (KWS) and the Friends Church Mission (FCM). Table 1 below

shows other products consumed by the community including management organizations at the source.

Table 1: Types and source of NTFPs consumed by households from Kakamega Forest

NTFP consumed/source	% sample households consuming NTFPs			(n=201)
	Forest Department	Friends church	Kenya Wildlife Service	Total (%)
Firewood	38.8	10.9	2.5	52.2
Herbal medicine	24.5	8.1	3.6	36.2
Grazing in the forest	23.4	4.5	1.0	28.9
Charcoal	6.5	0.0	0.0	6.5
Thatch grass	1.5	0.0	1.0	2.5
Cut grass	2.0	0.0	0.0	2.0
Structural materials	0.5	0.0	0.5	1

Firewood, as can be seen from Table 1, is the most dominant product consumed from Kakamega forest by sampled households. This was by 52.2% of the sampled households with the FD being the main source and KWS the least. Households reported use of this product throughout the year particularly as a major form of domestic energy for cooking and other household heating requirements. Apart from the forest, other major sources of firewood reported included household farms (39.3%) and the market (9.5%).

It can also be observed (Table 1) that 36.2% of sampled households residing around the forest indicated using herbal medicine to treat ailments that included respiratory infections, malaria, typhoid, skin infections, urine retention ailments and surgical/physical injuries. FD was also the main source though sections managed by FCM and KWS were other sources of this product.

Grazing in the forest was also reported as being carried out on an almost daily basis throughout the previous year by 28.9% of the sampled households. Some

households though, indicated grazing on specific days of the week such as weekends when labour for grazing was available from school going children. On average, grazing livestock in the forest was carried out for 259 days in a 2006 by sampled households. It was reported that only cows and bulls were permitted in the forest to graze. Although it was not clear to interviewed respondents why this was the case, it was found out that browsing animals were not allowed in the forest because they could degrade young and fragile forest vegetation (Personal Communication with DFO, 2006). Other households especially those within the section managed by KWS (1% from Table 1) reported grazing over the weekend when forest guards manning the forest were not likely to be present.

Those households procuring cut grass from the forest (2%) reported gathering on daily basis and were less likely to take their animals to graze in the forest. Cut grass was mainly used to feed livestock at home. It was revealed that these households did not drive their livestock to graze in the forest mainly because most had one cow on average, which was kept mainly for milk in zero grazing system. Most of these households preferred to feed it at home as it was uneconomical for them to spend a whole day in the forest herding.

Other products sourced from the forest for household consumption were charcoal, thatch grass and structural materials (Table 1). Charcoal was used as a source of energy mainly by households that lived in urban centres such as Kakamega, Lurambi, Malava, Kapkangani and Kaimosi. Structural materials were used to construct shelter and other structures such as fences. Thatch grass was used locally as a roofing material.

Interviewed households further indicated that they were only allowed to obtain NTFPs in the section managed by FD and FCM. It was reported that NTFPs permitted were limited and included firewood, grazing, gathering cut and thatch grass. Any person found with other products (other than above) was arrested and prosecuted in the local courts of law. Extraction from KWS managed section was

completely forbidden and any product obtained from that section was done illegally.

As seen in Table 1, most NTFPs consumed by households were sourced from the section managed by the FD and FCM. In total however, 8.6% of the sampled households reported to have obtained at least one NTFP from KWS section (Table 1).

Results further show that of all NTFPs consumed from KWS section, herbal medicines constituted the highest proportion (3.6%). Those responding indicated that one could easily get herbs from KWS section and this could be attributed to the level of biodiversity protection accorded to this section.

4.2 Quantities and economic value NTFPs accruing to households from the Kakamega Forest

Since it was confirmed that only NTFPs from FD and FCM sections were legally procured, this study focused only on 186 households extracting from fragments managed by FD/FCM. Further, this section only quantifies and estimates economic value of products legally obtained, i.e., firewood, 'livestock grazing', cut grass and thatch.

Table 2 below presents results on estimated quantities of NTFPs consumed by annually households sampled in the study area and their corresponding value based on Direct pricing Method (DPM).

Table 2: Quantities and value (DPM) of NTFPs in KShs⁵ consumed annually per household within Kakamega forest

NTFP	(n=186) % of households consuming NTFPs	Unit of consumption	Mean units consumed/ household	Weight (Kgs)/ unit	Mean consumpti on/househ old	Mean village retail price/unit of NTFP	Std. dev.	Direct annual value /household
Firewood	54	Headlots	70.1	26	1823	65	1.2	4,556
Cows/bulls grazing	30	1*	-	-	259 days	20	0	518
Cut grass	2	Wheelbarrow	24.1	30	723	50	0	1,205
Thatch grass	2	Bundles	1	20	20	47	0	47
Total								6,326

NB: * Measuring quantities consumed by cows during a day of grazing was difficult because extracting this NTFP involved physical grazing of livestock in the forest. Results indicated that each household had a mean of 3 livestock. Kshs 20 was charged by the FD for grazing one cow/bull in the forest for a month.

From Table 2 above, it can be observed that the local community depends on the forest more for firewood. Approximately 70.1 head lots (1823 kgs) of firewood is consumed per household/year in the study area. This product was reportedly consumed daily as it was the only readily available and affordable source of energy for most households.

⁵ During the study period, 1US\$=KShs 69

Direct retail prices of NTFPs identified were also obtained and the average can be seen in Table 2. Estimation of direct value using DPM was done and it was found out that at an average consumption of 1823Kgs per household in 2006, firewood contributed an indirect income of Kshs 4,556 to each household. Cut grass valued at Kshs 1,205 for an average of 723kgs household⁻¹ was the second highest contributor of indirect income to households sampled. 'Livestock grazing' however contributed only Kshs 518 (based on Kshs 20 charge per cow month⁻¹ by the FD) for an average of twelve months grazing in the forest. Thatch contributed the least at Kshs 47 to each household. Based on DPM method, it can be observed that all households sampled relied on the forest for NTFPs worth KShs 6,326 each in the year 2006.

4.3 Value based on cost of collection (CoC) method

73.8% of respondents reported farming as their main occupation whereas 8.9% were self employed mainly in the *boda boda* (bicycle transport) business. Table 3 below gives a summary of main occupations of the sampled household heads.

Table 3: Main occupations of the sampled households

Occupation	% of sample
Farming	73.2
Salaried employment	11.6
Self employment	8.9
Retired/not able to work	6.3

Results showed that respondents spent an average of 8 hours in their different occupations (Std. Dev. of 1.64). Value per hour however varied from one household to another in line with the nature of the household head's occupation. The minimum value per hour recorded was Kshs 8 (reported by a farmer) and the maximum was Kshs 133 (reported by a salaried worker). On average, the value per hour was Kshs 18.2 (Std Dev. 19.8).

The value of NTFP was ultimately determined by the product of value of one hour, time spent to extract a unit and the quantities extracted in a year.

Table 4: Values of NTFPs consumed per household per year from Kakamega forest based on CoC method

NTFP	Units	Units consumed in a year	Average Time spent to harvesting a unit (Hrs)	Total annual harvest hours	Annual Cost of collection value (using Kshs 18.2/hr)
Firewood	Headlots	70.1	3.4	238.3	4337
'Livestock grazing'	Grazing days	*1	2.0	518	9428
Cut grass	Wheelbarrow	24.1	1.3	31.3	570
Thatch grass	Bundles	1	5.0	5	91
Total					14,426

NB: Units consumed in *1 was measured in terms of annual grazing days (*1 mean of 259 in the previous year) because livestock grazed physically in the forest.

From Table 4, it can be seen that livestock grazing and firewood are still important products that consume substantial household time. 3.4 hours are spent to gather a headlot of firewood while an average of 2 hours is spent per day herding livestock. The total number of hours expended by households annually to harvest these products (518 and 238 respectively) is very high compared to other NTFPs. These products further constituted the bulk of value accruing from the forest to households with an average of Kshs 4337 and 9428 respectively. Cut grass required only an average of 1.3 hours to harvest and this product had a value of Kshs 570. Thatch grass took 5 hours of household time annually and this was an equivalent of Kshs 91. In total, each sampled household invested time worth KShs 14,426 annually on NTFPs that met important needs required within their households.

5.0 Discussion

It is evident that Kakamega forest is a critical common resource that is very important in supplying very basic household items, mainly used for livelihood sustenance by surrounding communities. In agreement with other studies such as MFP (2002) and Guthiga et al. (2006), firewood is the widely extracted NTFP from Kakamega forest and was shown to be the only readily available and cheap means of energy to most households.

'Livestock grazing' was also another important NTFP to the community from Kakamega forest. Livestock is a major source of cheap nutrition to many households. Animal products such as meat and milk are important foods necessary for good health. Studies have shown that livestock is regarded highly by rural households particularly because they supply a wide variety of value to rural communities, both as stock and flow of benefits. Livestock further provides critical reserves against financial shocks (Sugiyama et al., 2003), for example, when need for cash to gather for school fees and medical bills arise. It further provides daily cash income to agricultural families through sale of milk and livestock to neighbours without them or processing industries.

Few households (2%) reported extracting cut grass from the forest to feed their livestock as opposed to 30% who preferred to graze their livestock in the forest. Most respondents extracting cut grass from the forest mainly practiced Zero grazing system. It was also found that such households had an average of one cow and spending time in the forest herding was considered uneconomical. Nevertheless, Kakamega forest was still an important source of cut grass that sustained their livestock.

Thatch grass on the other hand was consumed by relatively few households and observations made showed that most shelters of households interviewed were relatively old (see Plate 6). It was also noted that farm holds were small, with an average of 0.9 ha household⁻¹ (MFP, 2002). This could have played a role in

restricting the development of new shelters. Households also observed that they could consider iron sheet roofs if they were to build new houses since this material was more durable and does not need to be replaced quite often like thatch.

From the results, it appears that the nature of NTFPs extracted from the forest by sampled households follows a particular trend of importance. It appears that this hinged on the role it plays within the household and legality (or otherwise) of extraction from the forest. Considering this view, it can be pointed out that firewood was more important to households living around Kakamega forest followed by benefits obtained through grazing of livestock, cut grass and lastly thatch. This argument is also supported by the amount of time spent on extracting them. Livestock grazing consumed an average of 518 hours (valued at Kshs 9428) of household time annually. This time was spread within an average of 259 days in a year. Firewood on the other hand, was extracted averagely once in every five days with household time expenditure of approximately 3 hours (238 hours annually). Both cut grass and thatch required an average time of 36 hours annually. In agreement with Godoy et al. (1995) it appears that households rank the NTFPs they collect (though unconsciously) based on their perception of value accruing from them in terms of their ability to provide equal or more compensation for the opportunity cost of time lost that would otherwise been spent on other economically rewarding occupations.

However, it is also important to note that perhaps other products could be ranking equally high but since their extraction was not legal, households were forced to find other alternatives, including stealing from the forest, to meet their needs and thus their role could not be clearly demonstrated.

This finding is in line with studies done elsewhere in the world that demonstrated that households consumed NTFPs mainly due to its great subsistence role (FAO, 1990; Shackleton and Shackleton, 2006).

FD was the main source of NTFPs though sections managed by FC and KWS were other sources (Mitchell, 2004). This was expected particularly because of the management approaches governing each section. Few households extracted from the KWS section since access was forbidden and those found extracting were arrested and prosecuted.

Although FD/FCM was important source of NTFPs consumed by the community, it is also clear that some households still obtained their NTFPs in the KWS section (Table 1). Mitchell (2004) also made similar observations. It is therefore highly probable that many households could be obtaining products from this section but decided to conceal information since they are aware that it was an illegal activity. This supports other observations (see De Young and Kaplan, 1988) that when communities are compelled to behave in a certain way (i.e., by coercive laws), they tend to react against it. Findings that the NTFPs were also being extracted from KWS section confirms that the local communities were willing to act against the law and take the risk of possible arrest in order to obtain the said products. This reiterates that the utility attained by households by consuming such products supercedes the potential risk of arrest and thus clearly demonstrates the importance of these NTFPs in sustenance of local households and the role of Kakamega forest as an important 'common' resource supplying them. A manifestation of 'reactance' was evident from respondents who decided to break the law in procuring NTFPs from the protected site managed by KWS.

This finding thus demonstrates that households living close to KWS managed sections experience the difficulty of accessing NTFPs necessary for their livelihoods. It also highlights challenges facing implementation of complete prohibition of community access to the forest for NTFP extraction. It also confirms assertions by Lawrence (2003) that complete prohibition of NTFPs harvest could be counterproductive since these products sustain livelihoods and neighbouring communities may resort to unsustainable means to obtain them, thereby resulting in biodiversity degradation.

Similarly, with respect to methods used to estimate economic value, it can be observed that CoC values are comparatively higher than those generated from DPM. This demonstrates the weaknesses of DPM (Godoy et al., 1993) as a method for estimating the economic value of natural resources. Grazing for example, is grossly underestimated at Kshs 518 worth when DPM is applied but shoots 18 times higher when CoC method is used. While the FD charges only Kshs 20 per month of grazing, surprisingly 2 hours of herding daily costs approximately Kshs 36. It can be thus confirmed that value based on DPM conceals a lot of NTFPs value and decisions based on this method may not reflect the reality, especially on the importance of NTFPs to rural communities. CoC method could therefore be a better means of demonstrating the value accruing to households from the Kakamega forest as it considers the opportunity cost of time invested in procuring NTFPs instead of other activities that could have earned households income.

Conclusions

Based on the findings of this study, several conclusions can be drawn. First conclusion is that Kakamega forest is very important in supplying the local communities with NTFPs namely: firewood, charcoal, livestock graze, herbal medicines, thatch grass and structural materials. These NTFPs play vital role in the livelihoods of local community in meeting basic needs that include energy, food, health care and shelter.

Secondly, firewood and livestock grazing are the highly consumed products from Kakamega forest. These products play a critical role within households mainly by supplying domestic energy and sustenance of livestock that provide nutrition to most households.

The two approaches used to estimate the economic value of NTFPs consumed from the Kakamega forest give different values. The CoC approach showed that

NTFPs plays a very important role in the livelihoods of rural households in the study area through an indirect contribution of Kshs 14,426 from Kakamega forest. This underscores the importance of the forest as a 'common' in reduction of poverty among neighbouring communities. This is in line with findings from similar studies such as Adhikari et al. (2004) and Agrawal (2007). It is also clear that researchers who will base their conclusions on DPM would most likely declare that NTFPs in the Kakamega forest are of low value whereas those using CoC method would appreciate their importance.

Finally, it is evident that the community can potentially derive a higher utility through consumption of a diversity of products from the Kakamega forest. However, due to existence of restrictive laws, they have been forced to limit the types and quantities of NTFPs consumed (FD/FCM sections) or not to benefit at all (KWS section). There is also evidence that despite the presence of these regulations, some members of the community still obtain these products. This may in a way demonstrate the degree to which household need such products. Because of extraction restrictions, studies such as this can not fully account the extent of reliance on NTFPs by households. This thus conceals the actual role common resource forests play in sustenance of rural livelihoods. It also results in the underestimation of the role such resources since values, for example, those presented in this study are based only on what was obtained legally from the forest.

6.0 References

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