Rural households' response to Fuelwood scarcity around Kakamega Forest, Western Kenya

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Abstract

The debate on forest degradation in Kenya is mainly concerned with the utilization and exploitation of forest resources. Of particular interest is fuelwood, whose scarcity is a major forest degradation concern. Fuelwood gathered from the forested commons is the most important source of domestic energy in the rural areas of many developing countries. For the case of Kakamega, as shown by this study, there is a declining trend in the availability of fuelwood. Despite this state, rural households still depend largely on it for energy provision in the face of limited options constrained by low capital base. This study sought to examine how these households cope with the existing scarcity of fuelwood. The study employed both primary and secondary sources of data. For primary data, a total of 140 households were selected and interviewed using semi-structured questionnaires. Response mechanisms were analyzed through descriptive methods by looking at collection attributes, use patterns and fuel saving technologies applied by households. Majority of households in Kakamega have resorted to planting trees on their own farms to ease problems of fuelwood shortage. Findings further reveal that households in their endeavor to circumvent the problem of continued scarcity, have resorted to poorer quality tree/bushes for fuelwood, alongside other innovative methods of responding to the fuelwood scarcity. With improved economic well being, households become less reliant on forests for their livelihoods. Since reduced forest reliance is positively related with reduced demand for forest products, the findings suggest complementarities between strategies aimed at poverty alleviation and those towards forest conservation.

Key words: Fuelwood scarcity, rural households, Kakamega Forest, response

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1. Introduction

In the developing world, forests contribute in important ways to the well-being of many rural populations, providing many products and services. These populations often rely heavily on forests for goods such as wood for fuel, fodder for livestock, building materials among others. Forests also act as reservoir or catchments for rivers and streams. While forest use is nearly ubiquitous in the developing world, the degree of forest dependence varies considerably across households. For some rural households forests are a main source of livelihood, for others they serve primarily a supplementary role or as a safety-net in difficult times (Warner, 2000). Understanding why dependence on forests differs across households is important for both forest conservation and poverty alleviation. Households that are heavily dependent on forests are an important source of forest degradation and tend to be quite vulnerable to the effects of forest decline. Thus there exists a "vicious circle" in which the rural poor are both agents and victims of resource degradation (Cleaver and Schreiber, 1994).

In Kenya, forests occupy a paltry 2.8% of the total land area (Byron and Arnold, 1999), but despite the relatively small forest cover, there is a high dependence on forest for provision of wood and non-wood products. As noted by Mogaka et al, (2001), it is estimated that about 3 million people living adjacent to forests in Kenya depend on them for provision of households' wood and non-wood products needs. In the rural economy, fuelwood use cannot be separated from other aspects of local production system, and fuelwood scarcity is part of a wider development problem. The rural poor live in a biomass based economy in which local land resources provide for the bulk of their survival needs. Wood and trees are an integral part of this economy; however, with a declining trend in wood availability, these rural economies are bound to harness a combination of strategies for adaptability purposes.

In recent years, forest degradation in Kenya has spawned great interest, important debates, and demonstrations as well as litigations. These stem in part from the magnitude of degradation and the role that human activities have continued to play on the overall state of the environment in Kenya. Strategic natural resources such as wildlife, soil and forests are being lost at a rapid rate (Bondi and Mugabe, 1996). Much of the forest loss is attributed to clearing for agricultural uses and the insatiable demand for forest products. In Kenya, it is estimated that wood provides about 73 per cent of total energy consumption, mainly as fuelwood for cooking and heating in rural areas, and as charcoal in urban areas (Bess, 1989; GoK, 1997). The current annual supply of fuelwood in the country is estimated to be 18.7 million tonnes. The trend of consumption of fuelwood in Kenya has been shown to vary with ecological zones (Hosier, 1985; Kituyi et al., 2001). However, due to degradation, the per capita consumption of fuelwood declined by approximately 40% and 50% respectively, between 1981 and 1995. This prompted the speculations that fuelwood may have become scarcer in the intervening periods (Nyang, 1999).

Due to this scarcity of fuelwood, and considering that rural households have to continue meeting their cooking energy requirements, coping strategies or mechanisms have been

sought by different households. Rural households develop different strategies to cope with decreasing fuelwood availability. Several responses may be undertaken by different household members at the same time or sequentially, as part of the same overall strategy. Most responses aim to meet actual stress, only some aim at prevention of worse effects in the future (for example, the planting of trees). Continued scarcity may lead to among other things the reallocation of household labour to increased search for forest products.

The rapid shrinking of Kakamega forest implies reduced supplies of forest goods and services to the local households. Fuelwood is the most extracted forest product. It is also the most important non-commercial domestic fuel energy in rural Kakamega (Kiplagat, 2007). KIFCON (1994) estimated the offtake of fuelwood at 100,000 m^3 per year. The declining trend of fuelwood has led many rural households to adapt different mechanisms to ensure continued supply of their domestic energy requirements. Response mechanisms applied by households have remained unclear, with some studies done already giving contradictory outcomes. The current study therefore sought to look at what mechanisms are applied by rural households in response to scarcity.

2. Materials and Methodology

2.1 Study area

The study site for this survey was around Kakamega Forest, situated in Kakamega District in Western Province of Kenya. It lies North East of Lake Victoria between latitudes 00°10'N and 00°21'N and longitudes 34°47'E and 34°58'E at about 1600m a.s.l. The forest covers an area of about 154.8 sq. kilometers out of which 15.92 sq. km is plantation forest while the rest is under natural forest. The 1994 welfare monitoring survey carried out in Kenya showed that 52% of the population in the district lie below the poverty line meaning that they can hardly afford basic necessities like food, shelter, clothing, education and such like amenities (Republic of Kenya, 2002). Kakamega Forest holds unique biological resources (flora, fauna and avifauna), which have been seen to share similar characteristics with those of the western African equatorial rainforests.

2.2 Livelihood activities in the study area

The study area employs the majority of its inhabitants within the agriculture sector (GoK 2002), with most of them being small-scale farmers. In fact 80% of the population lives in rural areas, and 62% of all households generate their income from agriculture. At the same time the district suffers from extreme demographic pressure with an annual population growth rate of 2.12%. Therefore, with 76% of the district's area being under agricultural cultivation and an additional 11% being covered with (gazetted) forest, an extension of cultivated areas seems impossible. This fact, combined with district poverty rate of 52%, shows the importance of exploring ways to facilitate secure incomes for households living on small-scale farming.

Studies by among others Guthiga and Mburu (2006) have showed widespread dependence on the forest by the local people who obtain firewood, thatch grass,

medicinal plants and also graze in the forest. Incidences of illegal logging, charcoal burning and hunting of small animals in the forest are also reported cases. All these activities add-up to the daily livelihood engagements of the peasants. The current study however found that labour markets especially for forest products are dysfunctional or thin. For instance the main forest product-fuelwood-attracted no standard unit price, in all the zones visited, this prompted the study to use a derived shadow price approach to get the market value of fuelwood.

2.3 Data collection

Data used for this study was collected from study sites for the Biodiversity Monitoring Transect Analysis in East Africa (BIOTA-EA) Subproject E13 between March and May 2007. The target population involved households living within approximately 5 km radius around the forest. The distance was purposively chosen for convenience since an earlier reconnaissance survey had indicated progressively fewer people extract beyond 5km stretch from the forest (Guthiga and Mburu, 2006). A census of households carried out with the help of administrative village heads and other local leaders generated a sampling frame consisting of approximately 34,000 households residing within approximately 10km radius of the forest. A random sample of 378 households was generated. The sampled households were randomly interspersed in the study area and across three management regimes. The three management regimes in Kakamega forest are the Kenya Wildlife Service (KWS), Forest Department (FD) and the Quakers Church Mission (QCM). From the random sample generated by the project, a total of 140 households were selected. Semi-structured questionnaires were used to elicit information on households' socio-economic characteristics, own-farm, forestry and other off-farm activities.

2.4 Data analysis techniques

This study draws upon descriptive methods of analysis. Descriptive methods were computed for collection strategies and use patterns of fuelwood by the rural agricultural households in Kakamega district.

3. Results and Discussions

The demographic variables used in the analysis are reported in Table 1. They include age of the household head, gender, main occupation, education level of head, household size among others.

Table 1: Demographic variables

Household characteristic	Unit of measurement	
Household head	Male	76%
	Female	24%
Age of head	Mean years	52
Main occupation	Farming	70%
	Salaried work	10%
	Self employment	7%
	Retired	7%
[4]Education level of head	Primary	62%
	Secondary	26%
	Post secondary	12%
Household size	Mean	5
Fuelwood source	Purchase	9%
	Free	70%
	Both free/purchase	21%

Source: Author's survey (2007)

Table 2 indicates collection strategies as reported by the respondents.

Table 2: Collection strategies applied by households

Strategies		Unit of measurement
Collection source	Own-farm	65%
	Forest	35%
Trees on-farm	Yes	99%
	No	1%
Collection frequency	Daily (%)	58
	Weekly	32
	Monthly	10

Source: Author's survey (2007)

Studies by Lung and Schaab (2004); Kiplagat (2007); both showed a larger percentage of households depending on fuelwood as the main source of domestic energy for cooking. When asked about how they responded to the unavailability of fuelwood, majority of them (65%) refocused their attention to collection from own-farms. The highest percentage, 99%, noted that they resorted to having trees on their pieces of land. It can thus be presumed that fuelwood shortage has triggered on-farm tree planting. Households noted that conservation activities were important contributors to the supply of fuelwood. Trees were seen as a long term investment, and with proper management a given stand of

[4] Education was reported in terms of number of years spent schooling. Those who reported 8 years and below were categorized into primary level; 9-12 years secondary; and 13 years and above post-secondary

trees can yield an output in the form of tree products such as pole wood, leaves, timber, and fuelwood for long periods of time.

Due to scarcity, households increased collection frequency in order to ensure sustainable supply of fuelwood. The frequency of collection was 58% on a daily, 32% on weekly, and 10% on a monthly basis. Due to scarcity, whenever households went out to fetch fuelwood in a day, hardly did they gather enough to last them for a long time. This prompted many households to collect on a daily basis.

Table 3 presents the effects of distance to collection sites on the frequency of collection.

Table 3: Collection frequency from different distances

		Dist1	Dist2	Dist3
Frequency	Per day	26(32%)	10(12%)	5(6%)
	Per week	16(19%)	9(11%)	8(10%)
	Per month	4(5%)	2(2.5%)	2(2.5%)

*Dist1 indicates a distance of <1.5km from the forest, Dist2 is 1.5-3.5km and Dist3 is >3.5km.
Source: Author's survey (2007)

At dist1, the frequency of collection for all the three categories is high, but this decreases with increasing distance. With increasing distances to collection sites, households tend to re-focus their attention to other, nearby sources, preferably own farms. Based on findings from Shiverly and Fischer (2004); Cooke (1998b) and Adhikari (1996) who reported that as fuelwood collection distances increase, frequency of collection from the same sites declined with households eventually refocusing there attention to nearby sites, the same argument was pointed out by households in Kakamega as a response to scarcity.

With regard to fuelwood use patterns, respondents indicated that due to scarcity, they supplemented fuelwood with other energy sources. In this respect, four different fuel mixes were identified[5]. These are given in Table 4.

Table 4: Fuel mixes in households

Fuel mixes	Proportion of households (%)
Fuelwood	74.4
Fuelwood and Charcoal	17.1
Fuelwood, Charcoal and Kerosene	4.9
Fuelwood and Kerosene	3.6

Source: Author's survey (2007)

The proportions indicate the percentage of households using a particular fuel mix. The higher percentage depending on fuelwood further supports the earlier argument on heavy dependence on this energy source by households. Similarly, as reported by Nyang (1999), the mix of fuelwood and charcoal comes second in terms of energy source for most rural

[5] Fuel mix is the combination in which a household uses different fuels.

households in Kenya. This shows a heavy reliance by rural economies on the natural resource base. Notably missing is the use of electricity or even liquefied petroleum gas (Lpg); indicating clearly that households depend entirely on natural resource base for their energy source.

The desirable attributes of these fuels were; cleanliness in combustion and handling, ease of handling, ease of availability and affordability. The use of lpg requires a consumer to have a gas cooker (in some instance) which may be a simple gas table or a more elaborate cooker including an oven; as well as a gas cylinder and a regulator which connects the cooker to the cylinder. Similarly the use of electricity would require that households get connected with electricity and buy electric cookers or cooking equipments. However, due to the cost implications associated with these two energy sources, rural households have limited options other than natural fuel sources (fuelwood and charcoal). An interesting analysis that one would like to carry out is the scenario of increased cost of fuelwood acquisition- both in terms of time and distance to collect. In such cases, it would be ideal to imagine that households will switch to electricity or lpg. But before such a conclusion is made, it is important to account for the cost of both alternatives. Being rational in their decisions, rural households will switch to a different alternative as long as the opportunity cost of acquiring it is lower than of the former. If the opportunity cost of using electricity is lower then households will switch to it and vice versa.

Another response strategy was the switch to poorer quality wood with no specific preference, for particular wood species. However, during times when fuelwood was in abundance wood preference existed. But since scarcity began, the only way to ensure one does not miss out on this energy source was to collect it from any tree species. Coupled with this was the switch to other poor quality fuelwood forms like agricultural residues. Fuel-saving or demand-reducing technologies were also mentioned as strategies adopted by households in coping with diminishing availability of fuelwood. Among the mechanisms mentioned include; complementary and simultaneous use of fuelwood with cow dung for cooking or retrieving half-burned fuelwood.

Table 5 explains percentages of household members' engagement in fuelwood collection activities.

Table 5: Household members' involvement in fuelwood collection

Household member	Proportion involved in %
Male adults	8.5
Female adults	55
Children	10.9
Hired Labour	9.8
Female adults and Children	4.9
Female adults and hired labour	6.1
Children and hired labour	1.2
Female and Male adults	2.4

Source: Author's survey (2007)

Fuelwood gathering activities were mainly undertaken by adult females in the household. From Table 5, it is shown that of the household members involved in collection, 55% were female. This complements findings by Cooke (1998b), Mahiri (2003), Kumar and Hotchkiss (1988) and Brouwer et al (1997). The adult male was least involved; and equally few households' involved hired labour in this activity. Children were also found to be less involved in this activity. Adult members of the household reported that since the inception of free primary education, many children were in school hence the low turnout in domestic activities. However, during the weekends or on school holidays, they are available to assist with household duties.

4. Conclusion and policy implications

This study has described and analyzed the responses to decreasing fuelwood availability among rural households in Kakamega District. It has demonstrated that rural households have evolved diverse ways of responding to the fuelwood scarcity. The objective that guided this study has been achieved through descriptive analysis. Responses to fuelwood scarcity were examined by looking at collection attributes, use patterns and fuel saving strategies applied by households. The study results indicate that 99% of households in Kakamega have planted trees on their farms. All those interviewed asserted that on-farm tree planting was resorted to as a result of declining availability of fuelwood from the forests where people used to collect from. This was more evident by more than 65% of respondents noting that currently they entirely collect their fuelwood from own farms. The findings reveal a link between on-farm conservation practices and the supply of fuelwood. Households in Kakamega appreciate trees as a long term investment, and with proper management a given stand of trees can yield an output in the form of tree products such as pole wood, leaves, timber, and fuelwood for long periods of time.

The households were suffering fuelwood problems, although conditions in Kakamega still compare favorably with other parts of the country. Fuelwood is essentially still regarded a "free" good by the population and very little fuelwood is actually purchased. Although households had to go further away to collect it, the extra costs and sacrifices were not as high as to people resorting to pay for the wood. For the same reason, the role of household income is not opportune in the present case. Nevertheless, it appears that under these conditions people have increased collection efforts, economize on fuelwood use, resorted to on-farm tree planting and shifted to lesser quality fuel. Since agricultural residues make a significant contribution to the energy needs of rural households, and no significant link has been established between their use as fuels and deterioration in environmental quality, their use should be encouraged. Households are already using them, the government should show the way by providing a framework for the promotion of their use.

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