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RESEARCH ARTICLE

FACTORS INFLUENCING FUELWOOD SCARCITY AMONG RURAL HOUSEHOLDS IN LURAMBI DISTRICT, KAKAMEGA COUNTY, KENYA

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ABSTRACT

Rural households, especially those in the developing world, rely on fuelwood for provision of energy for cooking and lighting. This study, carried out in Lurambi District, Kakamega County, examined factors influencing fuelwood scarcity among rural households. Data was collected from 200 households using sysematic random sampling technique, with the main tools for data collection being a standardised questionnaire and a Key Informant Interviews checklist. The findings of the study indicated that 95% of the households used fuelwood and that 84% of them experienced fuelwood scarcity. Further, the findings showed that lack of communal collection points and reducing land sizes have contributed to fuelwood scarcity. The study concluded that socio economic and environmental factors have contributed to fuelwood scarcity among rural households in the district.

INTRODUCTION

Fuelwood plays a major role in supplying energy to rural households in developing countries especially for cooking, heating and use in rural industries. It has been estimated that 2.4 billion people worldwide rely directly on traditional biomass fuels and that in poor countries biomass use presents over half of residential energy consumption (IEA, 2009). The demand for fuelwood is exacerbated by agricultural expansion and deforestation. In Asia, fuelwood comes from plantations. In Latin America fuelwood is no longer the primary source of energy for rural populations as it is used mostly for industrial purposes (Tobin, 2011). In the 19th Century, wood was used as a principle source of energy, even in North America and Europe and has since been replaced by more efficient and convenient alternatives such as gas and oil (Arnold, 2003). A study carried out on the wood energy situation in Bangladesh indicated that fuelwood scarcity is as a result of overuse and unsustainability of fuelwood production (Akther, 2010). In the Eastern African sub-region there is a wood fuel deficit especially in densely populated highlands in Central and Western Kenya. Research shows that there is a widening gap between supply and demand for woodfuel (Mahiri, 2002). Due to an annual population growth rate of 2.8% and available land being put to agricultural use, fuelwood sources have been on the decline in many areas of Kenya. This has resulted in a situation where demand outstrips supply thereby having far reaching impacts on the environment and livelihoods of the community (NEMA, 2007).

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MATERIALS AND METHODS

Study area

The study was carried out in Kakamega County which is located in Western Kenya. The County borders Bungoma County to the North, Trans Nzoia County to the North East, Uasin Gishu and Nandi Counties to the East, Vihiga County to the South, Siaya County to the South West and Busia County to the West. It comprises of nine constituencies and six Districts. It lies between longitudes $34^0$32"E and $35^0$30" East of the prime meridian and latitudes $0^0$30" North and $0^0$15" North of the Equator (Fig. 1). There are six administrative Districts comprising twenty seven locations and ninety seven sub-locations covering a total area of 3051km^2 (GoK, 2005).

Sample and Sampling procedure

The target population comprised of rural households in Lurambi District with emphasis on the household as a unit of data collection. With a population size of more than 10,000 households, the formula by Daniels (1999) was used to get a sample of 200 households. A random sampling technique was used for the villages where four villages were selected. These included Lubao, Sichirayi, Bukhungu and Shimala Vanju. The researchers carried out Systematic sampling within four villages to obtain 200 households. In this method, the total

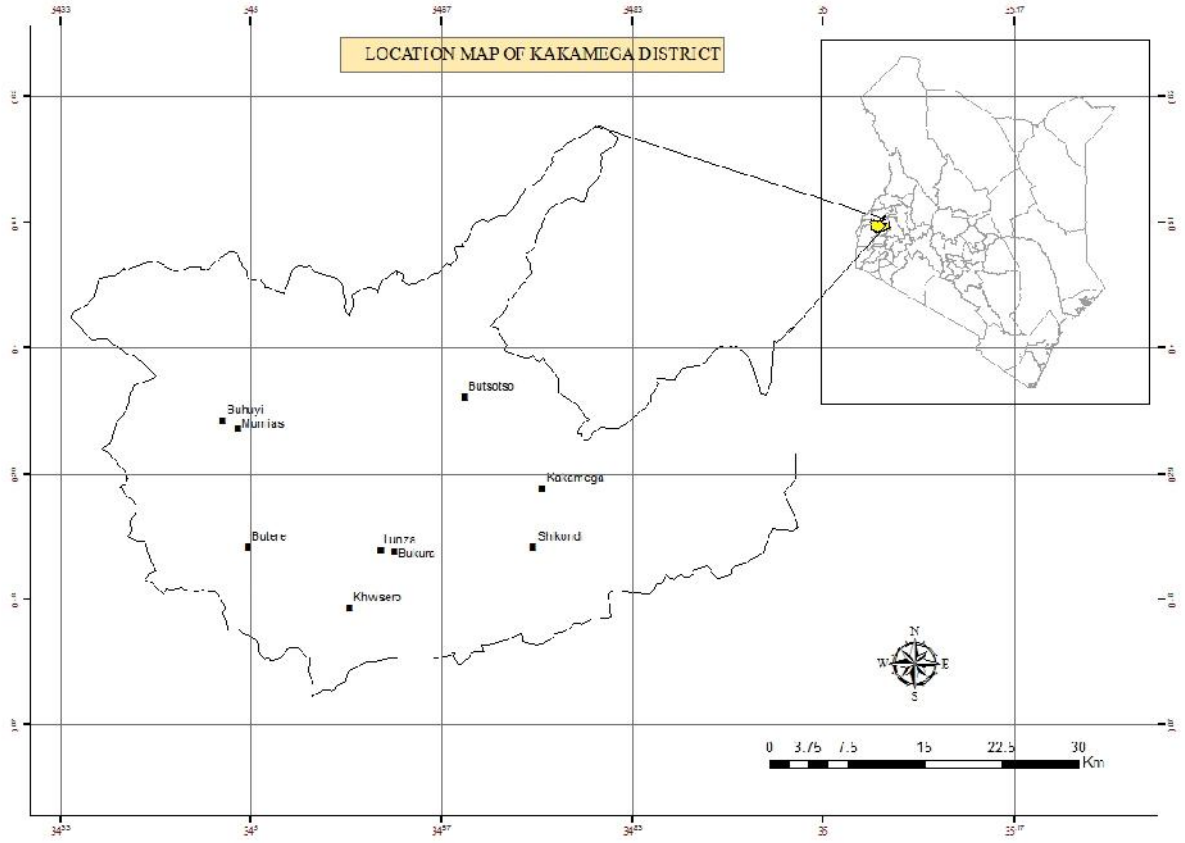

Figure 1. Location of Kakamega District

number of households in the villages was divided by the sample size to determine each of the households selected.

Data collection

Data collection involved the use of a standardized questionnaire that was administered to the households. The household head as the main respondent. The questionnaire involved structured and unstructured questions. Structured questions contained all possible alternative responses from which the respondents were able to select an answer. Where it was impossible to exhaust all categories, the study included a category of 'other specify' to take care of those responses. Data collection also involved the use of a checklist for key informants. The checklist was used to collect data from 8 key informants. Besides, an observation checklist was designed that captured the storage of wood fuel, type of fuel being utilised and woodlots planted.

Data Analysis

Data was subjected to analysis through the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were used to analyse fuelwood scarcity at the household level. Frequency of scarcity was cross tabulated with socio-economic and environmental factors to establish occurrence of any relationships between the variables. Results from the analysis were presented in tabular and graphic form.

RESULTS

The results indicated that fuelwood is used by 95% of the households of which majority, 84%, experienced fuelwood scarcity. A good number of households, 33.5%, experienced fuelwood scarcity on a monthly basis, 24.5% on a weekly basis and 21.5 % on a daily basis (Fig. 2).

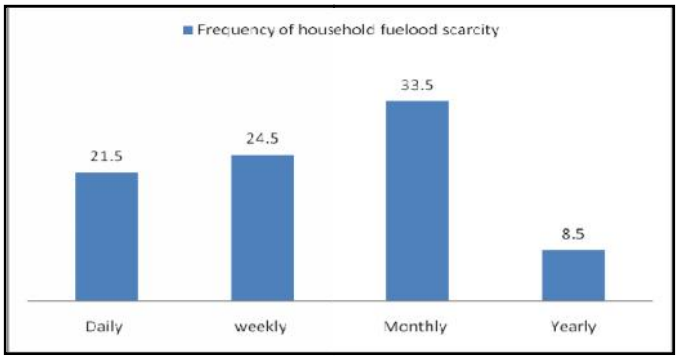

Figure 2. Frequency of Household Fuelwood scarcity among Households in Lurambi District

The results indicated that land size and ownership have an impact on the availability of fuelwood. Land ownership in the District is mainly freehold as indicated by 89% of the households in the study. Reduced land sizes within the District have made the land prone to agricultural intensification and overexploitation thereby leading to land degradation. Small scale farms dominate the area. This land can hardly remain fallow to enhance its regeneration capacity and soil fertility levels. This intensification also discourages the setting aside of land for tree planting as the focus is more on agriculture. Households own less than two acres of land due to increased land sub-division. The relationship between land use and fuelwood use is also statistically significant with p at 0.01.

This indicates that increasing changes in land use and increased fuelwood exploitation are contributing to fuelwood scarcity among households in Lurambi. Those with smaller pieces of land are forced to venture out of their own land parcels in search of firewood as they hardly have enough fuelwood within their farms. Chi square test showed a statistically significant relationship between land use and distances covered while collecting fuelwood i.e. $X^2=0.05 = 0.149$ which indicates land use patterns over time have had an impact on the distances covered to access fuelwood within the households. Overexploitation of fuelwood and the distances covered to access the wood also have a statistically significant relationship with $x^2=0.05 = 0.193$. Depletion of fuel wood due to overdependence on-farm sources forces people to travel long distances to access fuel wood

Land use and cost of fuelwood $x^2= 0.05 = 0.164$ are statistically significant as changes in land use such as conversion of land into agriculture and the depletion of the available tree cover has led to an increase in the cost of fuelwood. Fuelwood that was initially considered a 'free' resource is increasingly difficult to acquire thereby an increase in demand overriding supply leads to an increase in its prices.
In the study it was observed that 34% of the households rely on Kakamega forest for provision of fuelwood. This is a Government forest reserve and there are restrictions in access to the forest though collection of deadwood is allowed. Reduced access to common collection points has contributed to fuelwood scarcity within Lurambi as 47.5% of the households had access to communal collection points, while 52.5% of the population had no access to communal collection areas due to increasing land fragmentation and privatization.

Table 1. **Cross tabulation between tree planting and sources of fuelwood**

Sources	Tree planting		Total
	Yes	No	
Onfarm	46	1	47
Twigs/bushes	38	7	45
Forest	61	7	68
Market	29	11	40
Total	174	26	200

Cross tabulation between trees planted and the sources of fuelwood (Table 1) indicated that majority of households that collected fuelwood from on-farm sources and forest also planted trees to supplement what was being gathered in the forest. In this study, 67% of the households derived their fuelwood from sources outside the forest including figs and bushes and purchasing their fuelwood from the market. Indicates that there is increasing unavailability of fuelwood in the District as households are forced to use what is easily available in order to cater for their energy needs. Due to restrictions in access to the forest, households are increasingly depending on fuelwood sources outside the forest.

Table 2. Cross Tabulation of Tree Planting and Land Sizes

Land size	Tree planting		Total
	Yes	No	
<2 acres	148	25	173
3-5 acres	26	0	26
6-10 acres	1	0	1
Total	175	25	200

There exists a positive relationship between tree planting and land sizes within households in Lurambi District. Those households that have smaller land parcels i.e. less than two acres invested in tree planting. The same also applies to those with larger land parcels. In the study, it was observed that 87% of the households owned less than two acres of land. Of land in Lurambi is freehold; households have property rights and are able to invest in trees in order to supplement the use of fuelwood within the home repeated.

DISCUSSION

In this study, 95% of households interviewed depended on fuelwood for their household energy needs. These findings compare favourably to a study by Githiomi (2011) analysing household energy sources and utilization techniques through structured questionnaires among households in Maragua District, Kenya, where it was found that 96% of the households relied on firewood as a source of energy. This dependence on fuelwood has a direct impact on the environment as demand outstrips supply thereby leading to the overexploitation of the available resources. According to findings in the study, 66% of fuelwood is sourced from outside the forest (23.5% from on-farm sources, 22.5% from twigs and bushes, and 20% from markets) while 34% of the households get their fuelwood from the Kakamega forest. These findings are in line with an analysis of biofuel consumption patterns in the Northwestern highlands of Ethiopia where a structured household survey was carried out among 133 households; it was found that 26% accessed the fuelwood from privately owned farms (Bewket, 2005). In this study, 22.5% of the households derived their fuelwood from figs and bushes and 20% purchased their fuelwood from the market indicating that there is increasing unavailability of fuelwood in the District as households are forced to use what is easily available in order to cater for their energy needs.

Among the respondents 84%, noted that they experienced fuelwood scarcity. This result favourably compares with Akther (2010) findings, in a study where an exploratory survey was carried out to analyse the reasons for fuelwood scarcity and adaptation techniques in Brahmaputra, Bangladesh. The study found out that 94% of the households had experienced fuelwood scarcity. Land size and ownership have an impact on the availability of fuelwood. Land ownership in the District is freehold (89%) and only 6% is communal land meaning much of the land is privately owned (Beyene, 2011). There is a relationship between property rights and household demand for fuelwood which is measured by the source from which fuelwood is collected. Reduced land sizes within the District have made the land prone to agricultural intensification and overexploitation thereby leading to land degradation. Poverty plays a role in influencing fuelwood scarcity among households as households that fell in the lower income bracket relied on fuelwood for their energy needs. In times of scarcity, these households could hardly afford other alternatives that are deemed more expensive. It can be concluded that there is a positive relationship between fuelwood scarcity and income sources thereby poverty contributes to fuelwood scarcity. The Cypress, Eucalyptus, Cedar, Guava tree species are used as fuelwood among the households. The Guava and Mango trees have multiple benefits as they provide fuelwood if harvested properly and also supply fruits to the household. Some of the

households also used the avocado tree for fuelwood. The Avocado tree does not provide a good source of fuelwood and thus its use is associated with fuelwood scarcity. Households relied on the use of fruit trees during scarcity due to their availability. This is comparable to a study by Bensel (2007) addressing connections between fuelwood, deforestation and land degradation that saw an increase in mango trees planted in Cebu, Philippines for fuelwood. It was also observed that fruit trees are very popular for firewood, as they are easily available in the farms.

Conclusions

One of the factors influencing fuelwood scarcity in Lurambi is reduced land sizes where cash crop and subsistence farming is practised thereby leaving little space to plant trees. These changes in land use have also impacted on the distances travelled to access fuelwood as open access areas have been converted into private use, thereby contributing to the scarcity of fuelwood. Rural households are reliant on fuelwood for their energy needs, most of these households can hardly afford any other alternatives to fuelwood and thus available wood resources are depleted at a faster rate without putting in place measures to ensure sustained fuelwood production. Therefore the focus should be on sustained fuelwood production at the household level to cater for the increasing demand for fuelwood.

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