Fuelwood Gathering and Use in Northern Kenya

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Abstract

As formerly nomadic populations settle in arid and semi-arid areas of northern Kenya, there is increasing concern about the environmental impact of such settlement. In particular, such settlement places intense pressure on woody vegetation in the areas surrounding the settlement. This study points out that the environmental impact of sedentarization can result not only from the localized pressure of fuelwood gathering, but also due to dietary shifts associated with town life. Both market and food aid aspects of this dietary shift are illustrated. It is shown that changing the form of food aid distribution can have a beneficial impact on both women's labor effort and the environment.

Introduction

The process of pastoral sedentarization in the arid and semi-arid lands of northern Kenya is a relatively recent phenomenon. Many of the towns in this area were no more than small trading and water points until the late 1960's (Sobania, Robinson, O'Leary, Fratkin). The rapid population growth in these towns is associated with both "push" factors, such as the loss of animals in droughts and increased insecurity due to the proliferation of automatic rifles, as well as "pull" factors, such as labor, education, and health opportunities available in towns (McPeak and Little, Smith et al).

There is concern that such settlement places intense pressure on the fragile resources surrounding these towns (IPAL). There is growing awareness that much of the environmental degradation in arid and semi-arid Africa is localized, rather than widespread, in nature (Dodd, Turner, McPeak). Frequently, one of the most visible aspects of degradation is the loss of woody resources in areas surrounding these key resource areas (Keya, Moss).

This study was designed to develop an understanding of the nature of fuelwood gathering patterns and use in three lowland sites in northern Kenya. The vast majority of households in northern Kenya cook by burning wood gathered by household members in a traditional three stone fire. The study was designed to elicit information on labor patterns in fuelwood gathering and the use of wood that was gathered.

The study was also designed to gain insight into how changing consumption patterns influences fuelwood use. As formerly nomadic households settle, they often switch from an animal product based diet to a grain based diet. This can occur because animal products are no longer as available to the household, for example a household that

settled due to animal loss is no longer able to drink milk from the household herd each day, or due to increased availability of grains, for example a household that is closer to a market selling grain or a food aid distribution point. Of particular interest with regard to this point, the study was designed to illuminate how the form of food aid distribution impacts fuelwood use in the study area.

The outline of this study is as follows. The following section describes the larger project of which the fuelwood study was a component. The three study sites where data were gathered are also described, as is the data gathering methodology. In section three, summary statistics on fuelwood gathering patterns are presented. In section four, we consider fuelwood use patterns. Section five summarizes the findings, and section six concludes.

PARIMA and the study sites

This article draws on research that has been conducted by the Pastoral Risk Management Project (PARIMA) of the Global Livestock Collaborative Research Support Program.[1] Beginning in March 2000, thirty households in each of six locations in Kenya and five locations in Ethiopia were interviewed after each three months over a period of two years. In between rounds of these repeated surveys, additional survey components were fielded. This study draws on both the information contained in the repeated surveys and on the fuelwood survey component.

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[1] The GL-CRSP project is a collaborative effort of Utah State University, the University of Kentucky, Cornell University, Egerton University (Kenya), and the International Livestock Research Institute (ILRI). It addresses the causes and consequences of different types of risk among pastoralists; the means by which herders manage--economically, environmentally, and culturally--endemic and periodic risks; and the grassroots initiatives by herders to address the difficulties associated with high levels of risk.

The fuelwood study involved visiting each of the thirty sample households in the sample once each day over the course of a week. Detailed information on any fuelwood gathering that had taken place in the past 24 hours was recorded. In addition, households were asked to report anything they had cooked in the past 24 hours, and estimate ingredients, cooking times, and the quantity of wood used in cooking. Household wood inventories in terms of the number of sticks in the house and the weight of the wood were recorded each day. Households were also asked to report any fuelwood marketing or lending activity they completed in the past 24 hours. Finally, they were asked about any other fuels they used for cooking in the past 24 hours.

The fuelwood survey was fielded between August and September 2000 in the three Kenyan lowland sites of Kargi, Logologo, and North Horr.[2] **Kargi** is a Rendille settlement approximately 75 kilometers to the west of Marsabit town in a flat, arid basin. Mean annual rainfall in the Kargi area is 200mm. Kargi residents mostly conduct market activity in Kargi town, although they make occasional use of Marsabit markets. No cultivation is practiced in this area. Over the past 20 years, formerly nomadic Rendille have settled around the town center in clan groupings. Rendille in the Kargi area keep small herds in the area around town and rely on young men to stay with the remainder of the herd in highly mobile satellite camps. They keep relatively large numbers of camels and goats and it is not unusual for their camps to move several times during a season.

Logologo is an Ariaal settlement approximately 40 kilometers south of Marsabit town on the main Isiolo – Marsabit road. Mean annual rainfall in this site is around

[2] The descriptions of the study sites presented below are drawn from "Cursed if you do, blessed if you do: the contradictory processes o pastoral sedentarization in northern Kenya" by John McPeak and Peter Little.

250mm. Ariaal are a group that mixes elements of Samburu and Rendille culture (see Fratkin 1991). Logologo residents utilize markets in both Marsabit town and in Logologo town. Rain-fed agriculture is possible in the higher areas of this location, and a very small amount of small-scale irrigation is practiced in town. Most households in Logologo settled there in the 1970's following a series of poor rainfall years and herd losses. Logologo households no longer move the whole family with their animals. Instead, they keep small herds in the area around town and send the majority of their animals to satellite camps in the surrounding rangelands.

North Horr is a Gabra settlement approximately 200 kilometers west of Marsabit town on the northern edge of the Chabi desert. Mean annual rainfall in this area is around 150mm. Most market activity takes place in North Horr town, although residents do make occasional marketing trips to Marsabit town. No cultivation is practiced here. Many Gabra are nomadic in the traditional sense, as households move their house and household belongings to new areas with their animals with some frequency. However, the time between these moves is becoming longer and the area covered by these moves is becoming smaller as Gabra slowly appear to be moving toward the satellite camp based system of their Rendille neighbors. Gabra also keep relatively large numbers of camels and goats in their herds.

Fuelwood Gathering Patterns

Female household members gather fuelwood in this area almost without exception. A male conducted only one of 238 recorded fuelwood gathering trips. Adult females as well as female children are involved in this activity. Further analysis of the

demographic data will provide a fuller picture of the division of labor between different age groups.

Fuelwood gathering is not normally an everyday activity. Over the course of a week, the average household conducted fuelwood gathering trips on 2.7 days, or roughly 40% of the days. The average household in North Horr gathered firewood more frequently (3.3 days per week) while the average household in Kargi gathered wood less frequently (2.3 days per week). The data give the impression that many household follow the pattern: gather enough wood to last for two or three days, if possible borrow a day's worth of wood from neighbors when the gathered wood is finished, then go and collect again.

In all cases recorded, fuelwood gathering took place in only one place on a given day. However, in many cases, more than one species was gathered in that place. On average, 1.6 species were gathered per trip. The average number of species is highest in Logologo, 2.2, and lowest in North Horr, 1.0, with Kargi intermediate at 1.6.

The average trip length per day was three hours. Kargi residents spent the most time per trip, 4.5 hours on average, and Logologo households spent the least time on average, 2.1 hours per trip. As most of the sample households reside in towns, this indicates that the fuelwood gathering points are not very distant from the residential settlement. We can confirm that fuelwood gathering does place intense pressure on the woody resources in the area surrounding the towns of the study area.

The average weekly total spent on fuelwood gathering was 8.2 hours. Households in the two more arid sites of North Horr and Kargi spent significantly more time gathering wood per week on average than did households in Logologo. The Kargi mean

is 10.5 hours per week, the North Horr mean is 8.7 hours per week, and the Logologo mean is 5.5 hours per week.

The average number of sticks gathered per trip was 47.6, with Logologo slightly more than this average (54.1) and Kargi and North Horr slightly less (43.8 and 45.3 respectively). When multiple trips over the course of a week are summed, the average household gathered 131.0 sticks of fuelwood. The average Kargi household over the course of a week gathered significantly fewer sticks, 102.2, than the average Logologo household that gathered 147.0 sticks, or the average North Horr household that gathered 148.0 sticks.

For each day, the household inventory of fuelwood was weighed and counted. On an average day, a household had 18.7 sticks and an average weight of 11.8 kilos. Dividing each day's total weight by the total number of sticks, we can calculate the average weight per stick of 0.98 kilos. When the different sites are compared, we find the mean stick weight in Kargi is above this average at 1.1, while in North Horr and Logologo it is below it at 0.9. However, these differences are not significant at the 5% level. If we adopt the approximation that one stick weighs one kilo, we can calculate the average weight of the firewood load per day reported on the previous page. A rough estimate is 45 kilos per trip, or around 100 pounds.

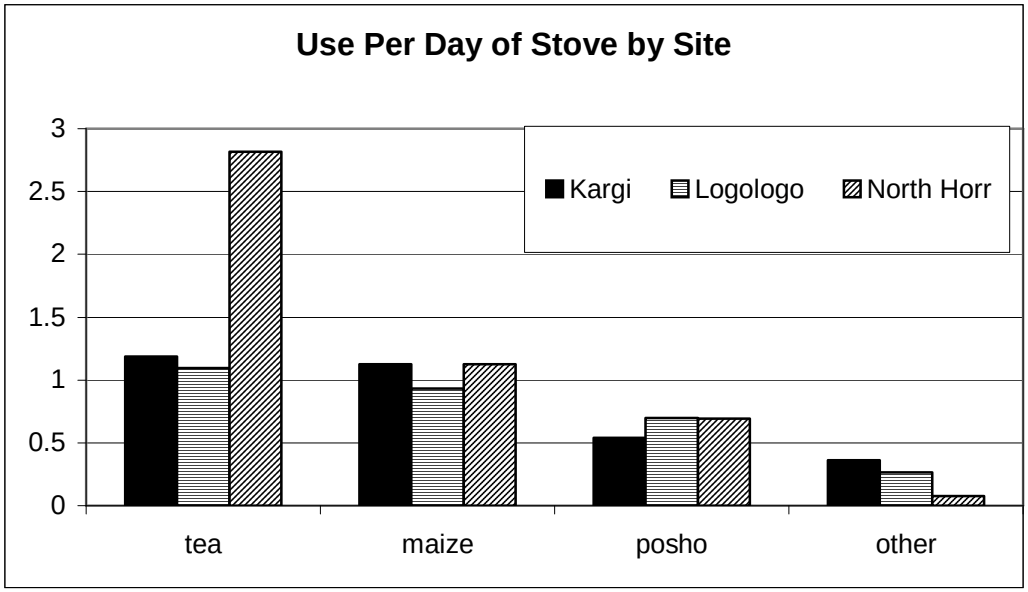
As alluded to above, households also obtain fuelwood from sources other than gathering. For 16% of observations, households borrowed fuelwood from other households. When they borrowed, the average amount borrowed was 9 sticks. Households also occasionally purchase fuelwood. For 10% of observations, households purchased wood. When they purchase, the average amount purchased was 9 sticks,

bought at an average cost of 2 ½ shillings per stick. Finally, households obtaining charcoal or other fuels account for less than 1% of observations. Clearly, household members gathered the vast majority of wood used by the sample households.

Fuelwood Use Patterns

A separate part of the survey form recorded information on all meals cooked by the household each day. Households used their stoves on average 3.6 times per day. North Horr households used their stoves significantly more than the other two sites (4.7 times per day compared to 3.2 for Kargi and 3.0 for Logologo).

The average household used the stove to cook tea 1.7 times per day, followed in frequency by meals containing unshelled maize 1.1 times per day, maize flour based meals 0.6 times per day, and other meals 0.2 times per day. When we consider the use to which the stove was put during the course of a day, we find that the difference between North Horr and the other sites largely reflects the higher frequency with which tea is prepared in this area in comparison to the other two areas. This can be seen in the following figure.

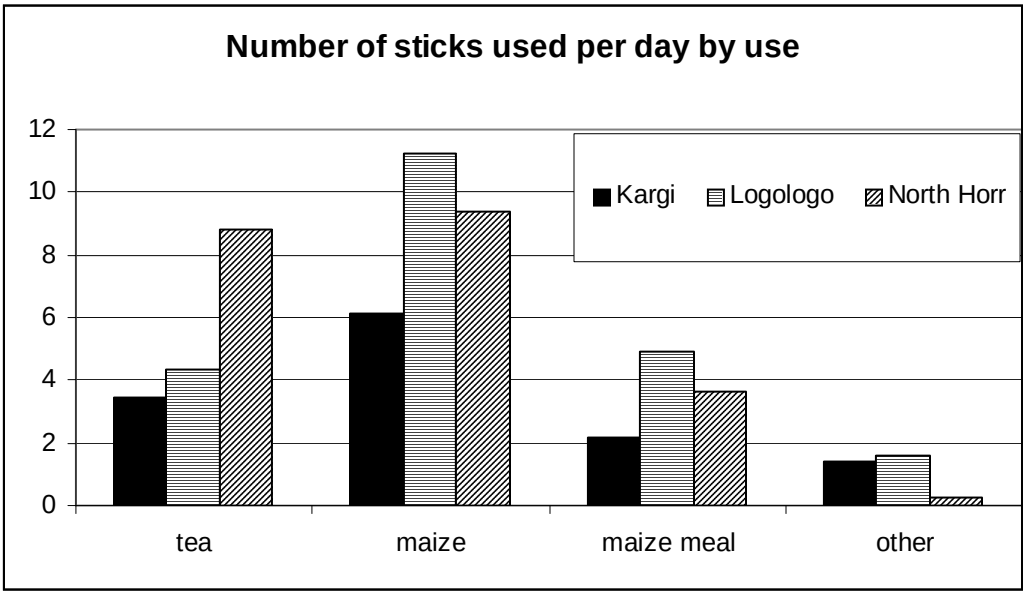


The average household used 19.0 sticks per day for cooking (approximately 19 kilos per day). The average number of sticks used by Kargi households, 13.2, was significantly lower than that used by North Horr and Logologo households, 22.2 and 22.0 respectively.[3] Recall that it was reported above that the average Kargi household gathered less wood per week than the average household in the other two sites. This agrees with the current finding that Kargi households use less wood per day for cooking.

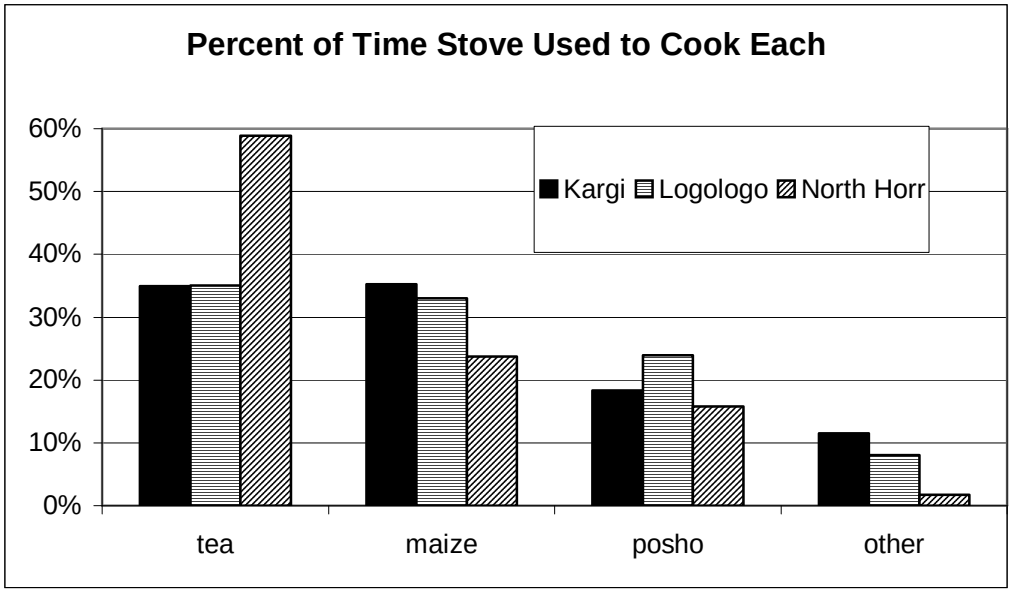
We can gain some understanding of the increased demands for fuelwood brought about by switching from a animal product based diet to a maize based diet by investigating the number of sticks used per day for each type of meal. From the overall sample, we find that the largest number of sticks per day, 8.8, was used in cooking meals based on unshelled maize. Tea used the second largest number of sticks per day on

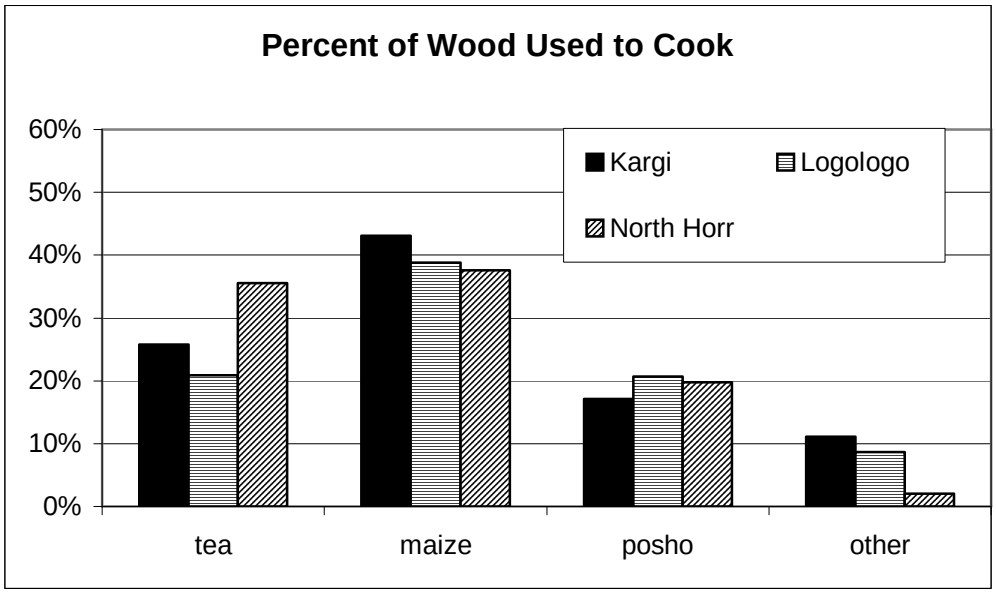
[3] Annualizing the amount of wood gathered per week and annualizing the amount of wood used per day give reasonably similar estimates of total annual use. In Kargi, the average household uses 5000 kilograms of wood per year, while in North Horr and Logologo the figures are around 8000 kilograms. An important extension of this work would be to assess the ecological sustainability of this level of use, which would require further ecological data.

average, 5.5. Maize flour based meals used 3.6 sticks per day on average, followed by all other meal types, with 1.1 sticks per day. The following figure illustrates how these overall averages vary by site.



An alternative perspective on fuelwood use can be obtained by contrasting the percent of times the stove was used to cook a particular type of meal with the percent of total daily fuelwood use required to cook this particular type of meal. Overall, we find that while 43% of times the stove was used, tea was cooked, the wood used for this purpose only accounts for 27% of total daily fuelwood use. In contrast, although 31% of uses were to cook meals based on unshelled maize, these meals used 40% of fuelwood. Interestingly, meals based on ground maize account for 19% of meals and used a similar percentage of total daily fuelwood use. These patterns can be brought out in the following figures.





Discussion

Further analysis of the data will be required to verify the main arguments of this paper. However, it does appear that the process of sedentarization has a two-fold impact on fuelwood resources. The first is a localization of pressure on woody resources in areas

surrounding towns. The second, subtler, aspect is the shift from a diet based on animal products to a maize based diet.

The first impact is illustrated in that only a few households in the sample move the household in a truly nomadic way. Households in this area have largely settled. As the fuelwood gathering trips they take are on average only a three hour round trip from town, settlement has placed intense pressure on resources around town.

With regard to the second impact, consider that for the period in which the fuelwood data was gathered, the average Kargi household had 5.1 liters of milk per day from their household herd, the average North Horr household had 2.5 liters, and the average Logologo household had 1.2 liters per day. Part of the explanation for why Kargi fuelwood use is lower than is found in the other two sites (recall that Kargi households used on average 13 sticks per day compared to 22 per day in the other two sites) is that Kargi residents rely more on milk from their herds to meet their consumption needs.

In contrast, consider the average amount spent on grains per two-week period by the average household in each of these three sites. The average Logologo household spent 225 shillings, while the average North Horr household spent 99 shillings, and the average Kargi household spent 17 shillings. When we contrast Logologo to the other two sites, we can see that more fuelwood is used in this site to cook maize and maize meal than in the other two sites (16.1 sticks per day versus 13.1 in North Horr and 8.1 in Kargi). At the level of cross-community comparisons, higher reliance on marketed food products is associated with higher fuelwood use. Further household level analysis should help develop this line of argument.

We can further explain patterns of fuelwood use when we recognize that not all maize comes from the market in this area. During the period under study, all of the households in Kargi and Logologo were receiving food aid, and 90% of North Horr households received food aid. Food aid packages in this area are predominantly unshelled maize, with smaller amounts of beans, peas, unimix, and oil provided occasionally. The amount received varied by site during the time the fuelwood data was gathered, with the average Kargi household received 7 kilograms of maize per month, the average Logologo household received 27 kilograms of maize per month, and the average North Horr household received 21 kilograms of maize per month. Over the course of the year following the fuelwood study this general pattern of food aid distribution continued, as Kargi households received an annual total of 92 kilos of food aid maize, Logologo households received 277 kilos, and North Horr households 237 kilos.

The data presented above suggests that meals based on unshelled maize use proportionately more wood than meals based on ground maize. To explore this issue further, enumerators in early 2002 conducted a cooking experiment with households in each of the three study sites. While this data is still coming in, preliminary results indicate it takes approximately 2 times as much wood (in kilogram terms) to cook unshelled maize as it does to cook an equivalent weight of ground maize. One kilogram of unshelled maize requires 1.9 kilograms of fuelwood as opposed to the one kilogram of fuelwood it takes to cook one kilogram of maize meal.

Using the approximation that each kilo of food aid distributed as unshelled maize requires one more kilo of fuelwood than if this had been distributed as ground maize, we can calculate that distributing ground maize would bring about a 2% (Kargi) to 4%

(Logologo) reduction in the amount of wood required per household for cooking over the course of a year.

From another perspective, we can calculate that if the food aid distributed in the study sites between July 2000 and June 2001 was distributed as ground maize it would have reduced the amount of time women spend gathering fuelwood annually by between 1% (Kargi), and 6% (Logologo).

Conclusion

As formerly nomadic populations become increasingly sedentarized, fragile ecosystems surrounding settlement points are put under strain. In particular, the woody vegetation surrounding towns in arid and semi-arid areas is placed under heavy pressure due to the demands of town residents for wood to use when cooking.

This study indicates that a different aspect of the increase in fuelwood demand results from dietary shifts that are associated with sedentarization. As households move from an animal product based diet to a maize based diet, fuelwood demands increase.

An intriguing implication of this study is that demands on both women's labor time and the environment could be reduced if food aid was distributed in the form of ground maize rather than as unshelled maize. Cooking ground maize requires roughly half the amount of fuelwood needed to cook an equivalent amount of unshelled maize. As the form of food aid distribution is largely in the hands of the donor community, this would appear to be a relatively simple intervention that would lead to benefits in this area. While the magnitude of the impact is not overwhelming, at least it is in the right

direction, and is indicative of greater gains in areas (or time periods) where food aid packages are larger.

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