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WOOD FUELS CONSUMPTION AND COOKING PRACTICES IN SELECTED SITES OF LOWER SHABEELLE, BANAADIR AND GEDO REGIONS OF SOMALIA

By

Melinda Smale
Michelle Savoie
Zahra Cabdi Shirwa
Moxamed Cali Axmed

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CONTENTS

I. EXECUTIVE SUMMARY AND RECOMMENDATIONS 1

Executive Summary 1

Recommendations 5

II. SITE DESCRIPTION 9

Lower Shabeelle 9
Population Characteristics 9
Climate, Topography, and Soils Characteristics 16
Charcoal and Fuelwood Marketing Patterns 16

Muqdisho 18
Population Characteristics 18
Charcoal and Fuelwood Marketing Patterns 28

Gedo 31
Population Characteristics 31
Climate, Topography, and Soils Characteristics 33
Charcoal and Fuelwood Marketing Patterns 34

III. LOWER SHABEELLE RESULTS: REFUGEE CAMP AND NON-REFUGEE VILLAGE 34

Community Perceptions and Responses to Wood Fuels Scarcity 34

Household Survey Results: Cooking Practices 37
Income Source, Consumption Units, Cooks, and Foods Prepared 37
Stove Types, Utensils, and Location of Stoves 41
Non-Cooking Uses of Stoves 47
Cooking Attitudes and Suggested Stove Modifications 48

Household Survey Results: Fuel Use 48
Fuel Types and Species 52
Collection and Purchase Patterns 54
Daily Expenditures, Fuel Expenditures, and Fuel Consumption 59

IV. MUQDISHO RESULTS 61

Community Perceptions and Responses to Wood Fuels Scarcity 61

Household Survey Results: Cooking Practices 64
Income Source, Consumption Units, Cooks, and Foods Prepared 64
Stove Types, Utensils, and Location of Stoves 66
Non-Cooking Uses of Stoves 74
Cooking Attitudes and Suggested Stove Modifications 75

CONTENTS (cont'd)

Household Survey Results: Charcoal and Fuelwood Use ...75
Fuel Type and Purchase Patterns 75
Daily Expenditures, Fuel Expenditures, and Fuel Consumption 78

V. GEDO RESULTS: REFUGEE CAMP, NON-REFUGEE VILLAGE AND MARKET TOWN 82

Community Perceptions and Responses to Wood Fuels Scarcity 82

Household Survey Results: Cooking Practices 85
Occupations, Consumption Units, Cooks, and Foods Prepared 85
Stove Types, Utensils, and Location of Stoves 86
Non-Cooking Uses of Stoves 88
Cooking Attitudes and Suggested Stove Modifications 88

Household Survey Results: Fuel Use 94
Fuel Types and Species 94
Collection and Purchase Patterns 94
Daily Expenditures, Fuel Expenditures, and Fuel Consumption 102

VI. SUMMARY AND COMPARISON OF SITES 103

Cooking Practices and Preferences 105

Fuel Use, Collection, and Expenditures 107

Major Statistical Results 110

References 111

APPENDIX A: Methods 113

APPENDIX B: Fuel Consumption Estimates: Hypothesis Tests, Moisture Content and Regression Results 119

APPENDIX C: Cooking Methods for Foods Cited in the Household Survey, by Zahra Cabdi Shirwa 129

APPENDIX D: Questionnaire and Critique of Questionnaire 133

APPENDIX E: VITA Enumerators 151

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I would also like to express my gratitude to the members of the VITA staff in Muqdisho whose patience and ingenuity were a source of inspiration to me. I thank especially Zahra Cabdi Shirwa, Moxamed Cali Axmed and Michelle Savoie, whose energy was inexhaustible and whose work was accomplished with great care. Finally, I thank Jim Steward and Maria Giannuzzi for the thoroughness with which they prepared the final document.

I. EXECUTIVE SUMMARY AND RECOMMENDATIONS

EXECUTIVE SUMMARY

Objectives and Use of Data

The goal of the National Woodstove Program is to conserve Somalia's wood resources through the development and distribution of fuel-efficient cookstoves. To develop suitable, acceptable stove models for the Somali population, a survey on cooking practices and wood fuels* consumption was conducted during the initial phases of the program.†

The survey has three principal objectives. The first objective is to compile descriptive data on current stove models, cooks' preferences, and cooking techniques. VITA technicians will use this descriptive information to develop marketable stove prototypes. The second objective is to provide fuel consumption estimates for project sites. These estimates can be used to calculate the costs and benefits of the stove program, as a means to evaluate its progress. Fuel consumption estimates are also of interest to forestry project planners who forecast wood fuel demand. As a third objective, VITA's survey estimates are intended as a contribution to a national data base which can be used by other donor and national agencies concerned with wood scarcity.

An added benefit of the VITA survey was the training of stove extension workers and socioeconomic counterparts in formal data collection and interviewing techniques. The use of extension agents as enumerators proved successful from the standpoint of both the data collection and the stove project. By participating in data collection, the extension agents could learn about community concerns and adapt to working with community members. In a formal interview setting, they learned quickly how to place the respondent at ease. Through a desire to ensure the success of the stove extension program, the VITA extension workers had a vested interest in collecting their data thoroughly. In practice, many of the interview problems could be and were resolved in the field by enumerators and socioeconomic counterparts, rather than by expatriate supervisors.

Method

The method used to observe, collect, and analyze data predetermines the type of information released from the data. To meet the comprehensive needs of the project, the survey instrument was written in Somali and included both formal and informal questionnaires.

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* Fuels derived from wood, i.e. charcoal and fuelwood.

† The survey was conducted from July to December 1983.

The informal questionnaire was used in group meetings with elders, women's committees, and fuelwood and charcoal cooperative members. Questions were worded to encourage discussion of community perceptions of wood fuels scarcity, strategies for adapting to rising fuel costs through changes in cooking practices, and suitable techniques for promoting or marketing cookstoves. The group meetings preceded the formal questionnaire, and served the dual purpose of providing the survey team with essential background information while introducing the survey method and the enumerators to community leaders.

The formal questionnaire was designed for use in a household survey, with the unit of observation defined as the number of persons for whom the head cook usually prepares meals. The respondent was the head cook, or the person responsible for choosing the kind and amount of foods cooked and the fuel used.

The formal questionnaire consists of three sections. The first series of questions addresses the composition of the consumption and cooking units, stove type, frequency of boiling water and preparing tea, use of embers after cooking, and stove maintenance requirements. Head cooks were also asked to state their cooking problems and suggest stove modifications to remedy these problems.

The second series of questions concerns fuel and wood species use and preferences, collection and purchase patterns, and fuel expenses as a proportion of daily cash expenditures. Head cooks were also asked whether they had modified their cooking practices or fuel use in response to increasing fuel costs or collection time.

The third component of the questionnaire is a procedure to measure the amount of fuel consumed in cooking, boiling water, and preparing tea. Enumerators asked the family to set aside a separate fuel pile for cooking needs. For five successive days, the enumerator weighed the fuel pile with a spring balance and tabulated the net weight change per day. The enumerator also cut a sample of wood or charcoal from the pile and identified the wood species. Wood samples were dried in a laboratory, and average moisture content was calculated for the purpose of adjusting consumption figures.

Sample sites were selected within project areas. Random or systematic sampling techniques within refugee, non-refugee village, and urban subgroups included both list and geographical sampling frames. In Muqdisho (Mogadishu), segments were selected within administrative sections* according to housing characteristics. The survey team interviewed each household within a segment. Under cost constraints and in the absence of accurate population figures, sample sizes were set at approximately 30 households per subgroup, for a total of 100 observations in Lower Shabeelle, 90 observations in Gedo, and 90 observations in Muqdisho. In Muqdisho, joint research conducted with Hubert Laux provided data for an additional 60 households.

* Muqdisho's sections are geographical and administrative divisions within the city.

Results

Although most staple foods consumed in the survey sites were livestock products and dishes prepared from sorghum, corn or wheat flour, the relative importance of specific foods and the composition of the diet differed notably among sites. The composition of the refugee diet in both the Gedo and Lower Shabeelle camps is determined by the ration food basket provided through CARE.

There is less variety in dishes prepared by refugee cooks, and although beans are not a preferred dish, they are often substituted for meat. Reflecting the refugees' lower purchasing power, meat and pasta were cited less frequently in the camps than in non-refugee villages. In the non-refugee agricultural villages of Lower Shabeelle, **muufo** (a corn or sorghum bread) was cited more frequently as a staple grain. In the Gedo non-refugee sites, **canjeero** (a light pancake) was the staple grain product, and meat and milk figured more heavily in the diet. In Muqdisho, pasta dominated other porridge and grain dishes.

A wide variety of indigenously produced and imported cookstoves are used by Somali women. Many of the cooks surveyed used two or more stove types. The predominant model used in the Lower Shabeelle villages and refugee camps was the ceramic stove, produced by potters' villages located near the regional capital of Marka. Two stoves were unique to Lower Shabeelle non-refugee villages: the **muufo** stove, and a large stationary model designed and built by local women. In Muqdisho sites, the most frequently used stove was the soapstone, produced and marketed by the Ceel-Buur soapstone cooperative. Auxiliary stoves used by Muqdisho women include three-stone, kerosene, metal, table, gas, and electric stoves. The three-stone model was the most frequently cited stove in the Gedo sites, although women in the market town of Luuq use soapstone models during the rainy season.

Portability is a critical stove feature in all sites. In rural areas and refugee camps, stoves are moved to a sheltered location or inside the home during rainy periods. In the more urban locations of Luuq and Muqdisho, where houses are designed with cooking shelters and courtyards, stoves are moved according to ventilation or space needs and the direction of the wind. Only in Golweyn, a settled agricultural village, and in Muqdishu, an urban site, were stationary stoves used by cooks.

In contrast to the variety in stove types, utensils and cooking techniques appear fairly uniform across sites. All women used lids while cooking. The majority of women in all sites except the non-refugee villages of Lower Shabeelle used metal rather than clay pots. The only pot specific to a dish was the **canjeero** pan, and the only stove specific to a dish was the **muufo** stove. Other pots and stoves were suitable for any cooking purpose.

Non-cooking uses of stoves and fuel varied across sites. More non-cooking uses were cited in non-refugee areas, where women used the stove to burn incense, fry coffee beans, and clean milk containers.

Water was boiled for washing or for making tea two or three times a day. Smoke was used in the Lower Shabeelle camps as a mosquito deterrent.

At present, procedures for maintaining or repairing stoves are not widespread. Only a few of the women mentioned maintenance practices, and few proposed stove modifications. To many of the women, especially those surveyed in Muqdisho, no aspect of cooking was considered to be particularly burdensome. Refugee women, of whom a larger proportion collect their fuel and who spend a greater amount of time in collection, are most concerned about this aspect of cooking. Non-refugee women in both the Lower Shabeelle and Gedo sites ranked smoke and heat as their greatest difficulties. Fire hazards were also considered a problem among the Gedo women. For both Lower Shabeelle and Gedo cooks, cooking time was considered least important. With the exception of heat, Muqdisho women gave all cooking problems less important ratings than the women in Gedo and Lower Shabeelle.

In Muqdisho, charcoal was the major fuel type used year-round, with fuelwood used occasionally to cook large quantities on the three-stone fire. In the roadside villages of Lower Shabeelle, charcoal was used only in the market town of Luuq. In Luuq, charcoal was purchased primarily during the rains and consumed in combination with fuelwood. In Cir Kud, the refugee camps, and the isolated agricultural villages of Lower Shabeelle, fuelwood was the major fuel type used year-round. During the dry seasons, crop residues were also used in combination with fuelwood in the agricultural villages of Lower Shabeelle.

In both Gedo and Lower Shabeelle regions, a higher percentage of collectors were found among refugee households. In Lower Shabeelle, all refugee collectors were women transporting fuelwood by backload. Non-refugee collectors included men transporting by cart as well as women transporting by backload. In Gedo, refugee women collected by backload and non-refugee women collected by donkey load or backload. In both Gedo and Lower Shabeelle sites, refugee women collected more frequently and for longer periods of time than non-refugee women. The number of cooks purchasing fuelwood was limited in the refugee camps, and these cooks purchased less regularly, or both collected and purchased. In non-refugee sites, the majority of cooks purchased fuel only.

Data on fuel purchasing frequency and expenditures were converted into daily fuel expenditure figures for all households purchasing fuel. Daily fuel expenses were then calculated as a proportion of daily cash expenditures. Cash expenditures included water, food, kerosene, charcoal, and fuelwood requirements. At all Muqdisho sites, the fuel share of expenditures averaged 11 percent. At Lower Shabeelle and Gedo sites, the fuel share of daily expenses averaged 14 to 16 percent and 8 to 10 percent, respectively.

Several factors may explain the difference in the level and composition of expenditures between non-refugee sites in Gedo and those in Lower Shabeelle. In informal discussions and group meetings, Luuq

women described inflationary pressures resulting from the large influx of refugees and the provision of refugee services in the area. The composition of the diet as well as the proportion of purchased food items in the diet may also differ between regions. In Lower Shabeelle sites, a larger proportion of food may be home-produced. Seasonal factors also contribute to different expenditure levels. Data was collected from interviews conducted during the short dry season in Lower Shabeelle, and during the short rainy season in Gedo.

Average per capita fuelwood consumption equaled 0.999 kilograms per day over Gedo sites and 1.136 kilograms per day over Lower Shabeelle sites, unadjusted for moisture content. At Muqdisho sites, per capita charcoal consumption averaged 0.817 kilograms per day. Regression results do not indicate that any particular weighting method is required to adjust averages for the age composition of the household.

Hypothesis tests on fuelwood consumption estimates suggest that households in the market town of Luuq consume at significantly different levels than households in the village of Cir Kud or in Maganey refugee camp. Differences in consumption between Cir Kud and Maganey households are not observable. This statistical evidence is corroborated by other survey findings. Daily cash expenditure levels are considerably higher in Luuq than in Cir Kud and Maganey. Most households purchase fuelwood in Luuq while the majority collect in Cir Kud and Maganey.

In Muqdisho, the data support the hypotheses that mean charcoal consumption is equal in Hodan and Wadajir, as well as in Hodan and Xamar Weyne. Mean consumption figures appear significantly different for Wadajir and Xamar Weyne subgroups. The Wadajir subgroup, representing a less affluent mix of households, appears to consume at a higher level than the Xamar Weyne subgroup. The lack of an observable difference between Hodan and Wadajir estimates may indicate that income differences are not great between selected sites, or that factors other than income are critical in determining average levels of consumption.

For Lower Shabeelle sites, statistical tests do not support the hypothesis that refugee and non-refugee subgroups consume fuelwood at different levels. This result may reflect the breadth of the population represented by the cluster of villages from which non-refugee data were drawn. The variance in fuelwood consumption figures is relatively high within the non-refugee group. When other factors affecting fuel consumption are combined in regression analysis, or when refugee and non-refugee consumption is compared after controlling for other factors, differences may prove statistically significant.

RECOMMENDATIONS

General

There can be no assurance of quality in large-scale production of stoves unless particular groups specialize in stove production, and a stove program cannot become self-supporting until households are

willing to pay the price for a quality product. By selecting a strategy of larger-scale production and marketing rather than owner-built production, the program can both protect standards of quality and encourage local enterprise. Extension activities remain important as a means of promoting stoves and educating women on stove use, maintenance, and fuel-conserving cooking techniques.

The success of any marketing effort will depend to a large extent on the cash available to households and the existence of a marketing infrastructure in a community. A case in point is the refugee household. Women in the camps spend a large part of their day collecting wood and preparing food. The appeal of a new, high-quality stove is great when women have few means by which to relieve the drudgery of their camp life. Improved stoves therefore have an intrinsic value to refugee women in addition to the benefits of fuel savings and increased cooking safety. However, refugee camp life is characterized by a high degree of uncertainty and risk. The limited investment in housing demonstrates that even where the means exist, the inclination toward investment over consumption may not. The prospect of paying a high price for a stove that will offer future benefits may not be attractive to refugee women. As a result, the response of refugee women to marketed stove will depend on the progress of resettlement and income-generating programs. If economic opportunities develop in the camps, cash for expenditures and investment will increase. Otherwise, the success of any stove program may be limited. A history of free distribution of goods and services in the camps adds another dimension to the problem. Although the survey findings suggest that refugee women could benefit substantially from the introduction of improved cookstoves, stove promotion may be more successful in non-refugee sites.

Two survey findings are of fundamental importance in plannig stove extension and marketing strategies. First, the breadth in stove models used by Somali women represents a somewhat unique finding relative to other African countries in which stoves have been promoted. The variety of indigenous models benefits the stove program in two respects. Technicians can build upon existing stove models, creating designs which improve the fuel-burning efficiency without altering attractive and acceptable characteristics. In addition, the project can draw on existing experience and resources in producing and marketing stoves, by working with such groups as tinsmiths, the soapstone cooperative at Ceel-Buur, and the Potter's villages of Lower Shabeelle.

The second important finding is that cooking practices and preferences are particular to a project site. Although the VITA program is national in scope, extension and marketing strategies must reflect distinctive site characteristics. The site-specific recommendations that follow are based on survey results on stove models and cooking practices, cash expenditure levels, and women's attitudes toward cooking.

Lower Shabeelle Sites

In the settled agricultural villages of Lower Shabeelle, stove prototypes which burn fuelwood or both fuelwood and charcoal should be developed from the portable ceramic model. Although these prototypes should be developed for use with clay as well as metal pots, a special **canjeero** pan design is not justified. In the future, stove technicians should experiment with improvements to both the **muufo** and stationary Golweyn designs. The **muufo** stove, a type of oven, consumes a large amount of fuelwood and should be modified to increase its fuel efficiency. Because their housing structures are more permanent and they cook a wide variety of dishes, women in the settled farming communities are likely to be receptive to an improved Golweyn stationary model with several pot holes and a chimney.

Given the agricultural marketing economy of the area, many households are expected to have cash available to purchase stoves. However, the ceramic stove currently in use is one of the lower-priced indigenous models. Results of group interviews suggest that, if cooks are to substitute a new ceramic model for the current one, price differentials should be minimal at the commencement of the program.

Most women interviewed did not feel that fuel costs or collection time represent an important cooking problem. If price differences are great, it is doubtful that these women would consider paying the additional cost solely on the basis of savings from reduced fuel use. Although extension workers can influence women's perceptions through educational programs, promotion should highlight the benefits of reduced smoke emission, heat, or fire hazards instead of reduced fuel consumption. **Tuulo** councils, elders, and women's committees appear to be the most suitable forum through which to introduce the new stove models.

In the Qoryooley refugee camps, development of portable ceramic stove prototypes is also justified by survey results. In the refugee camps, more women prepare **canjeero,** and prototypes should be adapted to suit the **canjeero** pan. Although the refugee households presumably have less cash to spend than non-refugee households, refugee women frequently collect their fuelwood and are more concerned about fuel consumption. Rather than proceed under the assumption that families are unwilling or unable to purchase stoves, the program might begin by promoting a stove comparable in price to the popular ceramic stove. In Qoryooley, where Save the Children extension workers have established agricultural and forestry committees among refugee households, the stove program might promote the stove through community groups on the basis of fuel savings. The stove program could be organized to complement ongoing forestry activities.

The effects on indigenous stove producers of mass production and marketing of an improved ceramic stoves should be investigated. The cookstove program represents a unique opportunity to encourage the development and expansion of the indigenous pottery industry, benefitting greatly the women potters who make up this industry. Presently, the

training program for potters requires a lengthy apprenticeship. Before establishing a competitive industry, the project should investigate ways to incorporate the expertise and marketing channels employed in the potter's villages.

In both refugee and non-refugee sites, food preparation programs should accompany stove promotion efforts. The purpose of food preparation programs, which are best perceived as group meetings rather than training programs, is to develop methods for conserving fuel through modified cooking practices. Women might discuss methods for conserving embers or reducing cooking time of staple dishes by altering food preparation.

Most of the women interviewed did not practice or perceive the need to practice maintenance procedures. When introducing new stove models, extension workers should devote considerable effort to ensure proper maintenance.

Gedo Sites

In the Gedo sites, where most women use the three-stone fire, the introduction of a stove that must be purchased is likely to be more difficult. A portable model appears more suitable than a stationary one. Although a design with several pot holes is not necessary, a model which is suitable for cooking **canjeero** is essential.

The higher cash expenditure levels in Gedo sites may reflect inflationary pressures or a different consumer basket rather than greater purchasing power. While many of the Luuq women use soapstone stoves, it is doubtful that the majority of refugee and village women in Gedo could afford to purchase a model as costly as the soapstone. However, if the new stoves can be produced locally, the transport component of stove costs can be eliminated from the purchase price.

In Luuq, promotion strategies which emphasize stove appearance, heat, and smoke reduction may be more successful than those focusing on fuel savings. A stove which burns both charcoal and fuelwood may be more suitable for promotion in Luuq. In the other villages, promoters should emphasize decreased fire hazards and smoke emission. In all areas, education on stove use and the importance of stove maintenance is critical.

In the refugee camps, the project should continue to work with mud/cement designs which are built and extended by local women. Although the major way to ensure uniform stove quality is production and sale by artisans or trained personnel, project experience reveals that a shift from a no-cost to a priced stove will be difficult to achieve in the Gedo refugee camps. Women are nevertheless aware of the fuelwood problem and are burdened by the high cost of fuel purchase or collection. While continuing to em-phasize the fuel savings associated with the new model, extension workers should concentrate on training women to maintain and repair their stoves (Smale and Savoie, 1983). When the

performance of the stove is decreased by poor stove condition, the likelihood of widespread stove adoption diminishes.

Muqdisho Sites

The Muqdisho promotion strategy should focus on stove appearance and reduction of heat emission rather than fuel savings or other benefits. For Muqdisho cooks in particular, the status appeal of a new, attractive stove will outweigh the importance of conservation features. Although the women interviewed recognize fuel scarcity as a national problem and perceive rising fuel costs in their daily expenditures, they will appreciate the benefits of fuel savings only as a result of continued educational and promotional efforts. The women's committees in Muqdisho provide a setting in which to begin instructional and promotional programs.

The high rate of actual fuel consumption relative to the fuel-burning capacity of the popular soapstone model indicates that a large proportion of charcoal may be consumed by wasteful cooking practices or by non-cooking uses. As in other sites, educational and promotional activities should be supplemented by group meetings and seminars aimed at developing fuel-saving food preparation and cooking techniques. This factor may be more critical in reducing fuel consumption than the stove design itself.

Although the stationary table stove is currently used in Muqdisho, most women tend to prefer and are able to afford lower cost portable models. A multiple pothole design does not appear to be necessary, although the importance of **canjeero** as a staple food requires development of a prototype suitable for the **canjeero** pan. Ideally, because there is a wide range in income levels and tastes in Muqdisho, several stove models of varying prices should be promoted. In Muqdisho, unlike in the rural areas, both printed materials and illustrations can be utilized in the marketing of the new stoves. The support of both the central office of the Somali Women's Democratic Organization and the local women's committees will be instrumental in ensuring the success of this marketing effort.

II. SITE DESCRIPTION*

LOWER SHABEELLE

Population Characteristics

For administrative purposes, the Lower Shabeelle region is divided into seven districts. The regional capital of Marka is located in the

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* Materials prepared by Michelle Savoie, VITA/Somalia.

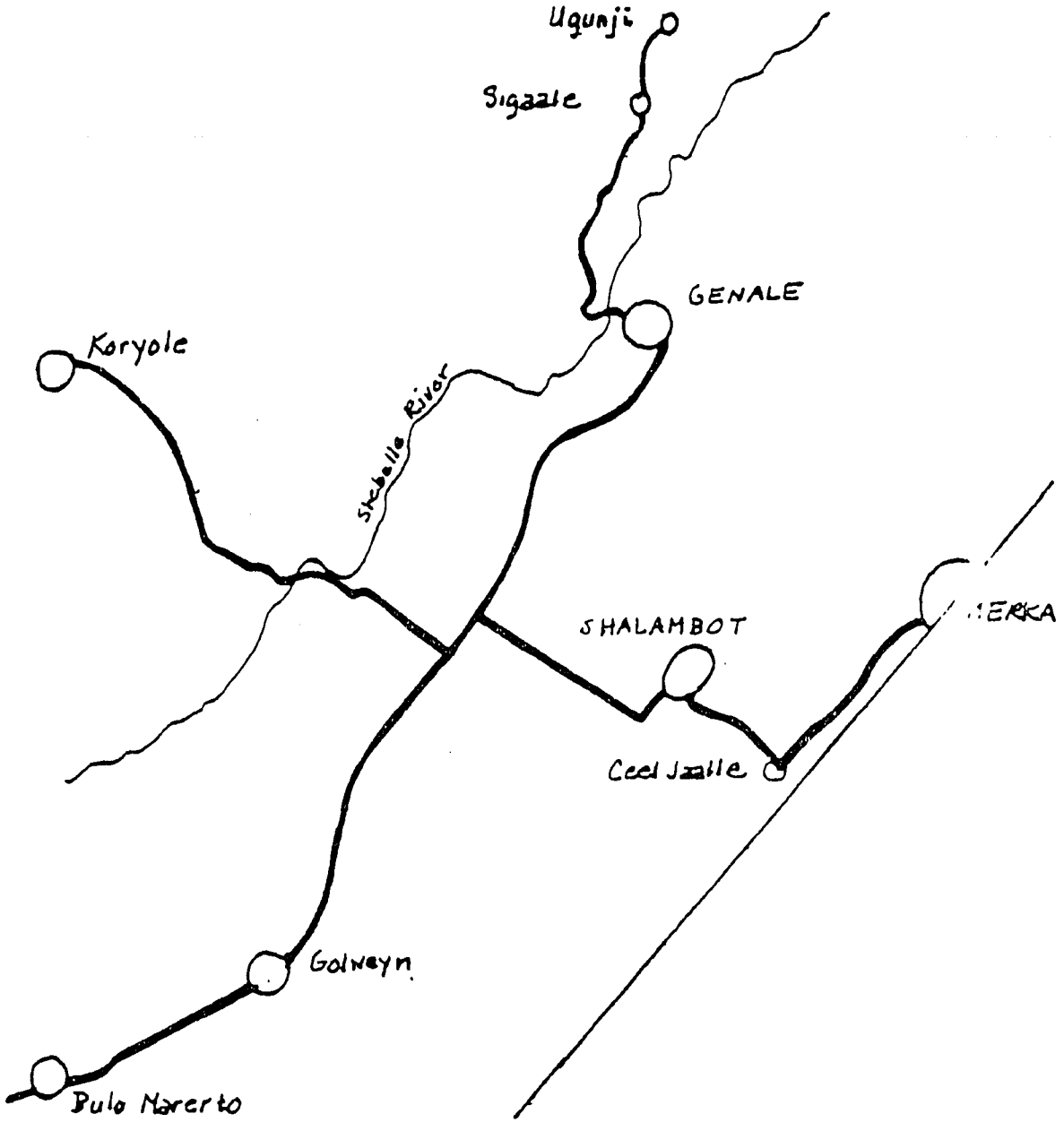

Figure 2.1

Map of Lower Shabeelle Survey Sites

coastal district. Afgooye and Wanle Weyn districts are located to the south of Muqdisho. Kurtunwaarey and Sablaale districts were created as resettlement areas for nomads who were dispossessed during the 1975 drought. In 1977, three refugee camps were established as part of the national relief effort in Qoryooley district. A seventh district, Baraawe, is located in the southernmost portion of Lower Shabeelle. In Baraawe, the 1975 resettlement plan established a fishing cooperative for displaced nomads.

The fuel consumption and cooking practices survey was conducted in the Qoryooley refugee camps and in five non-refugee villages. Figure 2.1 shows the approximate location of the sites. Ceel Jaalle is situated on the coast, at a distance of 4 to 5 kilometers from Marka. Golweyn and Buulo Mareerto are agricultural market towns located along the tarmac road to Kurtunwaarey. Ugunji and Sigaale are agricultural villages reached by dirt road from Jannaale. Population estimates for these sites could only be obtained from village elders. The elders estimated 207 households in Ugunji, 966 households in Sigaale, over 1,000 households each in Golweyn and Buulo Mareerto, and 150 households in Ceel Jaalle. Average household sizes were estimated by elders to be between 5 and 6 persons per unit.

The 1975 Census of the Population reported a population of 389,086 in the Lower Shabeelle region, or roughly the same population as the city of Muqdisho at that time (Somalia Ministry of National Planning, 1975). Since then, the rate of increase and the composition of the population have been affected by the influx of refugees into the resettlement areas and refugee camps. Population figures for the resettlement areas of Kurtunwaarey, Sablaale, and Baraawe are not available. The National Refugee Commission estimates a population of 41,000 in the three Qoryooley camps, excluding those refugees who may have settled with the indigenous population. The Regional Governor of Marka has noted that, in addition to these factors, an increasing proportion of residents have shifted from mixed or part-time farming to full-time farming (Regional Governor of Marka, September 1983). Changing specialization may reflect either a short-term response to poor herding conditions or a longer-term choice in favor of farming as a less risky enterprise. Customarily, the people of the surrounding area shift to farming as a risk dispersion strategy during difficult herding periods (Regional Governor of Marka, September 1983). The increase in full-time farmers results in a growing permanent population and places a burden on the existing resource base.

The proportion of settled agriculturalists is higher in Lower Shabeelle than in any other region of the country. The 1981 Demographic Survey estimated that 47 per cent of the Lower Shabeelle population is urban (living in district centers of resettlement areas), and 53 per cent is rural. The survey results indicate that, as in other regions of Somalia, for each age group studied, a higher proportion of this settled population is female (Somalia Ministry of National Planning, 1981).

The Demographic Survey reported the literacy rates and the kind and level of education received by men and women aged 20 years and over in 1981. The literacy rate among men is nearly three times that of women, or 54 per cent and 19 per cent respectively. Slightly over half of the literate men were educated in Koranic schools. One percent attended secondary school, and a negligible percentage pursued university studies. Ninety-four percent of all women over the age of 20, as compared with 61 percent of all men, had not attended school. The remaining 6 percent of women attended Koranic, elementary, intermediate, and secondary schools (Somalia Ministry of National Planning, 1981).

In contrast, both female and overall participation in the labor force, as measured by the 1980-81 Demographic Survey, are higher in Lower Shabeelle than in the Muqdisho region. Tables 2.1 and 2.2 show the percentage of males and females employed during the month preceding the interview, by age group. For the 20 through 49 age group, 87 percent of the men and 46 per cent of the women were employed. This relatively high participation may reflect, according to the survey, the absorptive capacity of the agricultural sector in Lower Shabeelle. Because many women's occupations are not considered formal employment, the participation rate for women may also be understated.

The Demographic Survey estimates indicate that almost half of the population of Lower Shabeelle was engaged in farming in 1981. Several types of farming are practiced in the region. Controlled irrigation and mechanized techniques are employed on state farms and private plantations located in Afgooye, Jannaale, Shalaamboot and Haval (U.S. Department of State, 1977). The objective of state farming is to provide staple crops for regional export. Private plantations produce bananas, citrus fruits, and sugar cane for regional and national export. These state and large private farms are a source of employment for the surrounding rural population.

On smaller, family-owned and operated farms, maize, sesame, beans, fruits, cotton, sugar cane, and tobacco are produced for cash sale. Farmers cultivate these crops under pump or flood irrigation. The smallest farming units are family operations, producing sorghum, maize, beans, and squash on flood-irrigated or rainfed fields. They may also intercrop sesame with the grain crops. These families, unlike the private plantation operators, generally live in villages adjacent to their fields. An estimated 2 **darab** (3.5 **darab** = 1 hectare) is required to support a family of six assuming two harvests per year (Caffrey et al., 1983).

As a result of tsetse fly infestation and the high proportion of cleared land, regional livestock holdings are comparatively low. Cattle, the major livestock type, are herded to pastures in the Baay region during the cultivating season.

In addition to agriculture and mixed farming, rural villagers and townspeople pursue a variety of occupations, including the collection

Table 2.1

Percentage of Female Population Employed in Month Preceding Interview, by Age Group, Lower Shabeelle

Age Group	Total Number	Total Stated	Number Employed	Number Employed as % of Total Stated
12-14	338	338	45	13
15-19	562	560	154	28
20-24	433	433	169	39
25-29	304	304	125	41
30-34	277	275	118	43
35-39	262	262	125	48
40-44	271	271	161	60
45-49	141	141	75	53
50-54	172	172	85	50
55-59	67	66	28	42
60-64	124	123	35	29
65-69	27	27	2	7
70-74	83	82	15	18
75+	85	85	5	6
Total	3146	3139	1142	36.4[a]

Source: Report on the Demographic Survey of Banaadir, Bay and Lower Shebelle Regions of Somalia, 1980-1981. Somalia Ministry of National Planning. Muqdisho, December 1981.

[a] For 20-49 years age group, the number of females employed as proportion of total stated is 46 percent.

Table 2.2

Percentage of Male Population Employed in Month Preceding Interview, by Age Group, Lower Shabeelle

Age Group	Total Number	Total Stated	Number Employed	Number Employed as % of Total Stated
12-14	414	411	71	17
15-19	511	511	202	40
20-24	314	314	314	76
25-29	213	213	179	84
30-34	214	214	202	94
35-39	181	181	168	93
40-44	201	201	186	93
45-49	137	136	124	91
50-54	192	192	178	93
55-59	81	81	75	93
60-64	142	141	121	85
65-69	40	40	26	65
70-74	67	67	48	72
75+	58	58	24	41
Total	2765	2759	1843	67[a]

Source: Report on the Demographic Survey of Banaadir, Bay and Lower Shebelle Regions of Somalia, 1980-1981. Somalia Ministry of National Planning. Muqdisho, December 1981.

[a] For 20-49 years age group, the number of males employed as proportion of total stated is 87 percent.

of fuelwood and construction materials, vending and marketing of agricultural produce, employment in craft and cottage industries, sales of light consumer goods, and government employment (Caffrey et al., 1983).

Groups specializing in fishing and the production of ceramic goods have settled along the coast. Lime deposits are also exploited near the regional capital of Marka. Both within the family unit and within one individual's lifetime, optimal resource use requires geographical and temporal dispersion of activities.

The Lower Shabeelle population represents an amalgam of regional and linguistic groups. For the indigenous settled population of the region, farming is considered to be a tradition. The inhabitants of the coastal cities of Baraawe and Marka are descendants of the Arab city-state population (Lewis, 1981). The refugee population originates from the the Ogaadeen, Sidamo, and Bale regions of Ethiopia, and includes a linguistic subgroup called the Somali Abo or Oromo-speakers (Fanale, 1982). The resettlement population in Somalia derives primarily from the northern regions of Sanaag, Togdheer, and Nugaal, and, to a lesser extent, from Bari, Mudug, and Galguduud (U.S. Department of State, 1977).

This formal classification of population subgroups tends to obscure the dynamic aspects of the population. Despite its relatively settled characteristics, there is both a history of social, cultural, and economic exchange between population subgroups and migration patterns between areas. The 1980-81 Demographic Survey has estimated that 75 percent of the population was born in the Lower Shabeelle region, but these figures do not capture the effect of temporary migration patterns (Somalia Ministry of National Planning, 1981).

Social organization in Lower Shabeelle is territorially based on community leaders rather than on lineage group affiliations, reflecting the distinctive sedentary and mixed characteristics of the population (Boston University African Studies Center, 1983). Regional and district level administrative structures are standardized throughout Somalia. Formal decision-making authority is vested in the District Commissioner, who is appointed by the Regional Commissioner. The District Commissioner presides over the District Council, which appoints the Chairmen of the **Tuulo** Councils, the village-level decision-making bodies. The **Tuulo** Council is comprised of elders and customary village leaders, as well as other semi-formal decision makers, such as cooperative members and representatives from the social, justice, and economic committees (Caffrey, 1983; Roarke, 1983).

The formal administration of the refugee camps reflects the distribution system established during the relief effort, but as with the **Tuulo** administration, the camp structure must be sanctioned by the Regional Refugee Commissioner and Assistant Regional Refugee Commissioner. The National Refugee Commission appoints the Commissioner and

Assistant Commissioner as well as each Camp Commander. The Camp Commander supervises the activities of the justice and social committees, as well as the activities of the camp section and subsection leaders. Each subsection is subdivided into units of 100 households (**boqolle**), units of 50 households (**ko..tonle**), and units of 10 households (**tobanturiye**), each with its respective leader (Caffrey et al., 1983; Fanale, 1982). Since the settlement pattern of the refugee population tends to follow regional origin and lineage affiliations, the section and subsection leaders are generally elders or customary, rather than appointed, leaders.

Climate, Topography, and Soils Characteristics

The Lower Shabeelle region has the highest average rainfall in Somalia with over 500 millimeters per year. The northeast wind blows from January through March, during **jiilaal**, the long dry season. From April to July (**gu**), sixty percent of the annual rainfall is recorded. A trace of rain falls from August to October (**xagaa**) , when the winds blow from the southwest. In the **dayr** season, lighter rains commence toward the end of October. The climate is characterized as tropical, semi-arid, with a mean annual temperature of 79.9 degrees Fahrenheit and little variation within the range (MacDonald, 1978; U.S. Department of Agriculture Biomass Team, 1982).

Both the topography and soils of the region are comparatively well suited to agricultural production. With the exception of a coastal area with shifting dunes, and an area to the southeast, the region is a floodplain with uniformly level terrain and fine-textured soil. The primary watershed, the Shabeelle river, traverses the region and provides the source for a system of waterways and irrigation canals. The water has a high mineral content. The most recent alluvial deposits are the best soils for farming. Soils are predominantly vertisols and cambisols, of clay-textured sediment. South of Kurtunwaarey, the river becomes swampy, and dries out during the long dry season (MacDonald, 1978; U.S. Department of State, 1977).

Vegetation is described as open rain-green, thorn tree savannah (Food and Agriculture Organization, UNESCO, 1977). The major tree types, acacia and commiphora, are found either in forest stands or scattered. Much of the natural vegetative cover has been cleared for farming, although the rate of deforestation is unknown. Since 1975, drought and war have created an additional source of population pressure on the ecological balance through refugee and resettlement plans as well as changes in specialization of production.

Charcoal and Fuelwood Marketing Patterns*

The production and distribution of charcoal are organized cooperatively under the jurisdiction of the National Range Agency (NRA). The NRA

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* Based on a personal interview with Jaamac Ismaaciil Maxamuud, District Representative of the National Range Agency.

issues production licenses, monitors production sites, and regulates prices. The central organization for marketing is the **Cad-Ceed** cooperative, which transports and distributes regional charcoal imports and exports. The cooperative is structured hierarchically from the national to regional to **Tuulo** level, where the charcoal is produced. The regional distribution cooperative, **Hilaac,** purchases charcoal from **Cad-Ceed** at 130 Somali shillings per quintal, and sells the charcoal at 150 Somali shillings per quintal. According to the NRA District Representative, **Hilaac** sells directly to consumers. The authorized price may vary by 10 shillings from the dry to the rainy season. In the seven years of **Cad-Ceed's** operation, the price has increased from 60 to 150 shillings per quintal. In addition to these authorized marketing channels, there exists an unofficial market with a varying price structure.

The charcoal cooperative **Cad-Ceed** has regional representatives in Baay, Middle Shabeelle, Muqdisho, and one district of Lower Shabeelle. Charcoal is imported and exported from regions in response to supply and demand conditions, so that at any one point in time, it is difficult to ascertain the proportion of regional consumption which is produced locally. According to the NRA District Representative, an average of 2,000 quintals are brought to the Marka area per month from the production sites of Buur-Hakabo in Baay Region and Qadar-Yarey and Gal-Gasha in the Qoryooley district of Lower Shabeelle. The wood species used for charcoal production in Lower Shabeelle are (1) **tugaar** (Acacia nilotica); (2) **galool** (Acacia bussei); and (3) **qurac** (Acacia tortilis).

The organization for fuelwood harvesting and distribution is the cooperative **Galool.** This organization has both a central office and local offices or cooperatives. The cooperative's customers are primarily bakeries and local institutions purchasing large quantities of fuelwood. The Lower Shabeelle cooperatives are located in Golweyn, Jannaale, and Shalaambood. Workers in these cooperatives harvest the fuelwood. The three species harvested are (1) **tugaar** (Acacia nilotica); (2) **galool** (Acacia bussei); and (3) **cadaad** (Acacia senegal). The greatest share of authorized harvesting occurs in the Baraawe Yare and Oraa-Oray districts of Qoryooley.

Considerably more fuelwood than charcoal is produced and marketed by private individuals serving the household market. Individuals sell fuelwood by the donkey cart, camel load, or bundle. While the price per bundle is set at each local market, the weight, number of sticks, and species composition vary by bundle. The bundle weight, in particular, varies considerably. The consumer and seller can negotiate the composition of the bundle. Identification of the price per bundle as a unit price is therefore misleading.

MUQDISHO

Population Characteristics

Muqdisho, located in Banaadir region, is divided into thirteen administrative sections. Segments from three of these sections were selected as survey sites. Hodan, one of the most heavily populated sections, is composed primarily of middle and high income groups. The section opens onto the periphery of the city, where income levels are mixed and households are geographically dispersed. Xamar Weyne, the oldest section of Muqdisho, has a relatively high population density and contains many of the older, established commercial enterprises of the city. Wadajir is a comparatively new section located on the outskirts of the city, whose population has grown considerably over the past decade. Many of the families in Wadajir have recently migrated to Muqdisho. Some families raise small livestock in their housing areas, and those living on the fringes of the section use fuelwood and lead a quasi-rural lifestyle.

Segments within sections were chosen on the basis of housing characteristics, as representative of socio-economic group (Figure 2.1). Each segment was composed of 30 households and bordered a major thoroughfare lined with shops, cutting inward from the thoroughfare onto dirt tracks and into more residential areas. Households in the segment were interviewed consecutively. This case study method was chosen over other sampling techniques because no data were available on the socio-economic composition of the sections. Population figures are available for Muqdisho, but with the rapid changes in urban settlement patterns, these figures soon become outdated.

The Somalia Ministry of Planning estimated the Muqdisho population to be approximately 350,000 at the time of the 1975 Census of the Population. In 1975, the population of Hodan was 41,136. The population of Wadajir was 23,561, and that of Xamar Weyne was 11,812. In group meetings with administrative leaders and women's committees in the survey sections an average of five to six persons per household was stated. In the 1981 Demographic Survey, the average number of persons per household was estimated at 5.1 (Somalia Ministry of National Planning, 1981). The 1977 Mogadishu Family Budget Survey, which covered poorer households on the fringes of Muqdisho, reported an average household size of 6.9 persons (Somalia State Planning Commission, 1978). Table 2.3 shows the percentage distribution of households by size from the Family Budget Survey. The range of sizes is quite large, with 37.2 percent of the households numbering 8 to 21 persons.

Demographic Survey results indicated that the percentage distribution of the population by age was weighted heavily toward children and youth under 20. Over 50 percent of the population was under the age of 20, with 18 percent between the ages of 20 and 29, and 26 percent over the age of 30.

In 1981, for those over 10 years of age, 56 percent of the population were literate. The literacy rate among men was 73 percent, and among women, 40 percent. Roughly 75 per cent of the female population, and

Table 2.3

Percentage Distribution of Households, by Size, Muqdisho

Household Size	Number of Households	Percentage Distribution
1	34	5.1
2	36	5.4
3	61	9.1
4	62	9.3
5	63	9.4
6	67	10.0
7	70	10.5
8	78	11.7
9	60	9.0
10	43	6.4
11	27	4.0
12	24	3.6
13	12	1.8
14	12	1.8
15	7	1.0
16	5	0.7
16+	9	1.2
Total	670	100.0

Source: Mogadishu Family Budget Survey 1977. Somalia State Planning Commission, Table 1.

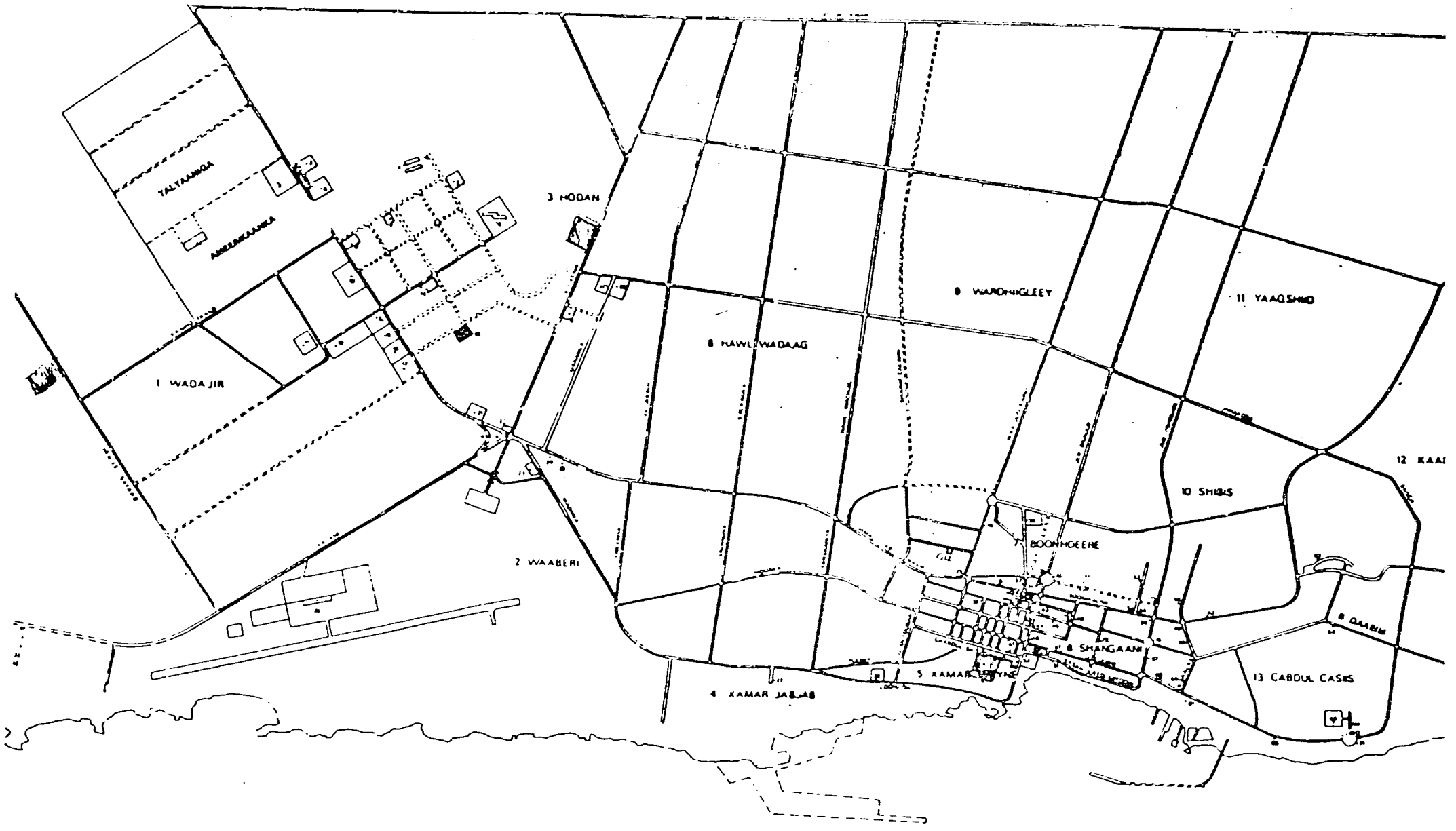

Figure 2.2

Muqdisho Survey Sites

39 percent of the male population over the age of 20 did not have any Koranic or public education. Three percent of men and one percent of women over the age of 20 had attained a university education. Of the remaining population, the largest percentage of both men and women had completed intermediate levels (Somalia Ministry of National Planning, 1981).

Table 2.4 gives the percentage distribution by occupation for combined Baay, Banaadir and Lower Shabeelle households. The predominance of farmer and farm manager groups (41 percent) can be explained by the importance of this economic activity in the Baay and Lower Shabeelle regions. Livestock-related employment appears minimal (2 percent), reflecting the lesser importance of this activity in the regions surveyed. Of the more urban-based occupations, the highest proportion of both men and women were involved in commercial or retailing enterprises (12 percent). Teachers, medical personnel, and other professionals represented 12 percent of the population. Eight percent of the population were in the armed services or were employed as government officials. For all single occupational categories, except commercial and farm-related employment, percentages are small.

The 1981 Demographic Survey reported the labor force participation for men and women by age group, with participation defined as whether the individual was employed in the month preceding the interview. Tables 2.5 and 2.6 show the number employed as a percentage of responses for men and women in Banaadir region. For the 20 to 49 age group, the percentage of men employed was 73. In contrast, only 18 percent of women in this age group were employed. The figure for women employed was lower in Banaadir than in either Baay or Lower Shabeelle regions.

The 1977 Mogadishu Family Budget Survey concentrated on the poorer groups living on the periphery of Muqdisho. Table 2.7 gives the percentage distribution of households by total monthly expenditures for these groups. In 1977, 29.6 percent of the 670 households surveyed spent over 1,000 Somali shillings per month. The percentage of households falling within this expenditure bracket was the largest for the survey.

Table 2.8 gives a breakdown of monthly expenditures by major category at the time of the survey. Out of an average monthly expenditure of 706.20 shillings, 15.82 shillings, or 2.22 percent of total expenditures, were allocated to purchasing charcoal. Food expenditures occupied 60.1 percent of the monthly budget.

The Family Budget Survey also detailed types of food expenditures, and these have been categorized according to food groups in Table 2.9. The food groups represent the methods by which foods are prepared in the Muqdisho diet. For example, potatoes and vegetables, as well as cooking spices, have been categorized as sauce ingredients or condiments. Sugar and spices used in preparing tea and coffee have been grouped with beverages. Average monthly expenditures were highest for grains (29.1 percent), meats (27.5 percent), and beverages (17.5 percent). Within the beverage group, sugar expenditures represent the

Table 2.4

Percentage Distribution of Occupations by Sector, Males and Females, for Baay, Banaadir, and Lower Shabeelle

Sector	Percentage Distribution		
	Male	Female	Total
Teachers	4	5	5
Doctors, Nurses, Pharmacists	1	1	1
Government Officials	2	1	1
Other Professionals	8	2	6
Clerks, Typists, Secretaries	5	4	5
Salesmen, Shopowners	12	11	12
Farmers, Farm Managers	33	60	41
Fishermen	1	--	1
Livestock Employment	2	2	2
Cooks, Maids, Domestics	3	7	4
Armed Services, Police	8	2	7
Tailors, Textiles	2	1	2
Metalworkers, Toolmakers, Welders	3	--	2
Carpenters, Bricklayers	5	--	3
Drivers, Mechanics	8	--	5
Other Skilled Laborers	3	--	3
Total	100	100	100

Source: Report on the Demographic Survey of Banaadir, Bay and Lower Shebelle Regions of Somalia, 1980-1981. Somalia Ministry of National Planning. Muqdisho, December 1981, Table 50.

Table 2.5

Percentage of Female Population Employed in Month Preceding Interview, by Age Group, Banaadir

Age Group	Total Number	Total Stated	Number Employed	Number Employed as % of Total Stated
12-14	740	740	22	3
15-19	1264	1264	134	11
20-24	965	965	177	18
25-29	702	702	122	17
30-34	585	585	116	20
35-39	327	327	51	16
40-44	368	367	77	21
45-49	196	196	36	18
50-54	239	239	41	17
55-59	103	103	14	14
60-64	211	211	19	9
65-69	46	46	4	9
70-74	129	129	2	2
75+	132	131	0	0
Total	6007	6005	815	14[a]

Source: Report on the Demographic Survey of Banaadir, Bay and Lower Shebelle Regions of Somalia, 1980-1981. Somalia Ministry of National Planning. Muqdisho, December 1981.

[a] For 20-49 years age group, the number of females employed as a proportion of total stated is 18 percent.

Table 2.6

Percentage of Male Population Employed in Month Preceding Interview, by Age Group, Banaadir

Age Group	Total Number	Total Stated	Number Employed	Number Employed as % of Total Stated
12-14	751	750	23	3
15-19	1104	1103	206	19
20-24	892	890	476	53
25-29	705	704	524	74
30-34	599	599	488	82
35-39	354	354	299	85
40-44	479	479	409	85
45-49	175	175	150	86
50-54	314	314	260	83
55-59	91	91	69	76
60-64	211	210	138	65
65-69	52	52	34	65
70-74	88	88	37	42
75+	71	71	11	15
Total	5886	5880	3124	53[a]

Source: Report on the Demographic Survey of Banaadir, Bay and Lower Shebelle Regions of Somalia, 1980-1981. Somalia Ministry of National Planning. Muqdisho, December 1981.

[a] For 20-49 years age group, 73 percent of males were employed in the month preceding interview.

Table 2.7

Percentage Distribution of Households by Total Monthly Expenditures, Muqdisho

Monthly Expenditures (Somali Shillings)	Number of Households	Percentage Distribution
0 - 100	7	1.0
100 - 200	26	3.9
200 - 300	42	6.3
300 - 400	68	10.1
400 - 500	79	11.8
500 - 600	65	9.7
600 - 700	61	9.1
700 - 800	51	7.6
800 - 900	42	6.3
900 - 1000	31	4.6
1000+	198	29.6
Total	670	100.0

Source: Mogadishu Family Budget Survey 1977. Somalia State Planning Commission. Muqdisho, 1978, Table 10.

Table 2.8

Average Monthly Expenditures by Category, Muqdisho Households

Group	Average Monthly Expenditures, Household[a] (Somali Shillings)	Group as Percent of Total Expenditures
Food	424.21	60.1
Beverage, tobacco, kat	15.68	2.2
Clothing, footwear	39.30	5.6
Housing, water	107.83	15.3
Fuel, lighting:		
kerosene	13.97	1.96
charcoal	15.82	2.22
electricity	3.73	0.52
Miscellaneous[b]	85.66	12.1
Total	706.20[c]	100.00

Source: Mogadishu Family Budget Survey 1977. Somalia State Planning Commission. Muqdisho, 1978, p. 4, Table 2.1.

a Household defined as persons living together and taking food from the same pot during period of inquiry; temporary guests expected to leave were excluded. Expenditures defined as money and value of goods and services received as income in kind.

b Category includes drugs, transport, school fees, cosmetics, jewelry, entertainment, appliances, grain milling, and feed expenses.

c Standard error is 9.92.

Table 2.9

Average Monthly Food Expenditures, by Food Groups, Muqdisho Households

Group[a]	Expenditures (Somali Shillings)	Group as % of Total Food Expenditures
Grains grained maize, maize, sorghum, rice, flour, spaghetti, bread	123.27	29.1
Meat and Proteins beef, camel, mutton, goat, fish, eggs, milk, beans	117.51	27.5
Oils sesame, ghee, vegetable	53.80	12.7
Sauces, Condiments potatoes, onions, tomatoes, lettuce, cucumber, salt, pepper	30.89	7.4
Fruit banana, papaya, grapefruit, lime, dates	24.45	5.8
Beverages, Spices tea, ginger, sugar, coffee, cardamon	74.29	17.5
Total	424.21	100.00[b]

Source: Mogadishu Family Budget Survey 1977. Somalia State Planning Commission. Muqdisho, 1978, p. 5, Table 2.2. For definitions, see Table 2.8.

a Groups defined on basis of method of food preparation.

b Single items most heavily represented in food expenditures are sugar (14.2%), vegetable oil (10.4%), cow's milk (9.6%), maize (7.7%), and camel meat (7.0%).

largest proportion. The individual items most heavily represented in the food budget are sugar, vegetable oil, cow's milk, maize, and camel meat.

Table 2.10 shows fuel expenses as a percentage of total monthly expenditures for households. As total expenditures increase, fuel expenses also increase fairly systematically. The percentage change in fuel cost is 6 percent for each of the first three expenditure brackets, and drops to a 1-2 percentage change per bracket through the 900-1000 Somali shillings expenditure bracket. For the final group, 1000+ shillings per month, the percentage change in fuel expenditures is 4 percent. The shift between fuel types appears less systematic as total expenditures rise. Within charcoal and fuelwood expenditures, charcoal dominates over wood for all expenditure brackets. The percentage of charcoal expenditures in total fuel expenses varies between 26 and 43 percent, but for most brackets, occupies around one-third of fuel expenses. The relative importance of wood varies more over expenditure brackets, and does not appear to decrease as expenditures rise. On the average over brackets, charcoal and fuelwood represent 52.56 percent of total fuel expenditures.

Charcoal and Fuelwood Marketing Patterns*

As mentioned earlier in the section on Charcoal and Fuelwood Marketing Patterns in Lower Shabeelle, fuelwood harvesting for distribution to hospitals, state institutions, foundries, and bakeries is organized through the national cooperative **Galool.** Fields of production are assigned and producers are licensed by the National Range Agency (NRA), which is also responsible for environmental protection. Harvest sites are located in Lower and Middle Shabeelle, Banaadir, and Baay Regions (Somalia Ministry of National Planning, 1975).

To harvest the fuelwood, laborers are hired to harvest the fuelwood are hired and supervised by the cooperative members. Primary wood species include **galool** (Acacia bussei), **qurac** (Acacia tortilis), and **qansax** (Acacia reficiens). The wood is transported by trucks owned or rented by the cooperative. Transport costs are determined by the weight of the load rather than the distance travelled. The transport cost per quintal is 13 Somali shillings. **Galool,** through its marketing organization, **Mahad,** sells the fuelwood to institutions for 30 shillings per quintal. The number of quintals transported to Muqdisho from January to September of 1983 is shown in Table 2.11. As the table indicates, the months of January and May follow periods of heavy rains during which fuel supplies are markedly reduced.

As in the Lower Shabeelle region, fuelwood is also supplied to households in Muqdisho by private producers and traders. Most fuelwood harvested by individuals or families is transported by donkey cart or

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* Based on personal discussions with Cabdullaahi Cilmi Jibril, National Range Agency Representative to charcoal cooperatives.

Table 2.10

Fuel Expenditures by Total Monthly Expenditures, Muqdisho Households

Expenditures (Somali Shillings)	Fuel Expenditures						All Fuels	Charcoal as % of All Fuels	Wood as % of All Fuels
	Petrol	Alcohol	Diesel	Kerosene	Charcoal	Wood			
0-100	--	--	--	3.08	2.09	0.48	5.65	36.99	8.49
100-200	--	--	.22	4.28	3.17	1.41	9.08	34.91	15.52
200-300	--	--	--	5.23	6.27	3.34	14.84	42.25	22.50
300-400	--	--	.04	10.20	5.16	4.47	19.87	25.96	22.50
400-500	--	.04	.06	12.64	7.30	4.61	24.65	29.61	18.70
500-600	--	--	.41	14.56	11.33	5.85	32.15	35.24	18.19
600-700	.09	--	.35	17.47	10.43	7.53	35.87	29.08	20.99
700-800	--	.20	.13	14.49	14.87	7.95	37.64	39.51	21.12
800-900	--	.05	.92	18.03	14.26	4.64	37.90	37.63	12.24
900-1000	--	--	.47	17.74	15.41	10.72	44.34	34.75	24.17
1000+	4.08	.25	1.17	26.52	20.00	9.36	61.38	32.58	15.25

Source: Mogadishu Family Budget Survey 1977, Somalia State Planning Commission. Muqdisho, 1978, Table 13.

Table 2.11

Quantities of Fuelwood and Charcoal Supplied to Muqdisho by Marketing Cooperatives, from January to September of 1983

Month	Quantities Supplied (Quintals)	
	Charcoal	Fuelwood
January[a]	4,567.0	1,159
February	25,742.5	24,267
March	23,951.0	34,712
April	27,040.5	31,978
May[a]	14,401.5	6,071
June	46,490.5	23,340
July	37,390.5	33,717
August	39,585.5	26,957
September	35,287	32,751
Total, Jan. - Sept.	254,456.5	214,952

Source: Personal interview with Cabdullaahi Cilmi Jibril, National Range Representative to Charcoal Cooperatives, October 26, 1983.

a Period following heavy rains.

camel to Muqdisho. The NRA does not regulate this harvesting, but levies a two shilling tax per donkey cart or camel at roadside checkpoints. The prices in this household market are not officially controlled.

The production and distribution of charcoal is organized similarly to that of fuelwood. The production zones designated by the NRA are located primarily in Baay, Lower Shabeelle, and Middle Shabeelle regions. Workers are hired by the cooperative to produce the charcoal. Production is continuous during the dry seasons. In the rainy seasons, production may occur on an intermittent basis.

The **Cad-Ceed** organization pays 30 Somali shillings per quintal to producers, transporting the charcoal to demand centers. Transportation costs are 50 shillings per quintal of charcoal. The cooperative **Hilaac** purchases the charcoal at 100 shillings per quintal, and sells to Muqdisho storekeepers at 120 shillings per quintal (1981-1982 prices). Storekeepers are licensed by **Hilaac** to wholesale or retail charcoal. The quantities of charcoal transported to Muqdisho from January to September of 1983 are shown in Table 2.11.

GEDO

Population Characteristics

The Gedo region of western Somalia borders both Kenya and Ethiopia. The region is divided into six administrative districts. Large refugee populations are concentrated in Luuq district, located to the north of the regional capital of Garbahaarrey, and in Baardeere district, located in the southern portion of the region. Ceel Waaq and Bullo Haawe districts are adjacent to the Kenyan border; Dolo district borders Ethiopia.

The survey was conducted in the refugee camp of Maganey, the town of Luuq, and the village of Cir Kud in Luuq district. Luuq, the district capital, is a commercial town located along an old Kenyan-Somali trading route. Cir Kud, the last village on the tarmac portion of the Luuq-Baydhabo road, is located 40 kilometers to the southeast of Luuq. Maganey refugee camp is one of the eight camps established in the Luuq district, and is located approximately 15 kilometers west of the town of Luuq.

Population estimates for the Gedo region are outdated. According to the national census estimates, the total regional population in 1975 was 212,091 persons, of whom 53 percent were male and 47 percent were female (Somalia Ministry of National Planning, 1975). In 1982, the official estimates of the number of refugees living in Luuq district was 132,000, with the Maganey camp population estimated at 11,000 (Somalia National Refugee Commission, 1982). Unofficial estimates for camp populations are considerably lower. Elders in Cir Kud estimated the village population at 1,000 households with an average of five persons per household.

Shifting settlement patterns are necessary if families are to adapt to changing resource conditions and economic opportunities. Since 1975, the influx of refugees into the region, a large proportion of whom are women and children, has altered both the total number of persons and the age and gender composition of the population. Some refugee groups may have settled outside the camps. For example, although there is no documentation on population increases in Cir Kud, new permanent housing construction may indicate an expanding population. In addition to the refugee population, non-refugee groups employed in livestock raising, farming, or trading have been attracted to the region by the goods and services provided through the refugee camps.

The Gedo region is the wet season pasturage for herders from Ceel Waaq, Baay region, and the eastern Kenyan provinces. Permanently settled families in Luuq, Cir Kud, and Maganey also maintain small herds of goats and sheep year round.

Farmers cultivate on both dry land and irrigated plots along the Jubba River, in and around the town of Luuq. Most farm enterprises are high-risk, and farmers grow primarily millet and sorghum intercropped with cowpeas and sesame. On the irrigated plots, they also cultivate onions, vegetables, and fruit. On a small farm next to Maganey, refugee farmers grow crops to supplement their food rations. No farming families were interviewed in the Cir Kud area.

Luuq is primarily a commercial town, where traders market locally produced and imported commodities, livestock, fodder and farm products, fuelwood and charcoal. Transportation services link Luuq with the refugee camps. Refugees exchange surplus rations for other consumption items supplied by the townspeople. Cir Kud is also a trading village, providing goods to herders who inhabit the area as well as to road travellers.

The indigenous population of Gedo is more homogenous than that of the Lower Shabeelle region (Cassanelli, 1982). Kinship affiliations are important in areas of scarce resource availability, and patterns of access to resources are well established (Lewis, 1981). As in other regions with Ethiopian refugees, the refugees originate from three main areas of Ethiopia: the Ogaadeen, the Bale region in the southeast lowlands and the Sidamo region in the central highlands. In addition, there are many Oromo speakers in the Gedo region (Fanale, 1982).

Regional and district level administrative structures in the Gedo region are similar to those in Muqdisho and Lower Shabeelle. In Luuq district, district commissioners preside over the town section leaders as well as the social, justice, and economic committees. The administrative organization of the Gedo region refugee camps is similar to that of the Lower Shabeelle camps. Formal decision-making structures were established as part of the relief effort. The administration of the camp is headed by the camp commander and the assistant camp commander who are employees of the National Refugee Commission. The section leaders, who are below the camp commanders in the hierarchy, are often customary leaders or elders, representing their sections in the

formation and implementation of decisions. Parallel to the section leaders are various semi-formal committees with community functions. These include agricultural, justice, youth, and women's committees.

Climate, Topography, and Soils Characteristics

Weather records for Luuq span a period of 27 years (U.S. Department of Agriculture Biomass Team, 1982). The average annual temperature is 30.3° Celsius, ranging from 28.1° Celsius during the short dry season **(xagaa)** to 33° Celsius during the long dry season **(jiilaal).** Considerably less precipitation is recorded in Gedo region than in Lower Shabeelle region, with an average of 289 millimeters per annum. Most of the rainfall occurs during the **gu** season, from March to May. Generally, less rain falls during the **dayr** season, from October to November, and little or no precipitation is recorded from June to September and from January through March. The winds shift direction from northeast during **jiilaal** to south during **xagaa.** In **xagaa,** wind velocity averages 17 kilometers per hour, frequently gusting to 23 kilometers per hour (U.S. Department of Agriculture Biomass Team, 1982).

The major watershed of the Gedo region is the Jubba river, originating in the highlands of Ethiopia. The town of Luuq and the refugee camps are located in the alluvial basin of the Jubba. Other areas in the district are composed of limestone uplands, gentle slopes, clay deposit basins, and gypsiferous interplains (Weiland, 1983).

Four general soil types are found within these topographic zones (Weiland, 1983). Vertisols **(dolo),** composed of sand, silt and clay, are found in micro-depressions and are not well suited to agricultural production. Cambol-orthids are found in convex slopes within the basins. These are medium-textured clay/load soils which hold water poorly. The **ganane** soils, found along river banks and in flood plains, are more recent alluvial soils with good potential for irrigated farming. A fourth common soil type, suitable only for forage, is present in all the topographic zones.

The vegetation in the Gedo region has been classified by the U.S. Department of Agriculture Biomass Team as thorntree/desert grass savannah (U. S. Department of Agriculture Biomass Team, 1982). Ronald Weiland, Interchurch Response Forestry Researcher in Cali Mataan, classifies the vegetation more descriptively as acacia-commiphora/ thorn bushland, consisting of medium height (2 - 3 meters) acacia shrubs with a barren ground surface (Weiland, 1983).

A minor forest stand of preferred fuelwood species is located about 10 kilometers southeast of Luuq in the basalt hills. The forest exhibits signs of fuelwood harvesting but not of deforestation. Around the refugee camps, an area within a radius of 3 - 5 kilometers has been deforested of all but low-lying shrubs (Weiland and Tukale, 1983). The town of Cir Kud, in contrast, is located near two forests containing preferred acacia species.

Charcoal and Fuelwood Marketing Patterns*

The District Representative of the National Range Agency monitors the fuelwood and charcoal production and marketing systems in the Luuq district. According to the District Representative, the National Range Agency has disbanded charcoal production and fuelwood marketing cooperatives in the Luuq district because of fuelwood scarcity. Charcoal is produced unofficially and sold in the market for 150 - 160 shillings per quintal.

The majority of households in the Luuq area use fuelwood that is harvested and sold by individuals. The preferred collection site for fuelwood is located on a ridge 15-20 kilometers east of Luuq. The District Representative stated that unregulated collectors contribute to the problem of receding forest areas through careless and uncontrolled harvesting patterns. Fuelwood is transported to Luuq by donkey cart or donkey pack and sold in 2 - 3 stick bundles or donkey loads.

There is no NRA representative in Cir Kud, and charcoal is not available for sale in the market. Fuelwood is gathered and sold by individuals in 1 - 3 stick bundles, 2 - 3 stick bundles, backloads and donkey loads. Maganey has no centralized fuelwood market, and vendors sell from their homes in 1 - 3 stick bundles. As in Lower Shabeelle sites, weights of bundles vary considerably, and fixed bundle prices do not necessarily reflect equivalent bundle volume or weight.

III. LOWER SHABEELLE RESULTS: REFUGEE CAMP AND NON-REFUGEE VILLAGE

COMMUNITY PERCEPTIONS AND RESPONSES TO WOOD FUELS SCARCITY

Group meetings with Regional Governor, District Mayor of Marka and Tuulo elders revealed that there is a deep awareness of charcoal and fuelwood scarcity problems at all leadership levels. The Regional Governor and Mayor of Marka attributed the problem to changes in the natural environment, as well as to deforestation caused by clearing and overuse of land resources. The burden on land and forest resources is a result of both the increase in temporary migration to the area for farming, and the shift in production specialization of permanent residents from herding to farming.

The survey sites of Jannaale and Golweyn are relatively prosperous agricultural market towns located along the asphalt road. Elders in Jannaale identified the source of wood fuels scarcity as increased expansion and clearing of agricultural landholdings. The wood fuels problem is evidenced by both the rising price of fuel and by disappearing forests. The women's committee there stated that, although household fuel costs depend on the size of the family, the number of

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* This description is based on personal discussions with the National Range Agency District Representative.

meals prepared, and the frequency of boiling water for washing, a large family may spend up to 15 Somali shillings per day. Members of Jannaale's fuelwood cooperative stated that they travel an increasingly greater distance to obtain wood, hiring a truck for transport. With high rental and food costs, they claim that their revenues do not always cover the expenses of collection.

Elders in Golweyn identified the same source and symptoms of fuelwood scarcity. Members of the women's committee added that where individuals previously collected wood for household use, they now must purchase fuel. As a result, they must rely on an uncertain market supply as well as the wood species offered on the market. The suppliers are private groups or individuals who transport the fuelwood on donkey carts or on the backs of camels.

Ceel Jaalle is a comparatively resource-poor town located along the coastal sand dunes, 4 - 5 kilometers from Marka. Here, elders identified natural desertification as the source of rising fuel prices and receding forest areas. While most fuelwood is purchased at the village market, they explained that women collect fuelwood for their households when the market supply is short or when they have too little cash on hand to pay the price. A bundle of four sticks costs two shillings in Ceel Jaalle, and according to the women's committee, a day's meals for the average family require over five shillings of fuel.

Elders in the three towns identified some strategies adopted by households in response to rising fuel costs. For example, in the agricultural Tuulos surrounding Jannaale, farm families use corn cobs and crop residues as alternative fuels. Crop residues are considered an inferior fuel because of the smoke emitted, but the smoke is also useful as a mosquito deterrent.

Women in these towns stated that they have observed few changes in cooking practices, and that many women still boil water for washing separately from meal preparation. They noted that, especially for the poorer community members, fuel expenses may cut into the food budget and reduce the money available for special foods such as meat. Consequently, meat is consumed less frequently in these agricultural communities than in the herding areas of Somalia.

Town elders suggested that more judicious use of fuel might result in 15 Somali shillings of fuel lasting for a longer period. Others recommended that trucks or subsidies be provided to the fuelwood cooperative.

The ceramic stove, which is produced by potters in two villages close to Marka, is the principal stove type of the Jannaale area. The elders indicated that the ceramic stove costs between 20 and 25 shillings in Jannaale. They agreed that the price families would be willing to pay for a stove depends on their income and on expected fuel savings, and suggested that a sound method for introducing the stove would be to train a group of women to build the stoves and permit them to produce

and market the stoves as an enterprise. This activity could be supplemented by educational group meetings for potential purchasers.

The elders in Ceel Jaalle perceived no alternative to present fuelwood use and cooking practices. Crop residues are not used in Ceel Jaalle villages. Women and children occasionally collect scrapwood or use the sticks from livestock enclosures as fuel. The women there stated that some families have reduced the number of times they boil water, or may skip the evening meal or special snacks, reserving fuel for the major mid-day meal.

In Ceel Jaalle, ceramic stoves and clay pots are widely used in cooking, and few families possess the more expensive soapstone stoves sold in Marka. According to the elders, the villagers prefer the taste of food prepared in clay pots and the low price of the ceramic stoves. Ceramic stoves require less fuel and cook food in less time than three-stone stoves. They cost 20 snillings, or one-tenth the price of a soapstone stove.

Ceel Jaalle elders explained that, if two stoves each cost 20 shillings, they would select the stove which is more fuel-efficient; however, if the more fuel-efficient stove cost more than 20 shillings, they would choose the less fuel-efficient stove because of its lower price. This discussion revealed that the amount of cash the villagers are able to spend restricts their choice of stoves. They did not perceive that a savings in fuel over time could justify the initial cost of a higher-priced stove. Like the group in Jannaale, the elders suggested that women be trained to build and market the stoves as an enterprise.

Members of the women's committee in Golweyn stated that women tend to cook the same number of hot meals every day, but may wash children with cold rather than hot water. Although preferred fuelwood species may no longer be available, corn cobs or crop residues are used only infrequently.

In discussing alternatives to present cooking practices, the women described a stove used especially in Golweyn and Buulo Mareerto (Golweyn stove). The Golweyn stove was designed by the women of Golweyn in response to the rising price of the ceramic stove and dissatisfaction with its lack of durability. They would have preferred to use the soapstone stove, but this model is too expensive for most community members.

The Golweyn stove is a stationary model, built by banking a ceramic stove with a mud mixture. Some of the stove models include several ceramic and **muufo** stove implants. When there are several stove implants, the chambers are not connected. When the ceramic implant breaks from heat or use, the women reset it with ash and clay. Periodically, they smooth the surface of the stove with mud. With this stove, they can cook various quantities and foods simultaneously. The stove is less hazardous for cooks and children because it is stationary, stable, and raised from the ground. Because it is sheltered and raised, women can use the stove during the rains.

HOUSEHOLD SURVEY RESULTS: COOKING PRACTICES

Income Source, Consumption Units, Cooks and Foods Prepared

In both refugee and non-refugee sites, the largest proportion of employed heads of household were farmers. In the refugee camps, all farms were smaller than 5 **darab** (3.5 **darab** = 1 hectare), and 9 out of the 10 farms were family-owned. Outside the refugee camps, roughly half of the farms were over 5 **darab** in size and all were family-owned. Maize and sesame were the major crops for all farms.

Table 3.1 lists the primary occupations of household heads and head cooks. Occupational activities of household heads in the refugee camps included fuel collection, carpentry, vending, and military or government employment. A third of the refugee household heads were unemployed. Non-refugee occupations included management of retail shops and government work. One non-refugee household head worked abroad, and none were unemployed.

Out of 31 refugee head cooks, only one stated that she had an income-generating activity. Nine of the 39 non-refugee cooks cited income-generating activities. These included a variety of craft, food processing, and domestic work activities. In one case, the head cook was also the head of household, owning and operating a farm of a few **darab** and selling its produce.

Because of their refugee status, the number of unemployed heads of household may be slightly overstated in the refugee camps. As a result of difficulties in defining and interpreting the question on income-generating activities, women's employment may be understated. For example, although few head cooks stated that they farmed, the farms are family-owned and operated and many of the women are known to help in farm labor, crop storage, and processing. The lack of response to this question by head cooks may reflect cultural influences.

Table 3.2 shows the average size of consumption units at refugee and non-refugee sites, as well as the composition of the units by age group. The consumption unit was defined as the number of persons for whom the head cook usually prepares meals. The composition of the refugee units is weighted more heavily toward children. The average total number of persons is only slightly higher in refugee households. The consumption unit decreases by an average of one person during the rainy season in non-refugee villages, but appears to remain constant year round in the refugee camps.

The average age of cooks in the refugee camps was approximately 32 years, and in non-refugee villages, 34 years. Often, head cooks were uncertain of their exact age and the age of other cooks. For this reason, average ages should be considered rough estimates. All but one cook prepared meals alone. Head cooks prepared most of the meals, with daughters and sisters of head cooks preparing about one-sixth of meals.

Table 3.1

Primary Occupations of Household Heads and Head Cooks, Refugee and Non-Refugee Sites, Lower Shabeelle

Occupation/ Income Earning Activity	Households		
	Refugee	Non-Refugee	Total
Household Head			
Farming			
less than 5 darab	10	15	25
5 - 10 darab	0	7	7
more than 10 darab	0	6	6
Commerce[a]	1	4	5
Fuel Collection	1	0	1
Carpentry	2	0	2
Military	2	0	2
Government	4	5	9
Abroad	0	1	1
Unemployed	11	0	11
Total	31	38[b]	69
Head Cook			
Basket, Mat-Making	1	2	3
Sales of Homemade Food Items	0	3	3
Paid Domestic	0	1	1
Sales of Farm Produce	0	1[c]	1
Farm Worker	0	1	1
No Income-Earning	30	31	61
Total	31	39	70

a Includes merchants, shopkeepers, and traders.

b One non-response on farm size. The number of non-refugee farmers is 29.

c Head cook is also household head, operating farm and selling its produce.

Table 3.2

Average Size and Composition of Consumption Unit, Refugee and Non-Refugee Sites, Lower Shabeelle

Site	Average Number of Persons, by Age Group			Average Number of Persons, by Season			
	0-3 years	4-12 years	12+ years	Xagaa	Dayr	Gu	Jiilaal
Refugee[a]							
Sample 1	1.097	2.387	4.032	7.516	7.516	7.516	7.484
Sample 2	1.30	3.10	3.833	8.233	8.233	8.233	8.233
Subtotal	1.197	2.738	3.934	7.869	7.869	7.869	7.852
Non-Refugee[b]	0.872	2.103	4.539	7.513	6.718	7.487	6.641
Total	1.07	2.490	4.170	7.730	7.420	7.720	7.380

Note: **Xagaa** = short dry season, **dayr** = short rainy season, **gu** = long rainy season, **jiilaal** = long dry season.

a Sample 1 drawn during **xagaa**, n=31; sample 2 drawn during **dayr**, n=30.

b n=39

Table 3.3

Foods Cooked in Refugee and Non-Refugee Sites, Lower Shabeelle

Dishes[a]	Number of Cooks Citing Dish			Cooks Citing as % of All Cooks
	Refugee	Non-Refugee	Total	
Soor	31	39	70	100
Bariis	28	28	56	80
Canjeero	18	15	33	47
Hilib[b]	8	30	38	54
Digir[c]	20	4	24	35
Cambuulo	12	31	43	61
Qamadi	11	0	11	10
Baasto	3	16	19	15
Muufo	0	20	20	29
Kalluun	0	1	1	--
Bun	0	3	4	--
Cagaar[d]	0	4	4	--

a **Soor** = porridge, **bariis** = rice, **canjeero** = light pancakes, **hilib** = meat, **digir** = beans, **cambuulo** = grain or rice and beans, **qamadi** = wheat and beans, **baasto** = pasta, **muufo** = corn or sorghum bread, **kalluun** = fish, **bun** = fried coffee beans, **cagaar** = vegetables. For a description of foods, see Appendix C.

b **Hilib** would usually be prepared with **bariis** or **baasto**, but because it is a more expensive food, it is not cooked as often in refugee households.

c Usually digir is cooked with rice or as **cambuulo**.

d **Cagaar** consumption depends on the season and is lower during **xagaa**, the short dry season.

The staple dishes of both refugee and non-refugee households are prepared from a base of rice, sorghum, wheat flour, or maize flour. Table 3.3 lists the foods cited by head cooks, and the preparation of these foods is explained in Appendix C. The breakfast dish is usually **canjeero** (light griddle cakes made from maize, sorghum, or wheat flour) or, in farming communities, **cambuulo** (a beans and porridge dish). Lunch and dinner in the refugee camps usually consists of either rice, **soor, cambuulo,** or **qamadi,** with sauce or beans. The evening meal is generally the lighter of the meals. Meat is rarely eaten in the camps, and pasta (**baasto**) is a luxury grain product.

A greater variety of foods and dishes are prepared in non-refugee villages, where the diet is not limited to the type of rations distributed in the camps. **Muufo,** a corn or sorghum bread, is a preferred dish. In the villages, families eat fried coffee beans (**tun**) and vegetables **cagaar,** as the season permits. In the coastal village of Ceel Jaalle, some families also consume fish. Pasta, a purchased product, is also more frequently consumed in Ceel Jaalle.

In addition to differences in the kinds of food consumed, the quantity of food consumed and number of hot meals may be greater in the non-refugee villages. According to the enumerators, Golweyn and Buulo Mareerto are more prosperous than the other villages surveyed. In these villages, most of the cooks prepared **muufo,** several of whom baked **muufo** daily. Meat was also cited more frequently in these villages, and snacks were prepared. Diet is expected to vary in the agricultural villages by season, but less so in the refugee camps where it is determined primarily by the composition of the ration food basket.

Cooks were generally unable to specify the cooking time required for preparing dishes. Cooking times for the **cambuulo** and bean dishes appear to be the longest, or from two to two and a half hours. (Prior to cooking, the beans are soaked overnight, in order to decrease their cooking time.) Since meat is often prepared in a sauce or stewed to accompany grain dishes, cooking time varies from 40 minutes to well over an hour. The baking of **muufo** requires heating of the clay pot in which the bread is baked, although the bread itself bakes in only 15-20 minutes. Cooking time and the fuel required for **canjeero** depend on the quantity prepared. Once the **canjeero** pan is hot, each pancake cooks in only a few minutes. Of these dishes, the porridge and beans and **muufo** appear to require the longest cooking time. This perception is based on observation, rather than on field tests.

Stove Types, Utensils, and Location of Stoves

Table 3.4 lists the primary and secondary stove types used by refugee and non-refugee cooks. While only three out of 31 refugee women possessed more than one stove, over half of the 40 non-refugee women used two stoves. Although half of the non-refugee women used a three-stone fire as their primary stove, the most fre-quently used stove over both groups was the ceramic stove. A few soapstone and modified three-stone stoves were used as secondary stoves, and one metal stove was cited.

Two characteristics were particular to the non-refugee cooks: (1) widespread use of the **muufo** stove, and (2) in Golweyn, the use of an indigenous design developed by the village women (Golweyn stove). Figure 3.1 illustrates the designs of the various stove types. For all but the **muufo** stove, either charcoal or fuelwood can be burned. With the **muufo** stove, only fuelwood may be used.

The ceramic stove is produced locally in potters' villages located along the coast near Marka. The potters are women, trained through apprenticeship. The clay for the pots is a special type found in deposits between the coastal dunes and seashore. According to the potters, there are no exclusive rights to the clay deposits, but taxes must occasionally be paid for their exploitation. The potters chiefly supply Marka merchants, who market the stoves in surrounding villages and in Muqdisho. The price cited for the ceramic stove in the villages surveyed ranged from 20 to 25 Somali shillings. The stove is light and portable, but not particularly durable. The potters also produce clay pots, **muufo** stoves, and water vessels.

The **muufo** stove is the only stove which is specific to a food, although **muufo** can also be prepared in a pan on other stoves. The **muufo** stove is a clay pot which is usually partially or totally submerged in a bank of clay or clay-lined barrel. To prepare **muufo,** the stove is heated with fuelwood, and when the stove is hot, the embers are removed and bread placed on the sides of the interior. If desired, a lid is placed over the stove, and embers are scattered on top of the lid.

The soapstone stove (**Buur-Jiko**) is produced by craftsmen at the soapstone cooperative of Ceel Buur. This stove costs considerably more than the ceramic stove, depending on transport and marketing costs. The stove is most popular among higher income groups in the regional capital of Marka, where it is preferred for its appearance and durability. Four of the refugee women used a soapstone stove, but none of the non-refugee women used this stove.

The multi-purpose Golweyn stove, described in the section on Community Perceptions, was designed and built by local women in Golweyn. The stove is the only stationary stove cited, and incorporates ceramic, **muufo** and three-stone stove elements. The stove is a mud bank into which ceramic and **muufo** stoves are inserted, with no connecting chambers. The modified three-stone stove is similar in construction to this stove, in that it is banked and slightly raised.

Seasonal location of the stoves follows a regular pattern. The use of the term "seasonal" is somewhat misleading. Cooks tend to move their stoves when it is raining, rather than for the duration of a season. Table 3.5 gives the location of the stoves for broad seasonal categories. During the dry seasons, most primary and secondary stoves are located outside in a sheltered area. Most primary stoves are brought inside the home during the rainy seasons. A slightly larger proportion of the non-refugee stoves are located permanently inside the home,

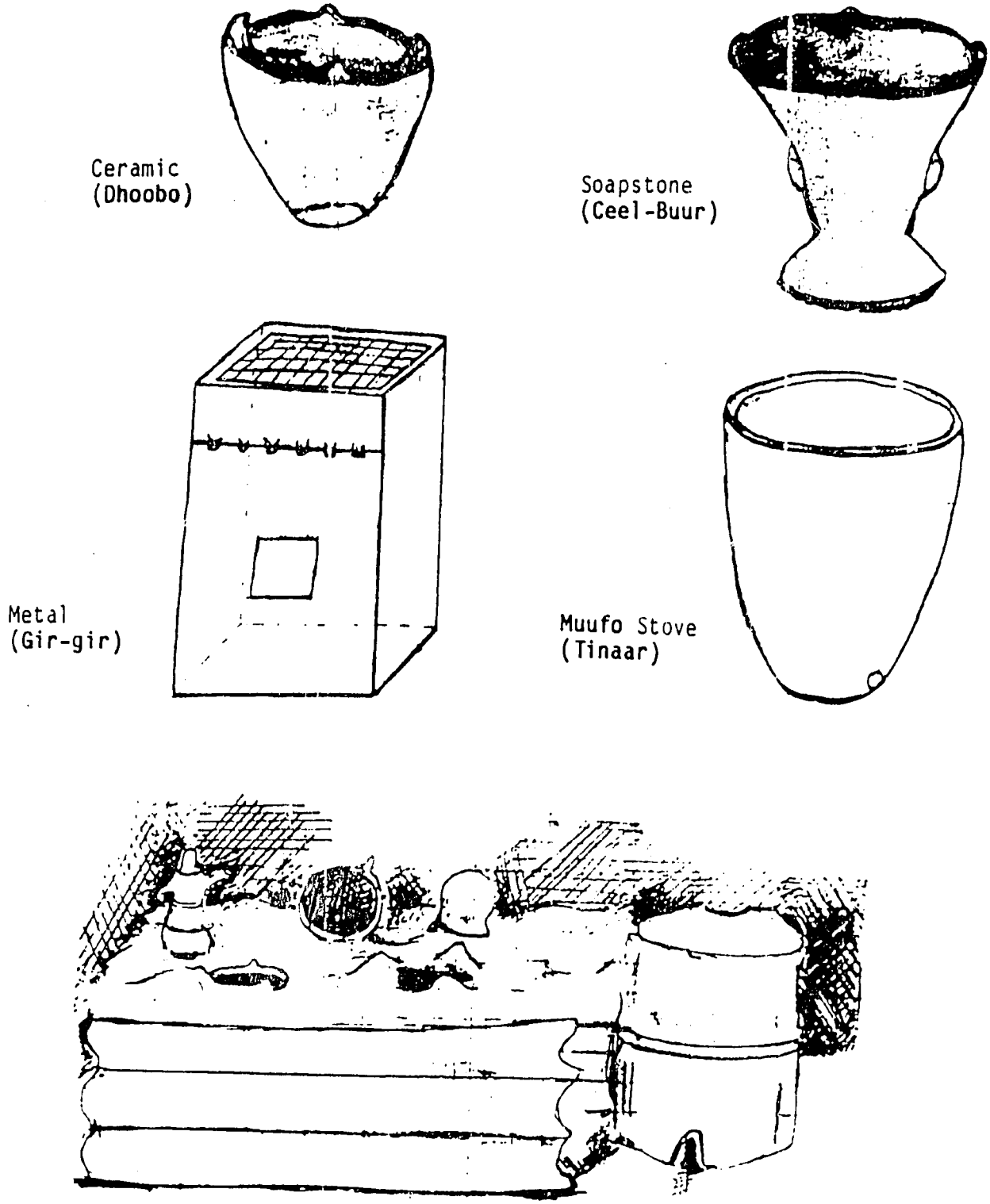


Figure 3.1

Stove Models[a]

[a] Original drawings submitted by Moxamed Cali Axmed, Socioeconomic Counterpart.

Table 3.4

Stove Types, Refugee and Non-Refugee Sites, Lower Shabeelle

Stove Type	Households		
	Refugee	Non-Refugee	Total
Most frequently used			
ceramic	23	16	39
three-stone	6	20	26
soapstone	1	0	1
modified three-stone	0	2	2
multi-purpose	0	1	1
muufo	0	1	1
metal	1	0	1
Subtotal[a]	31	40	71
Less frequently used			
ceramic	0	6	6
three-stone	0	2	2
soapstone	3	0	3
modified three-stone	0	1	1
muufo	0	14	14
Subtotal	3	23	26

Note: Over half of the non-refugee cooks used second or third stoves, while only three out of 31 refugee cooks used second stoves. In the camps, those with secondary soapstone stoves used ceramic stoves as the primary stove. In non-refugee sites, cooks using the ceramic as second stove cited the three-stone as the primary stove.

[a] One non-refugee cook cited three stoves. One of these, the **muufo** stove, was used as frequently as the ceramic.

Table 3.5

Seasonal Location of Stoves, Refugee and Non-Refugee Sites, Lower Shabeelle

Season/Stove/Location	Households		
	Refugee	Non-Refugee	Total
Most Frequently Used			
Xagaa, Jiilaal			
inside	6	16	22
outside, sheltered	15	19	34
outside	10	4	14
Dayr, Gu[a]			
inside	20	22	42
outside, sheltered	11	17	28
outside	0	0	0
Less Frequently Used			
Xagaa, Jiilaal			
inside	0	7	7
outside, sheltered	1	15	16
outside	2	1	3
Dayr, Gu			
inside	1	9	10
outside, sheltered	2	14	16
outside	0	0	0

Note: **Dayr** and **gu** are the rainy seasons, and **xagaa** and **jiilaal** are the dry seasons.

[a] Stoves may be moved only when it is raining, rather than for the duration of the season.

Table 3.6

Utensils and Practices, Refugee and Non-Refugee Sites, Lower Shabeelle

Utensil/Practice	Number of Cooks Using/Practicing			Number as % of All Cooks
	Refugee	Non-Refugee	Total	
Utensil type				
pot type				
clay	2	17	19	27
metal	29	5	34	49
both	0	17	17	24
pot size				
small	1	6	7	10
medium	26	22	48	70
large	1	1	2	--
combination of sizes	3	10	13	20
canjeero pan	18	15	33	47
lid used	31	39	70	100
Practice				
pot food-specific	0	0	0	--
stove food-specific	0	15[a]	15	20
simultaneous cooking	0	11[b]	11	16

a Out of 15 stoves that were cited as food-specific, 14 were **muufo** stoves. The **muufo** stove is used specifically for **muufo**, but **muufo** can also be prepared on other stoves in a pan.

b Combinations included porridge and fried coffee beans, porridge and meat, and rice and meat.

where special cooking shelters may have been constructed in the courtyard. This clearly reflects the more permanent construction of non-refugee housing. The figures suggest that portability is an important stove feature, especially for refugee women. Stationary stoves are attractive only where housing conditions permit the extra space needed for a well-ventilated cooking area.

Cooking utensils and practices are summarized in Table 3.6. Locally-produced clay pots are used by non-refugee villagers. The majority of refugee women used only aluminum pots. These more expensive pots were distributed as part of the relief program in the camps. A few of the women of the non-refugee villages stated that they preferred the taste of porridge and stew dishes prepared in clay pots, while they cooked pasta in metal pots. Pot size appears to be related to quantities of foods cooked rather than specific dishes, and most women who could afford it owned several sizes. Other than the **canjeero** pan, utensils are not specific to foods. Lids were used by all women.

More than one dish cannot be cooked simultaneously on either soapstone or ceramic stoves. A third of the non-refugee women stated that they cooked dishes simultaneously on three-stone fires or Golweyn stoves, including the porridge or rice and meat dishes, and porridge and fried coffee beans. Simultaneous cooking does not appear to be a very important stove characteristic, except for those few non-refugee women who cook a wider variety of dishes. Due to the limited capacity of the ceramic and soapstone stoves, the three-stone stove is used to cook large quantities for guests or special occasions.

Non-Cooking Uses of Stoves

Twelve of the 31 refugee women, as compared to four of the 39 non-refugee women, cited the boiling of water for washing as the only non-cooking use of the stove. One refugee woman claimed no non-cooking use. Table 3.7 lists these responses.

For both groups, the majority of women use the stove for a combination of non-cooking purposes. The most frequently cited combination was washing and use of the smoke as a mosquito deterrent. The variety of non-cooking uses was greater in the non-refugee than in the refugee sites, and included incense-burning, preparation of milk containers, and preparation of **ghee** (clarified butter). Some refugee women used their stoves for night lighting.

Table 3.7 also lists the average number of times water is boiled or tea prepared, and whether this occurs separately from meals or with remaining embers from meals. The average frequency of boiling water or preparing tea is roughly the same for refugee and non-refugee households, or 1.6 times a day. A larger number of non-refugee women than refugee women appear to use the embers left from cooking meals to boil water or prepare tea. Most women in either group cover embers after cooking meals to slow the burning rate, or conserve embers for later use. These figures must be qualified by the fact that, because routines vary, most women are unaware of how often they use the stove other than for cooking meals.

Cooking Attitudes and Suggested Stove Modifications

Each head cook was asked to rate cooking difficulties in decreasing order of importance. Cooking problems listed on the questionnaire were cooking time, heat, smoke, fuel cost or collection time, and fire or burns. The cook could add any other problems which she considered important.

Although many of the women felt that cooking was not burdensome and stated initially that they had no cooking difficulties, once they began discussing cooking, they were willing to rate their problems. The "scores" for each problem are shown in Table 3.8. The lower the score, the more important the problem was to the head cooks. In reviewing the figures, the underlying attitude of these women that no aspect of cooking is particularly burdensome should be borne in mind.

For refugee women, fuel cost or collection time presented the greatest difficulty, followed by smoke and then heat. Cooking time requirements, and fire or burn hazards, were least important. For non-refugee women, smoke and heat presented more difficulty than fuel. As with refugee women, cooking time and fire hazards were not considered to be important by non-refugee women.

Because the score ranges are different for each group, comparison between groups requires a standardized base. For purposes of comparison, a rate was calculated by taking the observed scores as a percentage of the total possible score, for each group. The lower the rate, the more important the problem. According to this procedure, cooking time, smoke, and fire hazards appear more important to non-refugee than refugee women. Heat appears to be equally important for both groups. Fuel is more of a problem to refugee women, of whom a larger proportion collect rather than purchase their wood.

Less than one-third of the cooks (22 out of 70) stated that they followed any procedures for maintaining their stoves. Procedures included ash removal and cleaning.

Stove modifications were suggested only in non-refugee villages in isolated cases. Suggestions included building a shelter, smoothing, ash removal, and an extra pot hole. Only one of these represents a stove design modification. The concept of stove modification was difficult for enumerators to explain. The non-response rate was highest for this open-ended question.

HOUSEHOLD SURVEY RESULTS: CHARCOAL AND FUELWOOD USE

In Lower Shabeelle refugee camps, the fuel use questionaire was administered once during the short dry season and again during the short rainy season, in a total of 61 households. Enumerators experienced some difficulties with the Oromo language and with non-responses on the fuel expenditures section of the questionnaire during the second

Table 3.7

Non-Cooking Uses of Stove, Use of Embers, Frequency of Boiling Water and Preparing Tea, Refugee and Non-Refugee Sites, Lower Shabeelle

Use/Frequency	Households		
	Refugee	Non-Refugee	Total
Non-Cooking Use:			
washing only	12	4	16
combination[a]	18	34	42
no other use	1	1	2
Average number of times water is boiled for washing daily	1.58	1.64	1.62
Average number of times tea is prepared daily	2.40	2.21	2.30
When water is boiled or tea is prepared:			
with embers from meal	3	17	20
separately from meal	28	18	46
both	0	4	4
Use of embers:			
left to die out	1	3	4
covered for later use	29	36	65
no response	1	0	1

[a] In both refugee and non-refugee sites, combinations consisted of washing and night lighting or use of the smoke as a mosquito deterrent. Villagers also cited washing and burning of incense, cleaning and lining of milk containers, and preparation of ghee and snacks such as popcorn.

Table 3.8

Cooking Problems, Refugee and Non-Refugee Sites, Lower Shabeelle

Problem	Rating		
	Refugee	Non-Refugee	Total
Time			
score[a]	142	144	286
rate[b]	.91	.74	.82
Heat			
score	76	87	163
rate	.49	.45	.47
Smoke			
score	65	46	111
rate	.42	.24	.32
Fuel			
score	49	115	164
rate	.32	.59	.47
Fire, Burns			
score	133	136	269
rate	.86	.70	.77

Note: Each cook was asked to rate cooking problems in decreasing order of importance, numbered from 1=most important to 5=least important. No problems other than those listed were reported.

a The scores are sums over observations. A lower score corresponds to a more important problem.

b To compare scores between groups, a rate was tabulated. The rate is the score as a percentage of the highest possible score, or 155 (5 x 31 observations) in refugee sites and 195 (5 x 39 observations) in non-refugee sites. The lower the rate, the more important the problem.

Table 3.9

Seasonal Use of Fuel Types, Refugee and Non-Refugee Sites, Lower Shabeelle

Season/Major Fuel Type	Households[a]		
	Refugee	Non-Refugee	Total
Xagaa			
wood	58	30	88
charcoal	--	--	--
crop residues	--	--	--
combination[b]	3	9	12
Dayr			
wood	55	24	79
charcoal	2	10	12
crop residues	--	--	--
combination	4	5	9
Gu			
wood	54	24	78
charcoal	3	10	13
crop residues	--	--	--
combination	4	5	9
Jiilaal			
wood	58	31	89
charcoal	--	--	--
crop residues	--	--	--
combination	3	9	11

Note: **Xagaa** = short dry season, **dayr** = short rainy season, **gu** = long rainy season, **jiilaal** = long dry season.

a For refugee, n = 61 and for non-refugee, n = 39.

b For refugee sites, over all seasons, three cooks used charcoal/wood and four used crop residues/wood. For non-refugee sites, nine used charcoal/wood and seven used residues/wood.

phase of the survey. Consequently, for expenditures information only, the data from the original group of 31 households is reliable.

Fuel Types and Species

Table 3.9 shows the major fuel types used in refugee and non-refugee households by season. A much larger proportion of refugee households than non-refugee households used fuelwood exclusively year round. Only a few refugee women used charcoal during the two rainy seasons. Several refugee households used a combination of charcoal and wood or crop residues and wood in various seasons. Charcoal was burned more often by non-refugee cooks, both as the major fuel type in wet seasons and in combination with wood during dry seasons. In the more isolated agricultural villages, crop residues were an alternative fuel. For all households surveyed, charcoal use appears to increase during the rainy seasons, while use of crop residues increases during the dry seasons.

Fuelwood species used by cooks were identified in three ways. The head cook was asked which species she used for cooking, preparing tea, and other household tasks. She was also asked to name the species she preferred. The enumerators then took cuttings from the household fuel pile, and identified the wood species. Species used, preferred, and sampled are listed in Table 3.10. The frequency with which each species was cited by cooks and sampled by enumerators was also tabulated. Botanical names have been identified for all but four of the species listed.

Most of the commonly used, preferred, and sampled species are acacias. Acacias are generally excellent sources of fuelwood. Two other widely used species, **caday** (salvadore persica) and **garas** (dobera glabra), are considered inferior as fuelwood but have other uses, such as fabrication of camel bells, cooking utensils, and toothbrushes. These woods are softer and may be found nearer to the camps than the preferred acacias. For the same kilogram weight, these species have a lower density and release fewer calories per kilogram than the harder acacias.

In Table 3.11, fuel types and species used and preferred are listed for refugee and non-refugee sites. Although most refugee women used fuelwood, they preferred charcoal. While more of the non-refugee women used charcoal, the majority preferred fuelwood. In general, the choice of fuel type was not based on cooking purposes. With the **muufo** stove, fuelwood is used, but **muufo** was also prepared in a pan over other stoves. Occasionally, charcoal was used for ironing, making cakes, or preparing tea.

The relative importance of certain fuelwood species depends on the site surveyed. Overall, most of the woods used and preferred are acacias. Although **caday** and **garas** are used more in refugee sites, neither is a preferred species. Cooks used any species for any cooking purpose. This result may indicate either that women's choice of species is constrained by species availability or that all species mentioned are suitable for a wide range of cooking purposes. In most cases, the

Table 3.10

Fuelwood Species Used, Preferred and Sampled, Lower Shabeelle

Local Name	Botanical Name[a]	Frequency[b]		
		Used	Preferred	Sampled
tugaar	acacia nilotica	.191	.222	.147
galool	acacia bussei	.145	.5	.074
mareer	cordia ovalis R.Br.	.106	.111	.118
garas	dobera glabra	.098	---	.044
caday	salvadore persica	.078	---	.029
cadaad	acacia senegal	.074	.097	.221
fulaay	acacia seyal	.070	.014	.088
jiiq	acacia seyal	.055	.042	.059
qoon-qoon	combretum nereoense	.035	---	.059
bilcil	acacia melliflera	.031	---	.029
qurac	acacia tortilis	.020	---	.015
gumar	acacia nubica	.020	---	.015
kulaan	balanites orbicularis	.020	---	---
dhugdaar	jatropha dichtar	.016	---	.029
quud	balanites aegyptiaca	.008	---	.015
waadhi	ackanthera shimperi	.008	---	.015
qansax	acacia reficiens	.008	---	---
sarman[c]	acacia benadirensis	.004	---	---
carmaan	blepharis edulis	.004	---	---
qended	commiphora sp.	.004	---	---
dhuumood	clerodendron microphyl.	.004	---	---
dhafaruur	grewia tenax	---	---	.015
qalanqaal	cordoba glandulosa	---	---	.015
eyrab[d]		.004	---	---
kadaar[d]		.004	---	---
dhamaan[d]		---	.014	---
dhun-baras[d]		---	---	.015
Total		1.0	1.0	1.0

a Ronald Wieland, Interchurch Response Forester; Rashid Abdi, "An Extract of Somali Names Based on Glover 'Check List of 1947' and Hemming 'Short List of Somali Plant Names of 1971'", Range Burao; Michael H. Madaney, "Common Names of Somali Plants," Department of Botany and Range Management, Faculty of Agriculture, Somalia, November 12, 1983.

b Enumerators asked what species were used and preferred by head cooks, and took a cutting from the household wood pile. The 70 respondents cited 256 fuelwood species used, and 72 fuelwood species preferred. Enumerators took 70 cuttings, two of which were not identified. Frequencies represent the number of times a species was cited or sampled as a proportion of the total number of observations.

c Also acacia misera, acacia bussei.

d Botanical name has not been identified.

preferred species was one of the species the cook actually used. In ten percent of the cases, women were not able to obtain the preferred species. Apparently, most cooks have not been obliged to shift to inferior species.

Collection and Purchase Patterns

The figures in Table 3.12 indicate that the proportion of households collecting fuelwood was considerably higher in refugee than in non-refugee sites. Out of a total of 39 non-refugee households, only 12 collected and most of these were located in Ugunji and Sigaale, the more isolated villages. Two modes of transport were used by collectors: (1) use of a donkey cart by men and (2) transport by women in backloads. This second method was the only mode of transport cited in refugee households.

The frequency of collection, given in days per week, is higher in the refugee camps than in non-refugee areas. Collection by donkey cart lowers the average frequency in non-refugee sites. Men collected by donkey cart once every three to four weeks. The average number of hours per trip is highest for men collecting by cart.

The average time per trip is slightly higher for refugee than non-refugee women collecting by backload. This result may reflect the higher population density and larger radius of the deforested area around the refugee camps. Respondents for both groups could more easily specify collection time than the distance travelled. For non-refugee sites, the subsample of collectors is also quite small. As a result, the figures in Table 3.12 represent only rough estimates.

In the households, one individual appeared to be responsible for fuelwood collection. Only in two households were two collectors cited. When collecting, women may work in groups, especially if travelling a great distance. The average age of collectors was roughly the same for both groups, or approximately 34 to 35 years. The age of collectors ranged from 14 to 50 years. The two second collectors were daughters, aged 14 and 16.

Purchase patterns for the sites are described in Table 3.13. Several refugee households both purchased and collected while non-refugee households either purchased or collected. Like collection figures, frequency of purchase and expenditures were difficult for head cooks to specify. In refugee households in particular, purchase patterns are not systematic. Respondents gave their best estimates for these figures.

The number of fuelwood purchasers was limited in refugee sites, or 13 out of 61 households. On the average, refugee cooks purchased fuelwood five times per week, in a variety of bundle types costing one or two shillings. These figures provide little information on prices, because of the wide variation in weight per stick and bundle composition. In a sample of 20 sticks from the Shalaambood market, the average weight

Table 3.11

Fuel Type and Fuelwood Species Most Frequently Used and Preferred, Refugee and Non-Refugee Sites, Lower Shabeelle

Type/Species	Households		
	Refugee	Non-Refugee	Total
Fuel Type			
Used[a]			
wood	58	30	88
charcoal	--	--	--
combination	3	9	12
Preferred			
wood	10	26	36
charcoal	51	13	64
Specific to Task[b]			
yes	1	2	3
no	2	7	9
not applicable	58	30	88
Fuelwood Species			
Most Frequently Used[c]	galool tugaar garas fulaay mareer cadaad	tugaar cadaad mareer galool caday jiiq	tugaar galool mareer garas caday cadaad
Preferred[c]	galool tugaar jiiq mareer fulaay	tugaar galool cadaad mareer jiiq	galool tugaar mareer cadaad jiiq
Specific to Task[d]			
yes	0	0	0
no	61	39	100
Preferred is Used			
yes	58	32	90
no	3	7	10

See following page for notes.

Table 3.11 - Continued

a For **xagaa** season. Combinations are charcoal and wood or crop residues and wood.

b Few uses (tasks) cited other than cooking or boiling water. Although not stated here, fuelwood must be used in the **muufo** oven. Occasionally, charcoal was used for ironing, making cakes, or tea.

c Listed in decreasing order of importance.

d Cooks used any species for any use (task).

Table 3.12

Collection Time, Frequency and Method, Refugee and Non-Refugee Sites, Lower Shabeelle

Time/Frequency/Method	Households		
	Refugee	Non-Refugee	Total
Number of Collectors[a]	52	12	64
Collectors as Proportion of All Households	.85	.31	.64
Method of Transport			
donkey cart, by men	0	7	7
backload, by women	52	5	57
Average Collection Frequency (days per week)	2.08	1.17	1.91
Average Collection Time, (hours per trip)[b]			
men	--	9.83[c]	9.83
women	6.74	5.67	6.54
Average Age, Collector[d]	35.40	32.75	34.90

[a] Several collectors in refugee camps also purchased fuelwood.

[b] Round trip. Respondents were more able to specify collection time than distance.

[c] Men collected by cart once every three to four weeks; they remained in the bush throughout the day.

[d] Only two second collectors were cited.

Table 3.13

Fuelwood Purchase Patterns, Refugee and Non-Refugee Sites, Lower Shabeelle

Frequency/Unit/Price	Households		
	Refugee	Non-Refugee	Total
Number of Purchasers[a]	13	27	40
Purchasers as Proportion of All Households	.21	.69	.40
Average Purchase Frequency, (days per week)	4.77	5.64	5.36
Unit and Price			
2-stick bundle, 1 shilling	7	11	18
3-stick bundle, 1 shilling	4	6	10
3-stick bundle, 2 shillings	2	6	8
4-stick bundle, 1 shilling	--	2	2
cartload, 120 shillings	--	2	2
Provider of Money			
household head	12	25	37
head cook	1	2	3

[a] Several refugee women both collected and purchased.

per stick was 0.567 kilograms, with a range of 0.257 to 1.444 kilograms. The variation in weight per bundle is expected to be smaller.

The majority of non-refugee households purchased fuelwood. On the average, non-refugee households purchased more frequently and in larger amounts than refugee households. Two of the households purchased by cartload. The variety of bundle prices and types found in refugee sites were similar to those found in non-refugee sites.

In all but three of the total number of households purchasing fuelwood, the provider of cash was the head of household. In one of these three households, the head cook was also the head of household.

Daily Expenditures, Fuel Expenditures, and Fuel Consumption

Average daily cash expenditures, daily fuel expenditures, and fuel as a percentage of cash expenditures are shown in Table 3.14. Three of the refugee cooks indicated that they had no regular cash expenditures. Of those refugee households with cash expenditures, the average daily total was 31.21 Somali shillings. According to the enumerators, several refugee households appeared to overstate their expenditures, or state "what they needed to spend," rather than the amount available to spend. In other instances, as in the second phase of the refugee camp survey, head cooks were unwilling to disclose their expenditures because of their refugee status. Daily cash expenditure figures were more easily recorded in non-refugee households, although the range was great between the amount spent in the isolated villages and that spent by some households in Golweyn and Buulo Mareerto. The average daily total among non-refugee households was 52.32 shillings.

Average daily fuel expenditures are 2.5 shillings higher in non-refugee households tnan in refugee households, but as a proportion of cash expenditures, they are roughly the same. These results are qualified by two factors: (1) the subsample of fuel purchasers within the first refugee sample is only six households; and (2) daily figures were also tabulated after the interview from frequency of purchase and expenditure per purchase data. Assuming that prices are the same in refugee at non-refugee sites, and that refugee households are consuming only what they purchase, non-refugee households would appear to consume more wood daily. However, there is no method by which to determine relative prices from the survey data, the refugee subsample is too small to generate reliable figures, and, by observation, the refugee families appear to purchase less regularly. The fuel shares of total daily cash expenditures in refugee and non-refugee households are 14 and 16 percent, respectively.

When asked if they shared wood with other cooks, two-thirds of the refugee women stated "no", while four-fifths of the non-refugee women stated "yes". In all cases, wood was shared only occasionally. Women often borrow the embers from a neighbor to start the morning fire. The enumerators commented that some refugee women would never think of borrowing wood because of the time and effort required to collect it.

Table 3.14

Daily Cash and Fuel Expenditures, Refugee and Non-Refugee Sites, Lower Shabeelle

Expenditures (Somali Shillings)	Site[a]		
	Refugee	Non-Refugee	Total
Average Daily Cash Expenditures	31.21	52.32	43.49
Average Daily Fuel Expenditures[b]	5.82	8.24	7.71
Average Fuel Expenditures as a Proportion of Daily Cash Expenditures	.14	.16	.16

[a] Expenditure information was collected only during the first refugee survey. Of the 31 households, three had no regular cash expenditures. (Refugee, n = 28; non-refugee, n = 39.)

[b] Only six refugee purchasers in the first survey. This subsample is too small to generate comparable figures.

All of the head cooks mentioned that their fuel expenditures had increased over the past year. When asked how they had responded to rising costs, 73 out of 100 stated that they had not changed their fuel use or cooking practices. Two women changed fuel type, 23 reduced the amount of fuel they used, and two reduced the number of hot meals or snacks they prepared.

Fuelwood consumption for both refugee and non-refugee sites is given in Table 3.15 . In the dry season (**xagaa**) survey, only a slight difference appears between consumption in refugee and non-refugee households. On the average, consumption varies little by day, although the coefficient of variation between days ranges from less than ten to over thirty percent within households. Average per capita consumption for both groups is approximately one kilogram per day. There are no statistically significant differences between consumption levels in refugee and non-refugee sites, although the magnitude of the figures for non-refugee sites tends to be slightly lower (for test results, see Appendix B).

Several factors may contribute to these findings. Within the non-refugee group, there are large differences in household and per capita consumption between villages. Although the samples are not large enough for statistical tests, the figures suggest that the non-refugee group is composed of different populations. For example, in the less prosperous town of Ceel Jaalle, average per capita figures were clustered around 0.5 kilograms per day. Also, the refugee sample, consisting of 28 households with complete consumption data, is very small. Another interpretation of the figures is simply that the refugee and non-refugee classifications do not represent appropriately defined groups, or that groups should be defined along other income and fuel availability indicators.

A second series of interviews (Sample 2 in Table 3.15) were undertaken during the rainy season (**dayr**) in the Qoryooley refugee camps. The purpose of this second phase was to test for seasonal differences in consumption. However, the spring balances used for the two surveys weighed inconsistently. The spring balance used in the second survey appeared to weigh more heavily than the balance used in the first. The estimates obtained in the second survey are similar to those of the first, but no interpretation is possible beause of these difficulties. Results for the second survey are internally consistent, but consumption magnitudes are not comparable between surveys.

IV. MUQDISHO RESULTS

COMMUNITY PERCEPTIONS AND RESPONSES TO WOOD FUELS SCARCITY

In the Hodan, Xamar Weyne, Wadajir, Wardhiigleey, and Shingaani sections of Muqdisho, members of the women's committees were interviewed during group meetings. At all locations, women commented on the rising

Table 3.15

Average Fuelwood Consumption, Per Consumption Unit and Per Capita, Refugee and Non-Refugee Sites, Lower Shabeelle

Site	Average Consumption Per Unit (kilograms)					Average Number of Persons/Unit	Average Per Capita Consumption (kilograms)
	Day 1	Day 2	Day 3	Day 4	4 Day Average		
Refugee							
sample 1							
mean	7.088	7.215	7.284	7.286	7.218	7.516	1.057
s.d.	3.021	3.378	3.222	2.972	3.025		.260
sample 2							
mean	7.37	7.485	7.439	7.195	7.372	8.233	.956
s.d.	1.57	1.818	.307	1.931	1.454		.197
Non-Refugee							
mean	7.826	7.465	7.434	7.651	7.594	7.513	1.192
s.d.	3.347	3.200	3.153	2.872	2.938		.633
Total, Sample 1 and Non-Refugee	7.518	7.361	7.371	7.499	7.437	7.514	1.136

Note: Sample 1 and sample 2 magnitudes cannot be compared because a different spring balance was used for each. The balance used for sample 2 weighed more heavily, but the systematic error has not been determined. Sample 2 was taken during **dayr** season, and sample 1 during **xagaa** season. Three of the 31 consumption observations in sample 1 were not complete. Sample 1 n=28, sample 2 n=30, non-refugee n=39.

cost of wood fuels for cooking. Charcoal is the major fuel type, but women use fuelwood to bake **muufo** or to cook large quantities for special occasions.

Women in Hodan mentioned that, where they could purchase a basket of charcoal for seven Somali shillings four years ago, they now pay 15 shillings for a smaller basket. Women of Xamar Weyne recalled that, around 10 years ago, women used primarily fuelwood for cooking. Many changed from the ceramic to the higher-cost soapstone stove at the same time that they changed from fuelwood to charcoal. Although charcoal is more expensive, it is cleaner and allows women to cook inside. Women have also adopted the **miska** or table stove, which is a charcoal-burning stationary stove. Women of Wardhiigleey stated that wood was the principal fuel until the price rose to two shillings per bundle. At that time, charcoal became the most commonly used fuel type. The women of Wadajir commented that, since the marketing of charcoal became regulated, women have less choice over where and what quantities to buy. Vendors charge a higher price than the cooperative outlets. Sometimes there are shortages caused by transport problems and the rains. Women in Hodan and Shingaani also claimed that, since the cooperatives have controlled production, prices have risen.

Women in Hodan cited a 15 shilling basket as the average family's charcoal requirement for one to two days. Women of Xamar Weyne stated that out of the 60 shillings they spend per day for essentials, 15 - 20 shillings are allocated to fuel. Women of Wadajir also mentioned that they needed up to a 15 - 20 shilling basket of charcoal per day to meet their cooking requirements. All women agreed that the proportion of daily expenditures occupied by fuel costs has risen over the past years.

In response to rising fuel costs, the women of these sections have developed a variety of fuel conserving practices. A common strategy is to cover the embers with ash after cooking to slow the rate of burning and permit later use. Rather than restart the fire for afternoon tea, some women prepare tea or coffee with embers from the lunch meal and keep it in a thermos. Some women in Xamar Weyne and Shingaani use the embers from the breakfast meal to cook part of the lunch meal early, so that full use can be made of the embers. The women of Wadajir sometimes use the embers to cook snacks and tea, rather than starting a new fire. Apparently, not all women follow these practices. As a result, their impact on fuel consumption has been relatively slight.

The Wadajir committee argued that there is no strategy for reducing fuel use other than purchasing a more efficient stove. With current models, reducing fuel use would mean decreasing the number of hot meals, which would adversely affect family welfare.

The committee in Hodan noted that the soapstone stove, which has largely replaced the ceramic, cooks more quickly than other stoves. The women in Shingaani stated that they preferred using the ceramic rather than the table stove or three-stone because they can more easily put the embers aside for re-use. Other women in Shingaani had

adopted the Chinese kerosene stove. The committee in Wardhiigleey complained that the kerosene stove was unsafe because of the higher incidence of fires caused by its flames. Women in Xamar Weyne claimed that flames shoot out of the table stove, creating a fire hazard, and that the soapstone is the safest of the stove types.

When asked what stove features were most important to them, the women generally agreed that the stove should be portable, durable, safe, attractive, and suit various pot sizes as well as the **canjeero** pan. Women in Xamar Weyne suggested that the stove provide a place or some means to store embers for later use.

The committees in Hodan, Shingaani, and Xamar Weyne suggested that any new stove be brought to the women's orientation centers or to merchants for promotion. The women in the centers would be trained to use the stove and then local merchants would be contacted to market it. In the past, the soapstone stove has been marketed directly by merchants. The kerosene stove was brought from the trade fair to the orientation center, where it was sold until it became more popular. The women of Wardhiigleey complained that once the merchants began selling the kerosene stove, the price rose too high. They would prefer to sell any new stoves from the orientation center or make an arrangement to control the price of stoves sold directly by merchants. The Wadajir committee concurred. The committees suggested a price that fell between those of the ceramic and soapstone models. If the stove is to be adopted by various income groups, its price, according to the women, must be lower than that of the soapstone, which is the most expensive portable model.

HOUSEHOLD SURVEY RESULTS

Income Source, Consumption Units, Cooks, and Foods Prepared

Three survey sites were selected in Muqdisho: Hodan, Wadajir, and Xamar Weyne. For all three sites, the primary occupations of household heads involved commercial or government employment. Slightly under one-tenth of all employed household heads worked abroad. The remainder were employed as drivers, carpenters, tailors, teachers, and laborers. One household head in Xamar Weyne received most of his income from rental of real estate, and two household heads in Wadajir were farmowners (Table 4.1).

In general, head cooks reported that they had no income-generating activities. Most of the women citing such activities were in Xamar Weyne and Wadajir, and were hat, basket, or mat makers. Several women in Wadajir kept small livestock. Other activities cited by head cooks included government employment, tailoring, and sales of homemade sweets.

The average size of the consumption unit was approximately 7.5 persons over all sites and all seasons, or roughly equivalent to that reported in Lower Shabeelle (Table 4.2). The smallest average consumption unit

Table 4.1

Primary Occupation of Household Heads and Head Cooks, Muqdisho Sites

Occupation/ Income Earning Activity	Households			
	Hodan	Wadajir	Xamar Weyne	Total
Household Head				
Commerce, Trade	8	13	17	37
Government	11	9	7	27
Abroad	2	--	5	7
Electrician	1	--	--	1
Driver	2	1	--	3
Koranic Teacher	1	1	--	2
Carpentry, Construction	1	1	--	2
Laborer	1	2	--	3
Farming	1	2	--	3
Real Estate	--	--	1	1
Tailor	--	1	--	1
Unemployed	1	--	--	1
No Response	1	--	--	1
Total	30	30	30	90
Head Cook				
Small Livestock	--	2	--	2
Hat, Basket, Mat-Making	1	3	4	8
Tailor	--	--	1	1
Sales of Home-Made Sweets	--	--	3	3
Commerce	--	--	--	--
Health Worker	--	1	--	1
Shopkeeper	1	--	--	1
Government	1	--	--	1
No Income Earning Activity	27	24	22	73
Total	30	30	30	90

sizes were found in Wadajir and Cabdul Casiis, and the largest in Hodan and Wardhiigleey. In Hodan, a relatively large proportion of the consumption units consisted of adults over the age of 12. In Xamar Weyne the composition tended to include more children. The distributions of consumption unit sizes for Wadajir and Hodan have wider ranges than that of Xamar Weyne. In Wadajir, a relatively larger proportion of units consists of fewer than four persons. In Xamar Weyne, unit sizes are more heavily clustered around eight persons.

Variation in average unit size between seasons is negligible in Muqdisho. The number of persons eating in the household changes daily according to the number of guests and family members present rather than by seasonal migration patterns. Unlike the effect of seasonal migration patterns, the effect of these variations in unit size is not systematic. Over a large number of households, the effects of these variations will average to zero.

The average age of cooks over sites and meals was 26.5 years. The average varies little between sites or meals. Most meals were prepared by individual women. Only three of the cooks shared cooking responsibilities for meals. In Wadajir and Xamar Weyne, all but a few meals were prepared by the head cook herself, but in Hodan, roughly half of the meals were cooked by other family members or hired cooks. Of the other cooks, most were daughters of head cooks.

With the exception of Xamar Weyne, the types of staple foods prepared in Muqdisho were similar to those in Lower Shabeelle non-refugee villages, although the relative importance of certain foods differed (Table 4.3). A higher proportion of Muqdisho cooks cited pasta and meat, and a lower proportion cited **muufo** or porridge and beans. Relative to other Muqdisho sites, fewer Xamar Weyne cooks prepared porridge and beans and **canjeero** and a greater number prepared **muufo**. In addition to staple grain and meat dishes, **bur** was prepared by some of the cooks. (**Bur** is a fried flour and egg dish.) Other dishes were cited by Xamar Weyne cooks only. These included **cagaar** (vegetables), **dango** (popcorn), **bajiye** (beancake), and sweets. Some women reported preparing sweets for sale. The cooks in Xamar Weyne cited fish (**kalluun**) almost as often as meat. The Muqdisho diet, unlike the Lower Shabeelle village diet, is not expected to vary seasonally. A description of foods is provided in Appendix C.

Stove Types, Utensils, and Location of Stoves

With the exception of Xamar Weyne, where the ceramic stove appears most popular, the principal stove type is the soapstone (Table 4.4). In Hodan and Xamar Weyne, some cooks reported the table stove as the most frequently used stove in their households. Only two three-stone stoves and one metal stove were cited as primary stoves. Figure 3.1 illustrates the designs of the major stove type. The table stove and **umeme** are shown in Figure 4.1. The table stove consists of two or three fireboxes with metal grates or screens inserted into a tiled shelf. The table stove, which burns charcoal only, permits simultaneous cooking of dishes. Other stove types found in Muqdisho are described in the section on Lower Shabeelle Cooking Practices.

Table 4.2

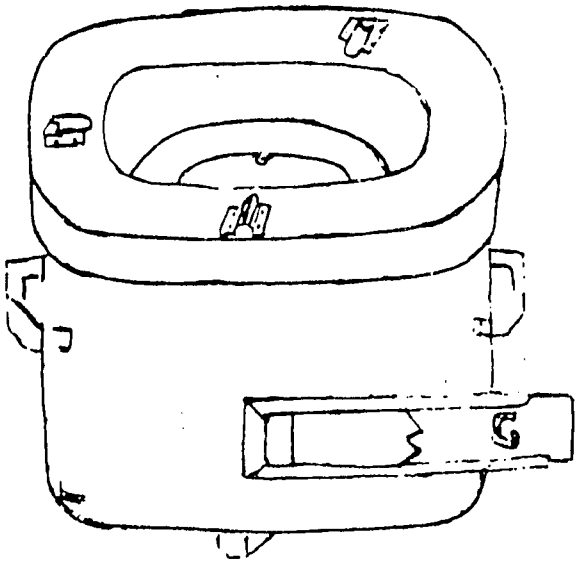
Average Size and Composition of Consumption Unit, Muqdisho Sites

Site[a]	Average Number of Persons, by Age Group			Average Number of Persons, by Season			
	0-3 yrs	4-12 yrs	12+ yrs	Xagaa	Dayr	Jiilaal	Gu
Hodan	0.7333	1.3333	7.3333	9.3993	9.1667	9.3993	9.1667
Wadajir	0.7667	1.2333	3.6	5.7	5.7	5.7	5.7
Xamar Weyne	1.2	2.6333	3.9667	7.8333	7.8333	7.8333	7.8333
Cabdul Casiis[b]	0.8	1.0667	4.2	--	6.0667	--	--
Wardhiigleey[b]	1.0333	1.8	5.167	--	8.0	--	--
Total	0.9067	1.6133	4.8534	7.6242	7.35334	7.6242	7.5667

Note: **Xagaa** and **jiilaal** are the dry seasons, and **dayr** and **gu** are the rainy seasons.

a Each site sample size = 30.

b Cabdul Casiis and Wardhiigleey data collected only for **dayr** season by Hubert Laux of the Geographisches Institut der Technischen Universität, Munich, West Germany.



Kenyan Design (Umeme)

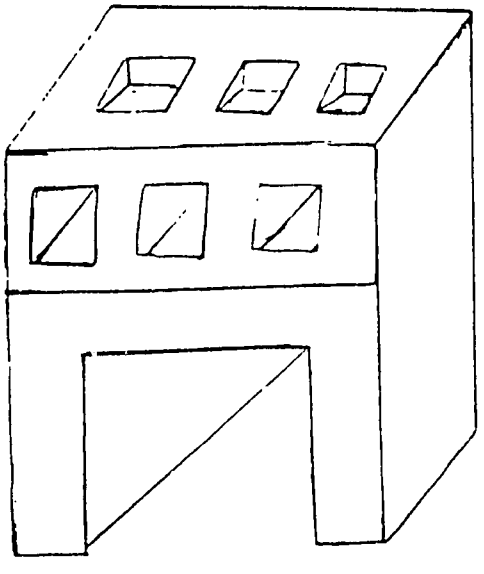


Table Stove (Miska)

Figure 4.1

Stove Models[a]

[a] Original drawings submitted by Moxamed Cali Axmed, Socioeconomic Counterpart.

Table 4.3

Foods Cooked in Muqdisho Sites

Dishes[a]	Number of Cooks Citing Dish				Cooks Citing Dish as % of All Cooks
	Hodan	Wadajir	Xamar Weyne	Total	
Baasto	29	29	30	88	.98
Bariis	29	29	29	87	.97
Canjeero	28	18	7	53	.59
Soor	7	24	26	57	.63
Cambuulo[b]	22	23	6	51	.56
Rooti	3	--	--	3	.03
Muufo	3	2	11	16	.18
Hilib[c]	23	29	30	82	.91
Bur	3	--	7	10	.11
Kalluun	--	1	21	22	.24
Cagaar	--	--	10	10	.11
Sweets	--	--	7	7	.08
Dango	--	--	1	1	.01
Bajiye	--	--	2	2	.02

a **baasto** = pasta, **bariis** = rice, **canjeero** = light pancakes, **soor** = porridge, **cambuulo** = grain or rice and beans, **rooti** = white bread, **muufo** = corn or sorghum bread, **hilib** = meat, **bur** = fried cake, **kalluun** = fish, **cagaar** = vegetables, **dango** = popcorn, **bajiye** = beancake. For description of dishes, see Appendix C.

b **ambuulo** is generally prepared with beans.

c **Hilib** is usually cooked with grains.

Table 4.4

Stove Type Most Frequently Used, Muqdisho Sites

Stove Type	Households					
	Hodan	Wadajir	Xamar Weyne	Cabdul Casiis[a]	Wardhiigleey[a]	Total
Most Frequently Used						
three-stone	--	--	1	--	--	1
modified three-stone	--	1	--	--	--	1
ceramic	--	4	18	3	4	29
soapstone	23	24	5	26	26	104
table stove	7	1	6	--	--	14
metal	--	--	--	1	--	1
Subtotal	30	30	30	30	30	150
Less Frequently Used						
three-stone	--	6	--	--	13	19
ceramic	1	--	5	1	1	8
soapstone	6	3	1	7	12	29
table stove	1	--	--	--	1	2
muufo stove	3	--	1	--	2	6
umeme[b]	1	--	--	--	--	1
gas	1	--	--	--	--	1
kerosene	--	--	--	5	2	7
electric	--	--	--	1	1	2
Subtotal	13	9	7	14	32	75

[a] Cabdul Casiis and Wardhiigleey data collected by Hubert Laux of the Geographischen Institut der Technischen Universitat, Munich, West Germany.

[b] Fuel-efficient, metal stove of Kenyan design.

Table 4.5

Seasonal Location of Stoves Most Frequently Used, Muqdisho Sites

Season/Location	Households			
	Hodan	Wadajir	Xamar Weyne	Total
Most Frequently Used				
Xagaa, Jiilaal				
inside	10	4	24	38
outside, sheltered	17	21	6	44
outside	3	5	--	8
Dayr, Gu[a]				
inside	10	4	24	38
outside, sheltered	17	21	6	44
outside	3	5	--	8
Less Frequently Used				
Xagaa, Jiilaal				
inside	6	2	6	14
outside, sheltered	6	4	1	11
outside	--	3	--	3
Dayr, Gu				
inside	6	2	6	14
outside, sheltered	6	4	1	11
outside	--	3	--	3

Note: **Dayr** and **gu** are the rainy seasons, and **xagaa** and **jiilaal** are the dry seasons.

[a] Stoves may be moved only when it is raining, rather than for the duration of the season.

Table 4.6

Utensils and Practices, Muqdisho Sites

Utensil/Practice	Number of Cooks Using/Practicing				Number as % of All Cooks
	Hodan	Wadajir	Xamar Weyne	Total	
Utensil type					
pot type					
clay	0	0	0	0	--
metal	30	30	30	90	1.00
pot size					
small	3	3	0	6	.07
medium	2	4	15	21	.23
large	2	5	0	7	.08
combination of sizes	23	18	15	56	.62
lid used	30	30	30	90	1.00
Practice					
pot food-specific	0	0	0	0	--
stove food-specific	3	0	1	4[a]	.04
simultaneous cooking[b]	13	18	3	34	.38

a Some of these food-specific stoves are **muufo** stoves.

b Combinations included sauce or meat and rice, and **canjeero** and tea.

Table 4.7

Non-Cooking Uses of Stoves, Use of Embers, Frequency of Boiling Water and Preparing Tea, Muqdisho Sites

Use/Frequency	Households			
	Hodan	Wadajir	Xamar Weyne	Total
Non-Cooking Uses:				
washing only	5	14	19	38
combination[a]	12	7	--	19
other[b]	5	8	11	24
no other use	8	1	--	9
Average number of times water is boiled daily	.6	1.35	.97	.97
Average number of times tea is prepared daily	2.33	2.43	2.37	2.38
When water is boiled or tea is prepared:				
with embers from meal	1	--	3	4
separately from meal	7	26	11	44
both	22	3	16	41
no response	--	1	--	1
Use of embers:				
left to die out	--	2	--	2
covered for later use	30	28	30	88

a Combinations consisted of washing and burning incense, and cleaning milk containers and preparing sweets.

b Incense, cleaning milk containers, preparing sweets.

Of the stove types less frequently used, the soapstone was the most often cited, followed by the three-stone and ceramic stove. The three-stone is usually an auxiliary stove in the Muqdisho households surveyed, used for cooking larger quantities or for special occasions. Many of the soapstone stoves cited as less frequently used were actually second soapstone stoves used as auxiliaries or for cooking larger quantities of food. The three-stone stoves were cited only in Wadajir and Wardhiigleey. **Muufo** stoves were found in Hodan and Xamar Weyne. Although more women baked **muufo** in Xamar Weyne, they prepared the dish in a pan rather than in a **muufo** stove. In Cabdul Casiis and Wardhiigleey, kerosene stoves and electric stoves were cited, and in Hodan, a gas stove was cited.

Table 4.5 indicates that for Muqdisho, where seasonal rains are lighter than in Lower Shabeelle and the climate is tempered by proximity to the ocean, stoves are not moved according to seasons. Cooks move their stoves to suit the direction of the wind, ventilation, or cooking space. Only a small number of total stoves (less than ten percent) were located outside any shelter. Portability remains an important stove feature for Muqdisho cooks, as indicated by the large proportion of portable models and by the preferences expressed in group meetings.

The utensils and cooking practices of Muqdisho cooks are listed in Table 4.6. No clay pots were cited, and over half of the cooks used a combination of pot sizes. All cooks used lids. With the exception of the **canjeero** pan, no pots were specific to dishes. As in Lower Shabeelle, the only dish-specific stoves were **muufo** stoves. Although 38 percent of the cooks stated that they prepared two or more dishes simultaneously on their stoves, in actual practice, dishes are generally cooked in the same pot and do not require two pot holes. Combinations included primarily beans and grain or sauce and grain dishes.

Non-Cooking Uses of Stoves

Non-cooking purposes differed in the Muqdisho sites from those in Lower Shabeelle (Table 4.7). A smaller proportion of cooks cited boiling water for washing as the only non-cooking use in Muqdisho, and the average frequency of boiling water for washing was lower than in Lower Shabeelle. Almost all of the Muqdisho cooks used the stove to burn incense. In Xamar Weyne, some women used their stoves to prepare sweets for sale, and in Wadajir, some cleaned milk containers. The use of smoke as a mosquito deterrent was not cited in Muqdisho.

The frequency of tea preparation averaged 2.4 times per day across sites with little variation between sites. Approximately half of the cooks boiled water or prepared tea separately from meals. Slightly less than half of the cooks indicated that they would use embers from the meal as well as start a new fire to boil water or prepare tea. Only two of the 90 cooks surveyed stated that they left embers to die out after using the stove. Despite some uncertainty over the interpretation of this survey question, the most reliable interpretation of responses is that the majority of cooks are aware of the utility of

saving embers from cooking for subsequent meals or other uses. The burning rate of the embers can be slowed by covering them with ashes, and when a woman is ready to cook again, she can re-use the embers without starting a new fire.

Cooking Attitudes and Suggested Stove Modifications

No new cooking problems were discovered in the Muqdisho portion of the survey. Moreover, many cooks expressed the opinion that they had no cooking difficulties or fewer than those listed in the questionnaire. Results are tabulated in Table 4.8, where scores represent totals over 30 observations for each site. The lower the score, the more important the difficulty.

The highest possible score for a cooking problem is 150 at each site. The large number of scores over 100 indicates that many women did not consider the cooking aspects listed to be problems. For the combined sites, time, smoke, and fire hazards were considered to be least important. The lesser importance of smoke reflects the fact that the major fuel type is charcoal. Where stoves are sheltered or located inside the home, fire hazards from gusty winds are decreased. Although heat was considered a major difficulty, it can only be moderately reduced through stove design. Despite rising fuel costs, the responses suggest that many of the cooks did not consider fuel expenditures as particularly burdensome.

As in Lower Shabeelle, less than one-third of the women stated that their stoves required maintenance. In response to the question on how the cooks would improve their stoves, only three modifications on existing designs were suggested. These included creating air holes or building a chimney to permit greater ventilation. In Hodan and Wadajir, 20 women stated simply that they would prefer "another stove". This response was undoubtedly conditioned by the enumerators' explanation of survey objectives. Again, the highest non-response rate was recorded for this question.

HOUSEHOLD SURVEY RESULTS: CHARCOAL AND FUELWOOD USE

Fuel Type and Purchase Patterns

In the Muqdisho sites surveyed, charcoal was used in all seasons by all households. The few households using a combination of wood and charcoal were located in Wadajir. Three households used wood with charcoal during the dry seasons, and five households used wood in combination with charcoal during the rainy seasons. No specific cooking uses were cited for fuelwood, and cooks explained that fuelwood may be used on the three-stone fire to cook larger quantities. The three cooks using fuelwood in combination with charcoal at the time of the survey purchased daily one bundle of three sticks for two Somali shillings. For all households surveyed, charcoal was the preferred fuel type.

Table 4.8

Cooking Problems, Muqdisho Sites

Problems	Rating			
	Hodan	Wadajir	Xamar Weyne	Total
Time score[a]	101	123	106	330
Heat score	42	47	54	143
Smoke score	113	106	91	310
Fuel score	107	99	86	292
Fire, Burns score	116	84	134	334

Note: Each cook was asked to rate cooking problems in decreasing order of importance, numbered from 1 = most important to 5 = least important. No problems other than those listed in the table were reported.

[a] The scores are sums over observations. A lower score corresponds to a more important problem. Scores are comparable between groups because the total possible score (5 x 30 observations) is the same for all groups.

Table 4.9

Charcoal Expenditures Per Purchase and Frequency of Purchase, Muqdisho

Site[a]	Expenditure per Purchase (Somali Shillings)					Average Expenditure per Purchase	Average Number of Purchases per Week (kilograms)		
	Basket		Half Quintal	Quintal					
	10-15	20-30	90	130-150	160-180		Basket	Quintal	All Units
Hodan	21	--	1	3	5	56.83	2.91	.306	2.129
Wadajir	1	22	--	--	7	57.17	2.37	.297	1.87
Xamar Weyne	8	17	--	3	2	40.83	4.22	.225	3.55
Subtotal	30	39	1	6	14	51.61	3.17	.276	2.516
Cabdul Casiis[b]						121.67			.989
Wardhiigleey[b]						114.88			2.273
Subtotal						118.275			1.631

a For each site, n = 30.

b Data for Cabdul Casiis and Wardhiigleey collected by Hubert Laux of the Geographischen Institut der Technischen Universität, Munich, West Germany.

Prices per unit are difficult to establish in the context of a household consumption survey. Charcoal appears to be sold in units of varying weight. A quintal is used to refer to sacks of charcoal as well as fractions of sacks, where the weight per comparable unit varies. The other standard unit, a basket, also varies by volume and weight. The range of costs cited by cooks, units, average expenditures per purchase, and average frequency of purchase are recorded in Table 4.9.

Charcoal purchase is not systematic in most households, and cooks cannot define the period over which the purchased amounts lasts. The figures reported by the cooks are rough estimates, and do not correspond closely to the physical quantities measured by enumerators. While conducting research for his doctoral dissertation, Hubert Laux of the Geographischen Institut der Technischen Universitat in Munich, West Germany, asked cooks to state a range for the prices paid and frequency of purchase. This method may yield more reliable figures than requesting a usual price paid and frequency of purchase. His results are included in Table 4.9, as average expenditure per purchase and average frequency of purchase per household.

As indicated in Table 4.9, baskets are sold in various sizes with different prices. In Hodan, most women purchased 10 or 15 shilling baskets, and in Wadajir and Xamar Weyne, they tended to purchase 20 or 30 shilling baskets. These quantities were purchased from two to seven times per week, depending on family size. Two half-quintal sacks were recorded as purchased bi-weekly for 90 shillings each. Quintals or sacks were also sold in a broad price range of 130 - 180 shillings. The 180 shilling sack represented the largest expenditure per purchase found in the VITA survey. Some of the households interviewed by Laux in his survey reported purchasing 200 shilling sacks. For all units, average expenditures per purchase were approximately 41 - 57 shillings in the VITA survey. Average frequency of purchase was 2.5 times per week. Laux's figures are slightly different for Cabdul Casiis and Wardhiigleey, with a much higher average expenditure per purchase and slightly lower average frequency of purchase.

Daily Expenditures, Fuel Expenditures and Fuel Consumption

Daily cash and fuel expenditures are reported in Table 4.10 for both VITA and Laux surveys. Daily fuel expenditures were calculated from expenditure per purchase and frequency of purchase data for each household. The proportion of fuel expenses in the daily total was then computed by household. Over all sites, there is a wide range in quoted expenditures, and the share of fuel expenses ranges from 7 to 19 percent. The lowest fuel shares of total cash expenditures are found in Hodan and Xamar Weyne, two of the more prosperous sites, with total expenditures averaging over 100 shillings per day. The highest fuel shares are found in Wadajir and Wardhiigleey, where daily expenditures are lowest, at 83 shillings per day. Although methods used to collect data in the VITA and Laux survey differed, results are comparable, as indicated by the subtotal figures. The VITA group repre-sents more affluent households. For all sites, daily cash expenditures average 99.786 shillings, of which 11 percent, or 8.278 shillings, were devoted to the purchase of fuel.

Table 4.10

Daily Cash and Fuel Expenditures, Muqdisho

Site[a]	Average Daily Expenditures (Somali Shillings)		
	Total	Fuel	Fuel as % of Total
Hodan			
mean	118.17	6.93	0.067
s.d.	(55.406)	(3.494)	(0.037)
Wadajir			
mean	83.621	7.528	0.111
s.d.	(53.267)	(3.540)	(0.072)
Xamar Weyne			
mean	121.724	9.21	0.077
s.d.	(26.836)	(5.422)	(0.044)
Subtotal	107.838	7.889	0.085
Cabdul Casiis[b]			
mean	92.25	7.61	0.104
s.d.	(69.30)	(3.751)	(0.060)
Wardhiigleey[b]			
mean	83.167	10.113	0.192
s.d.	(72.878)	(5.037)	(0.160)
Subtotal	87.709	8.862	0.148
Total	99.786	8.278	0.110

[a] For each site, n = 30.

[b] Cabdul Casiis and Wardhiigleey data collected by Hubert Laux.

Table 4.11

Average Charcoal Consumption Per Consumption Unit and Per Capita, Muqdisho

Site[a]	Average Consumption Per Unit (kilograms)					Average Number of Persons/Unit	Average Per Capita Consumption (kilograms)
	Day 1	Day 2	Day 3	Day 4	4-Day Average		
Hodan							
mean	5.479	5.623	5.686	5.543	5.583	9.167	.816
s.d.	1.515	1.575	1.571	1.427	1.415		.596
Wadajir							
mean	4.380	4.790	4.667	4.921	4.690	5.7	.973
s.d.	1.655	1.658	1.933	1.949	1.748		.398
X/Weyne							
mean	4.920	4.894	4.922	4.990	4.931	7.83	.661
s.d.	1.485	1.541	1.250	1.411	1.367		.024
Total	4.926	5.08	5.09	5.151	5.06	7.57	.817

[a] For all sites, n=30.

In slightly over 10 percent of the households surveyed by VITA, head cooks provided the money for fuel purchase. Out of 90 head cooks interviewed, 56 reported that they share charcoal occasionally. All cooks noted a rise in fuel expenditures over the past year. Over half of the women stated that they had not changed cooking practices in response to increasing prices. Twenty-nine women reported reducing fuel use, five stated that they had changed fuel types, and two had reduced the number of hot meals they prepared.

Average charcoal consumption figures for Hodan, Wadajir, and Xamar Weyne are shown in Table 4.11. Variation between average daily consumption figures is highest in Wadajir, at five percent, but coefficients of variation ranged from less than ten to over 25 percent in the households surveyed. Over all sites, the four-day average consumption figure was 5.06 kilograms for a consumption unit of 7.6 persons.

Considering that most cooks used the more fuel-efficient soapstone stoves, these daily consumption averages are remarkably high. Although the majority of cooks reported covering embers between meals to slow the burning rate, these figures suggest that either much of the charcoal continues to be lost in burning between meal preparation, or that a considerable amount of charcoal is used for boiling water, preparing tea, or non-cooking purposes. The amount of charcoal used in cooking also depends on the types of meals cooked, whether meals are cooked at regular times or food is reheated, and whether auxiliary stoves are used.

Enumerators have suggested that most of the households surveyed appeared relatively affluent. Although there is a wide range in both occupations and cash expenditures, the housing characteristics of the sites reflect predominantly high and middle income groups. In some households, family members also ate at various times of the day, or more than three times per day. Considerable work remains in identifying the major source of variation in fuel consumption. If this source is cooking techniques or non-cooking uses, the adoption of a more fuel-efficient stove alone may have little effect on consumption.

The fuel consumption figures obtained by Laux (0.53 and 0.41 kilograms per capita per day) are considerably lower. The sites selected in Cabdul Casiis and Wardhiigleey represent a less affluent population mix. Also, a different method was used to collect data. Laux provided money to purchase fuel, and he and his counterpart performed all measurements. In the VITA survey, no money was provided, and four Somali enumerator teams conducted the measurements. The difference in figures may be explained in part by the range of household sizes and income levels, but it also indicates that the method used to collect the consumption data may profoundly influence results.

V. GEDO RESULTS: REFUGEE CAMP, NON-REFUGEE VILLAGE, AND MARKET TOWN

COMMUNITY PERCEPTIONS AND RESPONSES TO WOOD FUELS SCARCITY

Group meetings with women's committees were held in Luuq and Cir Kud. In Luuq, fuelwood is the principal fuel type used by cooks, although both charcoal and fuelwood are used during the rainy seasons. Although Cir Kud is located on the asphalt road between the charcoal production areas of Baay region and Luuq, Cir Kud households do not consume charcoal.

Members of the Luuq women's committee have noted an increase in the prices of both charcoal and fuelwood since the establishment of the refugee camps. Of all regions of Somalia, the concentration of refugees is highest in Gedo. This increase in fuel price levels is related to two structural factors: (1) inflationary pressures brought about by a growing population base and expenditures for refugee assistance programs; and (2) recession of forest areas resulting from increased demand on resources. According to the committee, the price of fuel has risen at a faster rate than the price of other consumption items, such as staple foods. The women stated simply that with the growth of services and employment brought about by the influx of refugees, many people have cash and are willing to pay higher fuel prices.

According to the women of Cir Kud, their village economy has also been affected by the refugee camps. Many villagers are now employed by the government. Despite these changes, most women continue to collect fuelwood for their own household use. The committee stated that four years ago a woman could collect her backload in an hour's time. To obtain good fuelwood today, she must collect for three to four hours. The radius of the deforested area around Cir Kud is, nevertheless, visibly smaller than that of either Luuq or Maganey.

Although they agreed that fuel expenditures have increased over the past few years, members of the Luuq women's committee have not observed any changes in cooking practices. In general, cooks cover the embers to slow the burning rate or put them out after use. The women's committee has not noticed any reduction in hot meals or boiling of water. The committee in Cir Kud mentioned no changes in cooking practices, but expressed interest in learning methods to reduce fuel consumption.

Traders brought the Ceel-Buur soapstone stove to Luuq. Because of transport and marketing costs, prices for the stove are over 200 Somali shillings. Some women on the Luuq committee reported the use of a metal (**girgir**) stove, also sold by merchants. The women stated that any new stove provided free should be distributed through the orientation centers. If the stove must be purchased, a group of women should be taught to produce and market the stove. The only stove features suggested by the Luuq committee were portability and attractive appearance.

Table 5.1

Primary Occupations of Household Heads and Head Cooks, Gedo

Occupation/Income-Earning Activity	Households			Total
	Luuq	Cir Kud	Maganey	
Household Head				
Commerce[a]	11	12	1	24
Tea Shopkeeper	--	3	--	3
Government	16	4	7	27
Soldier	--	2	6	8
Farmer/farmworker	1	--	8[b]	9
Herder	--	2	1	3
Driver	--	1	--	1
Koranic Teacher	--	--	1	1
Sheikh	--	2	2	4
Abroad	2	2	--	4
Unemployed	--	2	3	5
Total	30	30	29[c]	89
Head Cook				
Government	--	--	2	2
Teacher	--	--	4	4
Farmworker	1	--	1	2
Herder	--	2	--	2
Vendor	--	1	--	1
Fuel Collection	--	1	--	1
Mat-maker	1	--	--	1
No Income-earning Activity	28	26	23	77
Total	30	30	30	90

[a] Includes shopkeepers, wholesalers, and traders.

[b] The major crop is maize; five out of seven farms are fully-owned; the farms are between 8 and 15 **jiibaal.**

[c] One household head deceased.

Table 5.2

Average Size and Composition of Consumption Unit, Gedo

Site[a]	Average Number of Persons, by Age Group			Average Number of Persons, by Season			
	0 - 3 yrs.	4 - 12 years	12+ years	Dayr	Xagaa	Jiilaal	Gu
Luuq	1.333	2.667	4.233	8.233	8.033	7.933	8.033
Cir Kud[b]	0.93 (0.967)	1.483 (1.533)	3.345 (3.733)	5.758 (6.233)	5.93 (6.4)	5.724 (6.20)	6.00 (9.8)
Maganey	0.933	2.067	3.3	6.3	6.233	6.3	6.3
Total	1.065 (1.078)	2.072 (2.089)	3.626 (3.756)	6.764 (6.922)	6.732 (6.889)	6.652 (6.811)	6.777 (8.044)

[a] Sample size is 30 for each site.

[b] One household runs a large Koranic school during the gu season. The average size of the consumption unit with this observation included is in parentheses. The adjusted figures are listed without parentheses.

Some women in Cir Kud have also purchased soapstone stoves for 200 shillings from travelling merchants. Members of the committee expressed the opinion that, if a stove saved fuel, those who could afford it would purchase it. For the stove to be widely accepted, however, the price should be considerably less than that of the soapstone, or fall between the cost of the ceramic and soapstone models.

HOUSEHOLD SURVEY RESULTS: COOKING PRACTICES

Occupations, Consumption Units, Cooks, and Foods Prepared

In the non-refugee sites of Luuq and Cir Kud, most household heads were employed by the government or in a variety of commercial, trading, and shopkeeping occupations (Table 5.1). Several were in the armed forces, worked abroad, or were unemployed. Few were directly employed in farming or herding activities. Although this distribution of occupations is not representative of the economic activity of the region as a whole, it may reflect the composition of employment in more settled roadside communities.

In Maganey refugee camp, most household heads were soldiers, farmers, or farmworkers, many of whom were employed by the refugee commission. The farms, which are in most cases owned, range in size from eight to 15 **jiibaal**. The major crop produced is maize. Several household heads in Maganey were herders, merchants, Koranic teachers, or were unemployed. In both Cir Kud and Maganey, two of the household heads were sheikhs.

As in Lower Shabeelle and Muqdisho, few of the head cooks participated in income-generating activities. More refugee than non-refugee women were employed. Activities of refugee women included employment with the refugee commission, teaching in the home, and farmwork. Among non-refugees, two women in Cir Kud raised livestock and one woman in Luuq was a farmworker. Other non-refugee occupations were vending, fuel collection, and mat-making.

The average size and composition of consumption units is given in Table 5.2. In Gedo, household interviews were conducted during the **dayr**, or short rainy season. For all three sample groups, average household composition was weighted slightly toward adults over the age of 12 years. Roughly one-sixth of the average consumption unit was under the age of four, one-third between the ages of four and 12, and one-half over the age of 12. The average size of the consumption unit was slightly lower (under six persons) in Cir Kud than in Maganey. The average number of persons was highest in Luuq. Seasonal variation in the size of the consumption unit appears to be slight, and does not correspond to a dry versus rainy season pattern. In Cir Kud, one of the families interviewed operates a large Koranic school during the long rainy **(gu)** season. In Table 5.2, average figures calculated after excluding this household are listed without parentheses. Average figures calculated from the full sample are recorded in parentheses.

The average age of all cooks was lower in the Gedo sites than in Lower Shabeelle sites, or approximately 28 years. In all three Gedo sites, the breakfast cook was generally the head cook (average age of 33 years), while half of those responsible for preparing lunch and evening meals were daughters and sisters of head cooks. As in Lower Shabeelle and Muqdisho, cooks prepared meals individually, with at most one second cook listed.

The foods prepared most often by the head cooks are listed in Table 5.3. As compared with sites in Lower Shabeelle and Muqdisho, less variety is apparent in the Gedo diet. The staple foods are based primarily on grains and porridges and do not include **muufo.** Pasta, a more costly grain product, is consumed less frequently in the camps. **Cambuulo** (porridge and beans) is cited less often in Luuq. **Canjeero** is prepared less frequently in the village of Cir Kud. Meat is costlier and is eaten less often in Maganey than in the non-refugee sites. Maganey cooks tend to substitute **cambuulo** for meat dishes.

Stove Types, Utensils, and Location of Stoves

Stove types for the Gedo sites are listed for households surveyed in Table 5.4. The survey showed that the three-stone fire was the predominant stove type in Gedo. In Maganey refugee camp, where sampling difficulties arose, some of the cooks surveyed used mud/cement stoves. These single pot hole designs have been extended as part of the Interchurch Response Appropriate Technology program. Less frequently used, secondary stoves included soapstone, ceramic, three-stone, and mud/cement models.

Compared with Lower Shabeelle and Muqdisho sites, relatively few secondary stoves were reported in Gedo. The large number of secondary soap-stone stoves found in Luuq represents a unique cooking practice among sites visited. Women of these households explained that for most of the year, they cook with fuelwood on the three-stone fire. During the sporadic rains of **dayr** and **gu,** they purchase charcoal to cook with the soapstone stove. For these women, the stove type and fuel type shifts by season. Soapstone and ceramic stove designs are illustrated in Figure 3.1.

The location of most frequently used stoves is given by season for all sites in Table 5.5. In both Cir Kud and Maganey, the three-stone fires are located outside in a sheltered cooking area or in a cooking **aqal.** In Luuq, most of the three-stone fires are placed outside the home in an open area, rather than in an **aqal.** Stove location reflects in part the housing structures of the sites. In general, families in Cir Kud and Maganey live in **mudul** or **aqal** structures. Many of the families in Luuq live in larger cement or rectangular mud and wattle homes with enclosed or partially-enclosed courtyards. There is a slight variation in stove location by season for the Cir Kud and Maganey sites, where three-stone fires are brought into a sheltered area or into the home during the rains. As mentioned above, most women in Luuq switch to cooking with the soapstone stove in a sheltered cooking area when it rains.

Table 5.3

Foods Cooked, Gedo

Dishes[a]	Number of Cooks Citing Dish				Cooks Citing as % of All Cooks
	Luuq	Cir Kud	Maganey	Total	
Bariis	30	30	30	90	1.00
Baasto	30	30	19	79	0.88
Cambuulo[b]	13	24	27	64	0.71
Soor	23	28	21	72	0.80
Canjeero	26	11	24	61	0.68
Hilib[c]	30	30	11	61	0.68

a **Bariis** = rice, **baasto** = pasta, **cambuulo** = wheat or rice and beans, **soor** = porridge, **canjeero** = light pancakes, **hilib** = meat. For description of foods, see Appendix C.

b Usually **digir** (beans) is cooked with rice to make **cambuulo.**

c **Hilib** is usually prepared with **bariis** or **baasto** but because it is a more expensive food, it is not cooked as often in refugee households.

Cooking utensils and practices are described in Table 5.6. All cooks reported using metal pots. Most cooks used medium-sized pots or a combination of sizes, depending on the number of persons for whom they cooked. Pots, other than the **canjeero** pan, were not specific in design or size to the food prepared. Lids were used by all cooks.

Stoves were not typically food-specific. Compared with Muqdisho and Lower Shabeelle sites, a larger proportion of women in Gedo mentioned cooking a number of dishes simultaneously. This reflects the use of the three-stone stove, which permits the cook to keep one dish warm while preparing another. The combinations cited included rice and meat or pasta and sauce dishes.

Non-Cooking Uses of Stoves

Three-stone stoves are well suited to a variety of non-cooking purposes. The majority of cooks reported non-cooking purposes that were similar to those found in Muqdisho and Lower Shabeelle. In Cir Kud, women used the three-stone stove to heat water, to fry coffee beans, and to clean milk containers. Women in Maganey burned incense, boiled water, and fried coffee beans. In this region, women use **qansax** (acacia reficiens) ash to clean their milk containers. The smoke and ash of the **qansax** gives sour and fresh camel milk a distinctive flavor. In Luuq, as in Muqdisho, women used their soapstone stoves to burn incense.

Tea was prepared and water boiled several times a day in the Gedo sites, or more frequently than in Muqdisho and as frequently as in the Lower Shabeelle sites. Out of 90 cooks interviewed, 88 stated that they conserved embers by putting them out or covering them for later use.

Cooking Attitudes and Suggested Stove Modifications

Table 5.8 lists cooking problems as rated by the cooks interviewed. The scores are sums over observations. Cooks listed their problems in decreasing order of importance. Lower scores correspond to the most troublesome problems.

The Luuq responses are similar to those of the cooks in Muqdisho, with the exception that smoke emission is a greater problem with the three-stone stove. Luuq women were bothered most by heat and smoke, while fuel costs, fire hazards, and cooking time were not particularly important. In the village of Cir Kud, women appeared to be most concerned with smoke and fire hazards. Although women in Cir Kud cooked in sheltered areas, their homes and cooking areas may be less protected from gusty winds that might cause fires than the the cooking areas of the Luuq women.

Of the three groups of women, those in Maganey were most concerned about the burden of fuel costs or collection. The women in Maganey have less income to spend on fuel, and those who collect their fuel travel a greater distance than the women of Cir Kud. The Maganey women

Table 5.4

Stove Types Used, Gedo

Stove Type	Households			
	Luuq	Cir Kud	Maganey	Total
Most Frequently Used				
three-stone	30	29	18	77
modified three-stone	--	--	1	1
soapstone	--	1	--	1
mud/cement[a]	--	--	11	11
Subtotal	30	30	30	90
Less Frequently Used				
soapstone	21	3	1	25
ceramic	1	1	--	2
three-stone	--	--	4	4
mud/cement	--	--	2	2
Subtotal	22	4	7	33

[a] Mistakenly drawn into sample, these are mud/cement, one pot hole designs introduced by the Interchurch Response Appropriate Technology Program.

Table 5.5

Seasonal Location of Stoves Most Frequently Used, Gedo

Season/Location	Households			
	Luuq	Cir Kud[a]	Maganey	Total
Xagaa				
inside	0	3	2	5
outside, sheltered	10	19	24	53
outside	20	8	4	32
Dayr				
inside	0	14	5	19
outside, sheltered	10	13	22	45
outside	20	3	3	26
Jiilaal				
inside	0	13	5	18
outside, sheltered	10	14	22	46
outside	20	3	3	26
Gu				
inside	0	2	2	4
outside, sheltered	10	20	24	54
outside	20	8	4	32

Note: In Luuq, all women who owned secondary soapstone stoves used them in a sheltered cooking area during the rains only. One ceramic stove was reported as a third stove but its location was not specified.

[a] The slightly irregular seasonal pattern in Cir Kud is explained by one respondent who stated she used her primary stove inside the home during **xagaa** and **dayr**, and in an outside sheltered location during **gu** and **jiilaal**.

Table 5.6

Utensils and Practices, Gedo

Utensils/Practices	Number of Cooks Using/Practicing				Number as % of All Cooks
	Luuq	Cir Kud	Maganey	Total	
Utensils					
pot type					
clay	0	0	0	0	--
metal	30	30	30	90	1.00
pot size					
small	0	4	0	4	0.04
medium	21	18	20	69	0.77
large	0	4	1	5	0.06
combination of sizes	9	4	9	22	0.24
lid used	30	30	30	90	1.00
Practices					
pot food-specific	0	0	0	0	--
stove food-specific	0	0	1	1	0.01
simultaneous cooking[a]	17	13	8	38	0.42

[a] Combinations included beans and rice or porridge; and meat or sauce and pasta.

Table 5.7

Non-Cooking Uses of Stoves, Use of Embers, Frequency of Boiling Water and Preparing Tea, Gedo

Use/Frequency	Households			
	Luuq	Cir Kud	Maganey	Total
Non-Cooking Uses:				
washing only	5	3	6	14
combination[a]	25	27	24	76
Average number of times water is boiled daily	1.53	1.57	1.60	1.57
When water is boiled or tea prepared:				
with embers from meal	10	15	12	37
separately from meal	5	12	18	35
both	15	3	0	18
Use of embers:				
left to die out	1	1	0	2
covered for later use	29	29	30	88

[a] Combinations consisted of washing and burning incense; washing and cleaning milk containers; and washing and frying coffee beans.

Table 5.8

Cooking Problems, Gedo

Problems	Rating			
	Luuq	Cir Kud	Maganey	Total
Time score[a]	109	114	127	350
Heat score	61	103	93	257
Smoke score	39	47	55	141
Fuel score	105	100	76[b]	281
Fire, burns score	134	86	104	324

Note: Each cook was asked to rate cooking problems in decreasing order of importance, numbered from 1 = most important to 5 = least important. No problems other than those listed in the table were reported.

[a] The scores are sums over observations. A lower score corresponds to a more important problem. Scores are comparable between groups, because the total possible score (5 x 30 observations) is the same for all groups.

[b] Of those with mud/cement stoves in Maganey, three cooks rated fuel as "1", four cooks rated fuel as "4", and one cook rated fuel as "5". As compared with non-refugee sites, a higher proportion of cooks in Maganey rated fuel between "1" and "3".

who use mud/cement stoves have also participated in extensive discussions on fuelwood scarcity. However, the pattern of responses among the women using mud/cement stoves did not differ greatly from that of the women using three-stone fires. A slightly larger proportion of women using three-stone fires rated fuel as the most important cooking problem. For the Maganey women, smoke was also a major problem, but fire hazards appear to be less important than in Cir Kud.

As in other survey sites, very few stove modifications were suggested by cooks in Gedo. A woman in Cir Kud suggested a cooking shelter, and a Maganey woman using a mud/cement stove suggested a portable design. Two women stated that they would prefer another stove, a response that may have been influenced by the interviewing process. One Maganey woman suggested smoothing of the mud/cement stove, a maintentance procedure rather than a design modification. Three of the five suggestions were made by Maganey women.

HOUSEHOLD SURVEY RESULTS: FUEL USE

Fuel Types and Species

Cooks in Cir Kud and Maganey used only wood year round (Table 5.9). The women of Luuq used fuelwood in three-stone fires and charcoal in soapstone stoves during the rainy seasons.

Cooks cited as many fuelwood species in the Gedo region as they did in Lower Shabeelle (Table 5.10). Most of the major species used are Acacias, although **galool** and **cadaad** were cited less frequently than in Lower Shabeelle. The preferred and most widely used Acacias were **qansax** and **qurac.** The botanical names of two of the major fuelwood species cited, **qoodhi** and **masaarojebis,** have not been identified. **Qoodhi** may be either **qadhi** (loranthus) or **kodi** (Balanites glabra). Most of the remaining species are either acacias or commiphoras. One euphorbia called **dharkayn** was also cited.

Species that are preferred and used are categorized by site in Table 5.11, in decreasing order of importance. **Dhuyac** and **dhuje** appear to be unique to Cir Kud, and **qoodhi,** to the Luuq-Maganey area. For combined sites, **qurac** and **qansax** are the species most preferred and most frequently used. In all reported cases, the preferred species are among those actually used.

Collection and Purchase Patterns

While none of the Luuq households collected fuelwood, almost three-fourths of all households in Cir Kud and Maganey collected. Method of transport, collection time, and frequency of collection are reported in Table 5.12. All collectors were women. Three of the women in Cir Kud transported fuel by donkey, and the remainder transported fuel by backload.

Table 5.9

Seasonal Use of Fuel Types, Gedo

Season/Major Fuel Type	Households[a]			
	Luuq	Cir Kud	Maganey	Total
Xagaa, Jiilaal				
wood	30	30	30	90
charcoal	--	--	--	--
Dayr, Gu				
wood	9	30	30	69
charcoal	--	--	--	--
combination[b]	21	--	--	21

Note: Xagaa = short dry season, dayr = short rainy season, gu = long rainy season, jiilaal = long dry season.

[a] For each site, n = 30.

[b] All combinations were charcoal/wood. Crop residues were not cited as a fuel type.

Table 5.10

Fuelwood Species Used, Preferred and Sampled, Gedo

Local Name	Botanical Name[a]	Frequency[b]	
		Used	Preferred
qansax	acacia reficiens	0.246	0.449
qurac	acacia tortilis	0.167	0.135
dhuyac	dalberqia commiphora	0.109	0.182
qoodhi[c]		0.109	0.079
mareer	cordia ovalis, R. Br.	0.094	0.022
fulaay	acacia seyal	0.058	--
cadaad	acacia senegal	0.040	0.022
galool	acacia bussei	0.040	0.022
masaarojebis[c]		0.036	--
xagar	commiphora erythrea	0.014	--
dhuje[d]		0.014	0.034
jawdheer[c]		0.011	--
bisiq	terminalia orbicularis	0.011	0.011
weyloyanjir[c]		0.007	0.022
jacjacle	ipomea sp.	0.007	--
dharkayn	euphorbia robecchi	0.007	--
bilcil	acacia melliflera	0.004	--
qoon-qoon	combretum nereoense	0.004	0.011
jiiq	acacia seyal	0.004	--
sarmaan[e]	acacia benadirensis	0.004	--
mirafur	commiphora boswellia	0.004	--
himir	ehretia orbicularis	0.004	--
dhafaruur	grewia tenax	0.004	--
oraay[c]		0.004	--
fuuyise[c]		--	0.011
Total		1.00	1.00

a Ronald Wieland, Interchurch Response Forester, Rashid Abdi, "An Extract of Somalia Names Based on Glover 'Checklist of 1947' and Hemming 'Short List of Somali Plant Names of 1971'," Range Burao; Michael H. Madaney, "Common Names of Somali Plants," Department of Botany and Range Management, Faculty of Agriculture, Somalia, November 12, 1983.

b Enumerators asked what species were used and preferred by head cooks, and took a cutting from the household wood pile. Respondents cited 276 species used and 89 species preferred. Enumerators took 90 cuttings. Frequencies represent the number of times a species was cited as a proportion of the total number of observations.

See following page for notes "c" through "e".

Table 5.10 - Continued

c Botanical names have not been identified. "**Qoodhi**" may be "**qadhi**" (loranthus) or "**kodi**" (balanites glabra).

d Probably "**duruuje**" = acacia spirocarpa

e Also acacia misera, acacia bussei

Table 5.11

Fuel Type and Fuelwood Species Most Frequently Used and Preferred, Gedo

Type/Species	Households			
	Luuq	Cir Kud	Maganey	Total
Fuel Type				
Used				
wood	9	30	30	69
charcoal	--	--	--	--
both	21	--	--	21
Preferred				
wood	30	30	30	90
charcoal	--	--	--	--
Specific to Use[a]				
yes	1	--	--	1
no	20	--	--	20
not applicable	9	30	30	69
Fuelwood Species				
Most Frequently Used[b]	qansax qoodhi fullay qurac	qurac dhuyac qansax mareer	qansax qurac dhuyac qoodhi	qansax qurac dhuyac qoodhi
Preferred[b]	qansax qoodhi qurac	dhuyac qurac dhuje	qansax qurac dhuyac	qansax dhuyac qurac
Specific to Task[c]				
yes	0	0	0	0
no	30	30	30	90
Preferred is Used				
yes	28	29	30	87
no	--	--	--	--
no response	2	1	--	3

a For **dayr** season, few uses (tasks) other than cooking, boiling water, and burning incense were cited. Charcoal is used for burning incense.

b Listed in decreasing order of importance.

c Women generally used any species for any use (task). "**Qansax**" is often used to clean milk containers.

Table 5.12

Collection Time, Frequency and Method, Gedo

Time/Frequency/Method	Households[a]			
	Luuq	Cir Kud	Maganey	Total
Number of Collectors	0	22	21	
Collectors as Proportion of All Households	--	.73	.7	.48
Method of Transport				
donkey, by women	--	3	0	3
backload, by women	--	19	21	44
Average Collection Frequency (days per week)	--	2.05	2.41	2.23
Average Collection Time (hours per trip)[b]	--	2.92	5.43	4.175
Average Age of Collector[c]	--	31.09	30.14	30.62

[a] For each site, n = 30.

[b] Round trip. Respondents were more able to specify collection time than distance.

[c] No second collectors listed.

Table 5.13

Fuelwood and Charcoal Purchase Patterns, Gedo

Frequency/Expenditure	Households			
	Luuq	Cir Kud	Maganey	Total
Number of Purchasers				
wood	30	11	9	50
charcoal[a]	21	--	--	21
Purchasers as Proportion of All Households				
wood	1.00	0.37	0.3	0.56
charcoal	0.23	--	--	0.23
Average Purchase Frequency (days per week)				
wood	1.78	2.09	5.22	2.47
charcoal	0.45	--	--	0.45
Unit and Price				
wood				
2-stick bundle, 1 sh.	5	2	5	12
3-stick bundle, 1 sh.	7	1	--	8
1 stick, 1 bundle	--	3	4	7
backload, 25 sh.	--	2	--	2
donkey load, 45-70 sh.	17	2	--	19
cart load, 180 sh.	1	--	--	1
3-stick bundle, 2 sh.	--	1	--	1
charcoal				
half-quintal, 50-80 sh.	14	--	--	14
quintal, 170-180 sh.	7	--	--	7
Provider of Money				
Household Head	22	10	6	38
Head Cook	8	1	3	12

[a] Households were interviewed during the short rainy season (dayr).

Table 5.14

Daily Cash and Fuel Expenditure, Gedo

Expenditures	Site[a]			
	Luuq	Cir Kud	Maganey	Total
Average Daily Cash Expenditures (shillings)[b]	111.83	74.31	41.21	78.30
Average Daily Fuel Expenditures (shillings)[c]	11.34	5.19	3.5	8.58
Average Fuel Expenditures as a Proportion of Daily Cash Expenditures	0.10	0.07	0.08	0.09

[a] Luuq, n = 30; Cir Kud, n = 29; and Maganey, n = 24.

[b] In Cir Kud, the household with the large Koranic school has been excluded from the average. In Maganey, six households had no regular cash expenditures.

[c] The subsamples of purchasers in Cir Kud and Maganey are too small to generate comparable figures.

Frequency of collection for Cir Kud and Maganey are similar, averaging 2.05 and 2.41 times per week, respectively. However, the average collection time in Maganey is almost twice that of Cir Kud. The Cir Kud forest areas are much closer to the village than those of the camp. The difference between average collection times may reflect the relative rates of deforestation in the two sites.

In Cir Kud and Maganey, the age of collectors ranged from 13 to 45 years, with an average age of 30 to 31 years. No second collectors were reported for these households, although women from different households often collect in groups.

As shown in Table 5.13, all cooks in Luuq purchased fuelwood while some cooks in Cir Kud both collected and purchased fuelwood. The lowest average frequency of fuelwood purchase was found in Luuq, where more than half the women purchased fuelwood by donkey load or cart load. In addition to wood, Luuq women purchased charcoal by the half quintal and quintal once every two to three weeks during the rainy seasons. Frequency of purchase figures for Luuq must be qualified by the fact that women using both charcoal and fuelwood had difficulty identifying a regular frequency for charcoal purchase. Use of charcoal depends on the extent of the rains. Interviews were conducted at the beginning of the short rainy season. According to the enumerators, the consumption implied by the figures may be overstated.

In Cir Kud, women purchased fuelwood by the bundle, donkey load, and backload directly from collectors, and on the average purchased more frequently than the women of Luuq. In Maganey refugee camp, enumerators found no organized fuel market. Here, women made purchases by the stick or bundle directly from collectors. The average frequency of purchase in Maganey was the highest of all Gedo sites, or 5.2 times per week. In 13 percent of the households, head cooks provided the money for fuel purchase.

Prices are as difficult to establish in the Gedo sites as in the other sites surveyed. For 35 two-shilling bundles (of two or three sticks) weighed in Luuq, the average weight per bundle was 2.241 kilograms, with a standard deviation of .853. For ten three-stick bundles, the average weight per bundle was 1.937 kilograms, with a standard deviation of .313. In Cir Kud, for 10 bundles of three sticks, average weight was 2.240 kilograms, with a standard deviation of .357. Average weight per stick for 10 sticks was 1.607 kilograms with a standard deviation of .756. In Maganey, where women also bought fuelwood by the stick, the average weight per stick was .745 kilograms, with a standard deviation of .249.

Daily Expenditures, Fuel Expenditures, and Fuel Consumption

As in the case of Lower Shabeelle, the subsamples of fuel purchasers in Cir Kud and Maganey were very small. Average cash and fuel expenditures for the three Gedo sites are shown in Table 5.14, with 30 observations of cash expenditures for each site and only 11 and nine fuel expenditure observations for Cir Kud and Maganey, respectively. Daily

cash expenditure figures are highest in Luuq, at 111.83 Somali shillings. Cash and fuel expenditures are influenced by both the high price levels in Luuq as well as the practice of purchasing both charcoal and fuelwood. Daily expenses in Cir Kud are 74.31 shillings. Fuel expenditures for Cir Kud households are less than half those of Luuq households. In Maganey, daily expenses average one-third of those in Luuq and daily fuel expenses less than one-third. Over sites, fuel expenses appear to decrease in proportion to total cash expenditures. In all sites, fuel expenses are approximately one-tenth of total daily expenditures. This figure is similar to the fuel share of daily expenses found in Muqdisho households and less than that found in Lower Shabeelle households.

Sixty-five out of the 90 head cooks shared wood occasionally. All head cooks noted a rise in fuel expenses over the past year. Only one cook stated that she had reduced the quantity of fuel she used. The remaining 89 reported that they had not altered their cooking practices to adapt to rising fuel prices.

Average fuelwood consumption figures for households are shown in Table 5.15. Over the four days in which wood was weighed, the average consumption per unit and per capita was significantly higher in Luuq than in Maganey and Cir Kud (for t-test results see Appendix B). Average per capita and per unit figures are roughly equivalent for Maganey and Cir Kud, or 0.9 kilograms. In Maganey and Cir Kud, stove types are the same and consumption unit sizes are similar. Enumerators noted that in Cir Kud, where families raise livestock and herders pass frequently, a larger proportion of the diet consists of milk. The importance of milk in the diet may account for the fact that per unit and per capita fuelwood consumption in Cir Kud and Maganey are of statistically equal magnitude, even though forest areas are closer to Cir Kud and cash expenditure levels are lower.

VI. SUMMARY AND COMPARISON OF SITES

As part of the original research design, refugee and non-refugee subgroups were defined as representative of major sources of variation in cooking methods and fuel consumption within regions. The hypothesis underlying this definition of subgroups was that refugee households, because they are located in areas of higher population concentration and have lower purchasing power, consume fuelwood at significantly different levels than non-refugee households. Initially, refugee and non-refugee households from different survey regions were to be analyzed jointly. Instead, empirical evidence suggests that regions as well as subgroups within regions may represent distinct populations. Fundamental differences between regions are reflected not only in such indicators as primary occupation of household head, cash expenditure levels, and fuel types used, but also in food preparation, fuel collection, and purchase patterns. As a consequence, the data are presented as a series of case studies.

Table 5.15

Average Fuelwood Consumption, Per Consumption Unit and Per Capita, Gedo

Site[a]	Average Consumption Per Unit (kilograms)					Average Number of Persons/Unit	Average Per Capita Consumption (kilograms)
	Day 1	Day 2	Day 3	Day 4	4-Day Average		
Luuq							
mean	8.296	8.50	8.51	8.70	8.50	8.233	1.121
s.d.	1.69	1.63	2.83	1.62	1.56		0.229
Cir Kud							
mean	5.155	5.095	5.206	5.390	5.212	5.759	0.932
s.d.	1.93	1.828	1.606	1.467	1.636		0.250
Maganey							
mean	5.341	5.353	5.780	5.968	5.61	6.3	0.943
s.d.	1.83	1.477	2.04	1.49	1.56		0.234
Total	6.264	6.316	6.50	6.686	6.441	6.76	0.999

[a] For Cir Kud, n = 29, excludes household with large Koranic school; for Luuq and Maganey, n = 30. Households were interviewed during **dayr** season.

The following two sections review results across regions. The first section compares cooking practices, and the second compares fuel use patterns. A third section summarizes results of hypothesis tests on fuel consumption levels and regression results indicating the effects of consumption unit size and composition on kilograms of fuelwood consumed.

COOKING PRACTICES AND PREFERENCES

Although most staple foods consumed in the survey sites consisted of livestock products and dishes prepared from a base of sorghum, corn or wheat flour, the relative importance of specific foods and the composition of the diet differed notably between and within sites as well as regions. In Lower Shabeelle non-refugee sites, **muufo** (a cornbread) was preferred to **canjeero** (light pancakes), bean dishes were eaten more frequently than meat dishes, and cooks prepared vegetables and a variety of snacks. In Gedo non-refugee sites, no **muufo** or vegetables were consumed, and meat and milk were more heavily represented in the diet. Within non-refugee sites, diet differences between households were related to cash availability and proximity to markets. The more affluent the households, the more frequently cooks cited meat and pasta.

The composition of the refugee diet in both Gedo and Lower Shabeelle camps is determined by the ration food basket provided through CARE. For this reason, there is less variety in dishes cited by refugee cooks. Although beans are not a preferred dish, they are often substituted for meat. Meat and pasta were cited less frequently in refugee camps than in non-refugee villages, reflecting the refugees' lower purchasing power.

In Muqdisho, pasta dominated other porridge and grain dishes as the staple grain. In Xamar Weyne, several specialty foods were prepared by cooks, and fish was consumed almost as frequently as meat. **Muufo** was also cited most frequently in Xamar Weyne. The different composition of the Xamar Weyne diet relative to other Muqdisho areas may reflect the existence of unique food preparation customs.

Differences in cooking practices are most evident in the data on stove models. Several indigenous designs as well as imported models are used by cooks, and many cooks use two or more stove types. In Lower Shabeelle, although the three-stone was the primary stove for roughly half of the non-refugee women, the most popular model in both villages and refugee camps was the ceramic stove. Two stove use characteristics were unique to Lower Shabeelle villages: the widespread use of the **muufo** stove, and the use of a large stationary model designed by local women. Although the soapstone stove is the most expensive of the indigenous designs, more soapstone stoves were found in the Lower Shabeelle refugee camps than in non-refugee villages. This stove undoubtedly holds a certain status value.

In Muqdisho, the most frequently used stove was the soapstone, but auxiliary stoves included three-stone, kerosene, metal, gas, and electric stoves. **Muufo** stoves were cited infrequently. In Xamar Weyne, the major stove type was the ceramic model. The stationary table stove was also used in some of the more affluent households.

The three-stone model was the predominant stove type in all of the Gedo region sites. Auxiliary stoves included the ceramic and soapstone models. Luuq women change both fuel type and stove type during the rainy seasons. When it rains, they cook with charcoal on the soapstone stove.

In contrast to the variation in stove types, utensils and cooking techniques appear fairly uniform across sites. All women use lids while cooking. The majority of women in all sites used metal pots. Only women in non-refugee villages of Lower Shabeelle used clay pots. Pot size was determined by the size of the consumption unit and the number of pots a cook could afford to purchase. The only pot specific to a dish was the **canjeero** pan, and the only stove specific to a dish was the **muufo** stove. Other pots and stoves were suitable for any cooking purpose.

A small proportion of cooks stated that they cooked two or more foods simultaneously. Cooks prepare foods simultaneously only with three-stone and table stoves. Dish combinations include tea with **canjeero,** and meat or sauce with grain dishes. Preparing dishes simultaneously does not appear to be an important cooking requirement in any of the sites surveyed.

Portability does appear to be a critical stove feature in all sites. In rural areas and refugee camps, stoves are moved to a sheltered location or inside the home during rainy periods. In the more urban sites of Luuq and Muqdisho, where houses are designed with cooking shelters and courtyards, stoves are moved according to the direction of the wind and ventilation or space needs. Only in Golweyn, a settled agricultural village, and in Muqdisho, an urban site, were stationary stoves used by cooks.

Current practices for maintaining or repairing stoves are not widespread. In isolated cases, women stated that they removed ashes, cemented, wired, or smoothed stoves with clay and ash. The majority of women put embers aside after meal preparation for later use, covering the embers with ash to slow the burning rate. A few of the women stated that they left embers to die out after cooking meals.

Only a few of the women proposed stove modifications. Some cooks suggested designing a portable stove, a cooking shelter, or creating air holes or a chimney for improved ventilation. This open-ended question was the only survey question with a high non-response rate.

Non-cooking uses of stoves or fuel varied across and within regions. More non-cooking uses were cited in non-refugee sites. In Lower Shabeelle, non-refugee cooks used the smoke from the cooking fires as

a mosquito deterrent, and used the stoves to burn incense, fry coffee beans, and clean milk containers. In Gedo, non-refugee women use the stove to burn incense, fry coffee beans, and clean milk containers. In Luuq and Muqdisho, the most frequently cited non-cooking purpose was the burning of incense. In Xamar Weyne, women prepared specialty sweets for sale. The frequency of boiling water for washing is lower in Muqdisho than in any of the other sites. Frequency of tea preparation is uniform over sites, or two to three times per day.

Attitudes toward cooking are of particular interest in stove extension. Many of the women, and especially those surveyed in Muqdisho, were initially reluctant to rank their cooking problems because they felt that no aspect of cooking was burdensome. However, once they began discussing with enumerators various aspects of cooking, they were generally willing to rank their cooking problems. In several instances, the results emerging from this section of the questionnaire complement the findings on stove types and fuel collection or purchase patterns.

In Lower Shabeelle, where wood is the main fuel type, smoke and heat were most troublesome for non-refugee women. Obtaining fuelwood was the greatest problem for refugee women. A higher proportion of refugee women collected their fuel, and those who purchased fuel bought less regularly and in smaller amounts than village women. For both groups, cooking time requirements and fire hazards were considered least important.

In Gedo, non-refugee women were bothered most by smoke and heat and least by cooking time and obtaining fuel. For Cir Kud women, whose cooking areas are less sheltered than those of Luuq women, fire hazards were considered a problem. Of the three sites, the refugee cooks in Maganey were most concerned about fuel. These women are collectors like the Cir Kud women, but must travel a greater distance to obtain their fuel.

In Muqdisho, despite rising fuel expenditures, cooks did not consider fuel cost burdensome. With the exception of heat emission, Muqdisho women gave all cooking problems less important ratings. An implication of this result is that marketing strategies in Muqdisho should focus on the appearance of the stove rather than its utility in alleviating cooking problems.

FUEL USE, COLLECTION, AND EXPENDITURES

In general, fuel types used by cooks depended on cash availability as well as proximity to an organized fuel market. In Muqdisho, charcoal was the major fuel type used year round, with fuelwood used occasionally to cook large quantities on the three-stone fire. Although fuelwood may also be used by lower income groups living on the periphery of the city, these groups were not represented among the survey sites.

In the roadside villages of Lower Shabeelle, charcoal was used more often than in isolated villages or refugee camps. In Gedo, charcoal was used only in the market town of Luuq. In both Lower Shabeelle and Gedo, charcoal was purchased primarily during the rains, and used in combination with fuelwood. In Cir Kud, both refugee camps, and in isolated agricultural villages of Lower Shabeelle, fuelwood was the major fuel type used year round. During the dry seasons, crop residues were used in combination with fuelwood in the agricultural villages of Lower Shabeelle.

Most of the preferred, commonly used, and sampled wood species were relatively high density acacias. The most often cited species in Lower Shabeelle were **tugaar** (Acacia nilotica), **galool** (Acacia bussei), and **cadaad** (Acacia senegal). These species are marketed by fuelwood harvesters. The most often cited species in Gedo region were **qurac** (Acacia tortilis) and **qansax** (Acacia reficiens). Two of the most frequently cited species used in Gedo, **qoodhi** and **masaarojebis**, have not been identified. In the refugee camps in particular, several inferior fuelwood species were cited by collectors, including **garas** (Dobera glabra), **caday** (Salvadore persica), and **dharkayn** (Euphorbia robecchi). In both refugee and non-refugee sites of Gedo and Lower Shabeelle, **mareer** (Cordia ovalis, Br.) and **fulaay** (Acacia seyal) were also used frequently. For most cooks, the preferred species were also the most commonly used species. This result may suggest that purchasers are willing to pay the price for preferred species, and that preferred species continue to be available to collectors.

In both Gedo and Lower Shabeelle regions, a higher proportion of collectors were found among refugee households. In Lower Shabeelle, all refugee collectors were women transporting fuelwood by backload. Non-refugee collectors included men transporting by cart as well as women collecting by backload. In Gedo, refugee women collected by backload and non-refugee women collected by donkey load or backload. In both Gedo and Lower Shabeelle sites, refugee women collected more frequently and for longer periods of time than non-refugee women. Men collecting by cart had the longest collection time, and collected with lower frequency. Although women often mentioned collecting with women from other households, only two second collectors from the same household were listed for all sites. This result may imply that, although women collect in groups, the responsibility for collection is allocated to one individual within the household.

The number of cooks purchasing fuelwood was limited in the refugee camps. Those cooks in the camps who did buy fuelwood purchased less regularly, or both collected and purchased. In non-refugee sites, the majority of cooks purchased fuel only. In Lower Shabeelle non-refugee sites, most cooks purchased an average 5.6 times per week various bundle sizes costing one to two shillings. In Luuq, many women purchased wood by donkey load with lesser frequency. Luuq women also purchased charcoal during the rainy seasons, depending on the extent of the rains. In Cir Kud and Maganey, many cooks purchased by the one-shilling stick. In Cir Kud, some women also purchased directly from collectors by the backload.

No organized fuel market exists in Maganey, and women bought directly from collectors. Here, the method of transport and quantity of fuelwood purchased at one time is determined not only by the distance to fuelwood sources, but by cash flow within the household. Although Maganey is located at a greater distance from collection points, no organized market exists, and women tend to buy in smaller quantities.

Fuelwood prices per unit are difficult to establish in the context of a household consumption survey. The composition, weight, and prices of units vary widely. Wood may be sold in bundles of two to four sticks for prices of one or two shillings, where stick sizes and weights vary. In a sample of 20 sticks from the Shalaambood market, average weight per stick was 0.567 kilograms, with a range of 0.257 to 1.444 kilograms. In Luuq, 45 one-shilling bundles were weighed, with an average of 2.09 kilograms, and standard deviation of 0.756. In Maganey, the average weight per stick for 10 sticks was 0.745 kilograms with a standard deviation of 0.249. The range in price and weight suggests that, in order to establish and compare prices per unit across sites, supplementary marketing studies are necessary.

In Muqdisho, where charcoal is purchased, prices were equally difficult to establish. As in other sites, women were not able to precisely report the frequency of purchase. In many households, purchase patterns may not be systematic.

Data on purchasing frequency and expenditures were converted into daily fuel expenditure figures for all households purchasing fuel. Daily fuel expenditure figures were then computed as a proportion of daily cash expenditures. Daily cash expenditures included water, food, kerosene, charcoal and fuelwood requirements.

In Muqdisho sites, the highest daily expenditures were quoted in Xamar Weyne and Hodan, with averages of 122 and 118 Somali shillings, respectively. For the less affluent sites of Wadajir, Cabdul Casiis and Wardhiigleey, average expenditures ranged from 84 to 92 shillings per day. Over all sites, the fuel share of expenses ranged from 7 to 19 percent, with an average of 11 percent.

In Lower Shabeelle non-refugee villages, average expenditures per day were 52.32 shillings. In Gedo non-refugee sites, average daily expenditures were considerably higher, or 74.31 shillings in Cir Kud, and 111.83 shillings in Luuq. The fuel share of daily expenses was 14 to 16 percent in Lower Shabeelle sites and 8 to 10 percent in Gedo sites.

In refugee camps, several women stated that they had no regular cash expenditures. According to enumerators, other women overstated their expenditures, quoting what they wished or needed to spend rather than what was available to spend. Of those who cited daily expenses, the average was 31.21 shillings in the Qoryooley camps and 41.21 shillings in Maganey.

Several factors may explain the difference in level and composition of expenditures between non-refugee sites in Gedo and Lower Shabeelle. In

informal discussions and group meetings, Luuq women described inflationary pressures resulting from the large influx of refugees and the provision of refugee services in the area. The composition of the diet and the proportion of purchased food items in the diet may also differ between regions. In Lower Shabeelle, a larger proportion of food may be home-produced. Seasonal factors also contribute to different expenditure levels. Interviews were conducted during the short dry season in Lower Shabeelle, and during the short rainy season in Gedo.

MAJOR STATISTICAL RESULTS

Difference of means tests on survey subgroups, as subgroups reflect income and price factors, suggest that households in the market town of Luuq consume fuel at significantly higher levels than households in the village of Cir Kud or in Maganey refugee camp. Differences in consumption between Cir Kud and Maganey groups are not observable. This statistical evidence is corroborated by other survey findings. Daily cash expenditure levels are considerably higher in Luuq than in Cir Kud and Maganey. While most households purchase fuelwood in Luuq, the majority of households in Cir Kud and Maganey collect their wood.

For Lower Shabeelle sites, statistical tests do not support the hypothesis that refugee and non-refugee subgroups consume fuelwood at different levels. This result may reflect the breadth of the population represented by the cluster of villages from which non-refugee data were drawn. The variance in fuelwood consumption figures is relatively high within the non-refugee group. When other factors affecting fuelwood consumption are combined in regression analysis, or when refugee and non-refugee consumption is compared after controlling for other factors, differences may prove statistically significant.

Over all survey sites, regression results support the hypothesis that the size of the consumption unit significantly affects the household fuel consumption level. However, the figures do not reveal any particular weighting procedure for adjusting household fuel consumption figures according to the composition of the consumption unit. Although a large proportion of the variation in consumption is explained by consumption unit size, the effects of income, price, stove type, and cooking practice variables remain to be investigated.

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APPENDIX A

Methods

Survey Instrument

Design

The survey instrument is composed of both an informal and a formal questionnaire. The informal questionnaire is used in group meetings with elders, women's committees, and fuelwood and charcoal cooperative members. Questions are designed to encourage discussion of community perceptions of fuelwood scarcity, strategies for adapting to rising fuel costs through changes in cooking practices, and suitable methods for distributing cookstoves. The group meeting precedes the formal survey, and serves the dual purpose of providing the survey team with essential background information and introducing the survey method and enumerators to community leaders.

The formal questionnaire is designed as a household survey, with the unit of observation defined as the number of persons for whom the head cook usually prepares meals. The respondent is the head cook, or the person responsible for choosing the type and amount of foods cooked and fuel used.

The formal questionnaire consists of three distinct sections. The first series of questions addresses the composition of the consumption and cooking units, stove type, frequency of boiling water and preparing tea, use of embers after cooking, and stove maintenance requirements. Head cooks are then asked to state their cooking problems and suggest stove modifications to remedy these problems.

A second series of questions addresses fuel and species use and preferences, collection and purchase patterns, and fuel expenses as a proportion of daily cash expenditures. Head cooks are asked whether they have modified their cooking practices or fuel use in response to increasing fuel expenditures or collection time.

The third component of the questionnaire is a weighing procedure to measure fuel consumed in cooking, boiling water, and preparing tea. Enumerators ask the family to set aside a separate fuel pile for cooking needs. For five successive days, the enumerator weighs the fuel pile with a spring balance and tabulates the net weight change per day. The enumerator also cuts a sample of wood or charcoal from the pile and identifies the wood species. Wood samples are dried in a laboratory, and average moisture content is calculated for the purpose of adjusting consumption figures. The species identification can be used in two ways: as a proxy for the density of wood, and as an observation on the fuel type actually used by cooks.

Format

The formal questionnaire was translated into Somali, retranslated into English, and revised during enumerator training as well as after a

brief pre-test in Lower Shabeelle. Despite these precautions, ambiguities remain both in the interpretation of the questions and in the type of probe to be used with respondents. Ideally, a pre-test should be conducted in each site to ensure elimination of irrelevant questions and the flexibility of the instrument.

For example, questions on collection of fuel proved irrelevant for the sites selected in Muqdisho, and variation in the size of the consumption unit in Muqdisho was caused by factors other than seasonal employment or migration. With the exception of Lower Shabeelle farmers, few respondents perceived four distinct seasons or names for seasons. Despite such differences, the additional time and cost required for exhaustive site-by-site pre-tests were not justified by the minor increase in interview efficiency.

Differences in interpretation of questions were not produced solely by regional factors; they were also influenced by income, age, education, and other characteristics of the respondents. Initially, enumerators were instructed to state the question as worded in the questionnaire, and probe with a neutral statement such as "yes..." or "I see". However, the Somali translation of the questions was cumbersome, and enumerators often found it necessary to explain the questions. As a result, the final procedure was modified so that the enumerators would begin by stating the question as worded, and if the respondent demonstrated confusion, they would explain the content of the question.

The format of the questionnaire also created some difficulties for enumerators, many of whom were unaccustomed to working with formal instruments. Enumerators were confused by the tables, boxes and multiple choice format, and dismayed by the apparent length of the questionnaire. In practice, they discovered that this format saves recording time and decreases the subjectivity of interpreting responses. The interview time required to administer the questionnaire was approximately 35-40 minutes.

The confusion of the enumerators introduces an important point which should be considered in future designs of the questionnaire. The format of the questionnaire must be such that it follows a respondent's thought process as well as reduces time in recording and data entry. The suitability of exclusive categories, multiple choice, and open-ended questions for the subject of interest and the society in which the research is conducted is a factor that must be considered in each research setting.

Non-Response and Biased Response

Although the overall non-response rate was low, it was highest for the open-ended question on cooking problems and the question on income-earning activities of the head cook. For the most part, women were willing and able to rate their cooking problems in decreasing order of importance. However, they were not comfortable with suggesting stove modifications to resolve these problems. The typical response was "no idea" or "a better stove."

While a low non-response rate is encouraging from a statistical standpoint, it may also disguise error arising from culturally influenced responses. For example, a high proportion of women in Lower Shabeelle responded that they pursued no income-earning activities. Many of these women were known to be actively engaged in agricultural cultivation, although they chose to cite the farm work as the occupation of the head of household, or did not consider their work as an income-earning activity.

Another example is represented by responses on cash expenditures. In income studies, researchers typically discover that poorer members of the population overstate their income, and more prosperous members of the population understate their income. The enumerators working in the Qoryooley camps suggested that, in some cases, head cooks overstated their expenditures, or stated "what they would wish to spend," rather than the cash they actually spend. Other enumerators in the Gedo camps have suggested that the refugees feel that in order to maintain their refugee status, they must always respond with "no work, no income."

Although income is one of the principal factors expected to influence type of fuel and amount consumed, this variable is one of the most difficult to observe and measure. The survey team did not attempt to ask cooks about household income. Broad sources of income variation are implicit in the site selection. In Muqdisho, sites were selected as segments from administrative sections, based on housing characteristics. Housing characteristics were considered rough proxies for income level. Other proxies for income are included in the questionnaire: (1) daily cash expenditures--a measure of disposable income (money spent on fuel, food, and water); and (2) occupations of head of household and head cook.

Non-response rates and the quality of responses are influenced considerably by the thoroughness and interest of the enumerators themselves, the adequacy with which they explain the content and objectives of the survey, and the rapport they are able to establish with repondents. This single factor may be more critical in ensuring data quality than either the format of the questionnaire or the nature of the question.

Most of the above problems are typical of surveys in any subject area or locale and can be anticipated. The problems which were specific to the VITA survey concern the procedure for measuring fuel consumption.

Fuel Measurement Difficulties

The measurement procedure was difficult for enumerators and placed a considerable burden on respondents. When explaining the survey method to respondents, enumerators asked the family to place the amount of fuel required for approximately four days cooking in a separate pile. Use of fuel from this pile was to be controlled: only this pile would be used for cooking, boiling water, and preparing tea, and the pile would be used only for these purposes. Fuel is not generally used for heating in the areas surveyed. Controlling for non-cooking purposes was one of the more difficult aspects of the weighing procedure.

The amount of fuel a family can purchase at one time is limited by their disposable income, and the amount a family can collect is restricted by their labor time and transport method. A large number of respondents only purchased or collected enough fuel to last a day or two. Unexpected guests or exceptional cooking needs might require additional purchase or the borrowing of fuel. In some cases, fuel was not available at the market at regular times.

To overcome these difficulties, enumerators established weighing schedules and arrangements to suit each household. Nevertheless, calculations were more complex than anticipated, and the elapsed time between weighings did not always correspond to 24 hours. In cases where the amount borrowed from neighbors was unknown, the measurement could not be adjusted. In cases where the amount was known, adjustment of figures was difficult due to the wide variation in weight per unit of fuel.

The measurement procedure cannot capture the periodic use of different types of fuel. For example, families in Lower Shabeelle primarily use fuelwood, but wealthier families occasionally use charcoal and farm families use maize stalks following harvest. In Muqdisho, women chiefly use charcoal, but use fuelwood to cook large quantities on the three-stone fire or to make **muufo** (corn or sorghum bread). In Luuq and Golweyn, women switch from fuelwood to charcoal when it rains, but not for the duration of the rainy season. At one point in time, enumerators may find only one type of fuel used in the home. These factors affect the accuracy of annual consumption figures extrapolated from survey data. The survey records the predominant fuel type used by season, and the measurement corresponds to one season, or more properly, a part of one season.

Several problems in interpretating figures emerged in the Muqdisho and Luuq portions of the survey. According to responses on frequency and quantities purchased, some households appear to be purchasing a different amount of charcoal than they consume. The maintenance of substantial household stocks is infrequent, and the discrepancy between the figures is also too large to be explained by the few other uses cited.

The most apparent reason for the discrepancy is that, once the quantity purchased exceeds a few days' supply, cooks are unable to state exactly how long the quantity will last. Fuel purchase is not systematic. The lack of a clear relationship between quantities stated and quantities measured may be evidence that oral recall is an inadequate technique for observing fuel consumption.

Another difficulty in interpreting responses on quantities of charcoal and fuelwood purchased is that there is no standard price per unit. In Muqdisho, baskets cost from 15 to 30 shillings, and quintals, from 120 to 200 shillings. In order to determine a per unit price for charcoal or fuelwood, supplementary market studies are necessary.

Site and Sample Selection

The choice in survey coverage and sampling procedure is based on 1) the end-use of the data, 2) the breadth of existing knowledge on the composition and variance of the population, and 3) cost and time constraints. In this survey, the choice was affected by the lack of existing knowledge about the population of interest, and other cost and logistical considerations.

Accurate population estimates and information on the composition of the population were not available to the survey team. As a consequence, the team followed a procedure of defining population subgroups on the basis of factors affecting fuel scarcity. These subgroups are refugee, non-refugee village, and urban.

Sites were selected by project areas. Random and systematic sampling techniques within population subgroups included both list and geographical frames. In refugee camps, the team selected households from the formal camp administrative structure, or **kontonle** (group of 50 households) and **tobanturiye** (groups of 10 households). Although this procedure corresponds to a list method, names are not necessary and the problems of redundancy and listing errors are avoided. In one non-refugee village, the team drew from a list compiled by the extension agent. In other villages, the team followed a skip pattern to select houses geographically. In Muqdisho, segments were selected within administrative sections according to housing charatteristics, and the team interviewed each household within the segment. Sampling difficulties were numerous. Occasionally, local officials or elders intervened in the procedure.

Under cost constraints and in the absence of accurate population figures, sample sizes were set at approximately 30 households per subgroup, for a total of 100 observations in Lower Shabeelle, 90 observations in Gedo, and 90 observations in Muqdisho. In Muqdisho, joint research conducted with Hubert Laux covered an additional 60 households.

Because a site selection and sampling procedure of this type produces estimates with large sampling error, the estimates can be used to describe the population groups studied, but should not be used in broader inference. The set of observations may most properly be termed selected, and results therefore represent a series of case studies. Results can be used to compare groups and identify target populations for decision-making, but should not be used to compute regional or national estimates without substantial knowledge of the population.

As stated earlier, the most complete research design might include two instruments for cooking practices and fuel consumption, as well as two sample sizes. If population subgroups have been identified, there may be little need to use a formal questionnaire or sampling procedure to investigate cooking practices. In contrast, variation in fuel consumption is expected to be so great that large sample size is necessary. In the interests of time and coherence of data, the survey team combined the cooking practices and fuel consumption survey.

Enumerator Training and Selection

With the objective of training extension and counterpart teams in primary data collection, and because of the burden placed on respondents by this type of survey, VITA decided to use exclusively Somali enumerators. Two professional enumerators were hired from the Ministry of Planning to work on the Muqdisho portion of the survey. The remaining 24 enumerators were VITA stove extension workers and socioeconomic counterparts.

Enumerators were trained over a two-week period as part of the stove extension class. During the first week they were introduced to research objectives, types of data collection, and the definition of a sample. During the second week they worked with the questionnaire in mock interview sessions.

Enumerators interviewed in teams of one man and one woman whenever possible. The cooks, who were all women, did not appear to respond differently when a man or woman asked the questions. Women were more comfortable discussing cooking practices with other women, and women enumerators understood this section of the questionnaire more thoroughly.

The teams were introduced to community members by elders or administrative leaders. The support of local leaders was critical to the success of the interview process. In the Qoryooley refugee camps, a more extensive introduction and explanation was necessary to preface the interview. Here, VITA enumerators interviewed with Save the Children extension workers, who were already familiar with refugee problems and had established a sound working relationship with the camp administration.

The use of extension agents as enumerators has been successful from the standpoint of data collection as well as the stove project. By participating in data collection, the extension agents had the opportunity to learn about community problems and adapt to working with community members. They learned quickly in a formal interview setting how to place the respondent at ease. Because the extension workers wished to ensure the success of stove extension programs, they also had a vested interest in collecting their data thoroughly. Many of the interview problems could be solved in the field by enumerators and socioeconomic counterparts, rather than by expatriate supervisors.

The least successful enumerating occurred when professional enumerators working outside of VITA were hired. These enumerators had less interest in the subject matter or the questionnaire and had no incentive other than salary for completing their work conscientiously. In conducting this survey, the incentive to perform well outweighed the importance of previous enumerating experience.

APPENDIX B

Fuel Consumption Estimates: Hypothesis Tests, Moisture Content, and Regression Results

Table B.1 shows average daily fuelwood consumption per capita for Lower Shabeelle and Gedo sites. Within regions, refugee and non-refugee mean values are compared through t-tests. The null hypothesis that Luuq and Cir Kud averages are statistically equal is rejected at the 0.95 confidence level. Using a two-tailed test, data support the hypothesis that, on the average, fuelwood consumption levels are significantly different between Luuq and Cir Kud sites and between Luuq and Maganey camp sites. Mean and variance data do not indicate that Cir Kud and Maganey groups consume at significantly different levels. In Lower Shabeelle, refugee and non-refugee subgroups do not appear to constitute distinct populations with respect to fuelwood consumption.

Results of t-tests for Muqdisho sites are shown in Table B.2. At a 0.05 significance level, the null hypotheses that mean charcoal consumption is equal in Hodan and Wadajir and in Hodan and Xamar Weyne are accepted. Mean consumption figures appear significantly different for Wadajir and Xamar Weyne subgroups. The Wadajir subgroup, representing a less affluent mix of households, appears to consume at a higher level than the Xamar Weyne subgroup. The lack of observable difference between Hodan and Wadajir figures may indicate that income differences are not great between selected sites, or that other factors are critical in determining average levels of consumption.

In Table B.3, kilogram fuelwood consumption estimates have been adjusted to reflect dry weight content. Fuelwood samples were drawn from household wood piles during the short dry season in Lower Shabeelle and during the short rainy season in Gedo. A second set of fuelwood samples was drawn in the Lower Shabeelle refugee camps during the short rainy season. For the first series in Lower Shabeelle, figures are subject to error because of procedural difficulties in laboratory tests. Moisture content levels in Gedo and Lower Shabeelle regions suggest that, on the average, households consume relatively dry wood. Average moisture content levels range from 10 to 25 percent over sites. Adjusted, or dry weight, consumption levels range from .78 to 1 kilogram of fuelwood per capita per day.

One of the principal factors expected to influence the level of fuelwood or charcoal consumed is the size and composition of the consumption unit. Survey data record the number of consumers by age groups of 0-3 years, 4-12 years, and over 12 years of age. By regressing average household fuel consumption on the number of consumers in each age group, the effect of an additional consumer in each group on the level of consumption can be estimated. This procedure also estimates weights which can be used to adjust fuel consumption figures to reflect the composition of the consumption unit.

Regression results for Lower Shabeelle and Gedo sites are shown in Table B.4. The regression coefficients (b_i) show the effect of an additional person in each age group on the consumption level. The intercept, or constant, indicates the mean level of consumption attained when the number of persons within all age groups is zero.

Statistical results indicate that, in Luuq, Maganey, and Qoryooley camps of Lower Shabeelle, effects of the number of consumers in each age group on fuel consumption levels are positive and statistically significant at the 0.95 confidence level. In Cir Kud, the effect on fuelwood consumption of an additional consumer between the ages of 0 and 3 is not significantly different from zero. In non-refugee villages of Lower Shabeelle, at the 0.95 confidence level, the effect of an additional consumer in any age group is not statistically significant.

The magnitude of regression coefficients in Gedo and Lower Shabeelle sites does not indicate any particular weighting procedure for adjustment of consumption figures according to unit composition. Within regression equations, coefficients for age group variables are similar. Differences are evident between sites. In Luuq, an additional consumer over 12 years of age increases household fuel consumption by 0.5 kilograms per day. In the Qoryooley camps of Lower Shabeelle, an additional adult increases household fuel consumption by 0.8 kilograms per day.

In all sites except non-refugee villages of Lower Shabeelle, regression statistics show that a large proportion of the variation in fuelwood consumption per unit is explained by variation in the number of consumers within age groups. The low adjusted multiple correlation coefficient in Lower Shabeelle villages suggests that factors other than the composition of the consumption unit are significant in explaining variation in fuel consumption levels. Omitted factors of income level, distance from collection sites and markets may explain a greater proportion of the variation in fuel consumption than unit composition. For the Lower Shabeelle non-refugee data, households were interviewed in a cluster of villages.

In Table B.5, a binary variable reflecting site location was entered in the regression equation for Lower Shebelle non-refugee villages. This variable was specified as an intercept dummy and included in the equation with the variable measuring the total number of consumers per household. Results indicate that the level of fuelwood consumption is significantly higher in Golweyn, Buulo Mareerto and Sigaale. On the average, households in Ceel Jaalle are estimated to consume at a level 2.6 kilograms lower than those of the more prosperous agricultural villages. When the intercept of the regression equation is allowed to shift to reflect site differences, the effect of the total number of consumers on fuelwood consumption levels is positive and significant at the 0.05 level. The multiple correlation coefficient remains small, suggesting that only a small proportion of the variation in consumption can be attributed to these factors.

Table B.5 also shows regression results for other Gedo and Lower Shabeelle sites. The effect of an additional consumer is statistically significant at the 0.05 level in other sites, and magnitudes are similar over sites. An additional consumer per household increases the level of consumption by 0.5-0.6 kilograms per day. A large proportion of the variation in household fuel consumption can be explained by the size of the consumption unit.

Results of regressions investigating the effects of consumption unit size and composition on charcoal consumption in Muqdisho are shown in Table B.6. In Xamar Weyne, the effect of an additional consumer in any age group is positive and statistically significant. In Hodan and Wadajir, only the effect of an additional adult increases consumption levels significantly. The relative weight of the effect of an additional consumer does not vary across age groups in Xamar Weyne. This result suggests that an adjustment for the composition of the consumption unit is not necessary for Xamar Weyne figures. Over Muqdisho sites, roughly 60 percent of the variation in charcoal consumption is explained by variation in the size of the consumption unit.

Over all survey sites, regression results substantiate the hypothesis that the size of the consumption unit affects significantly the household fuel consumption level. However, the figures do not reveal any particular weighting procedure for adjusting household fuel consumption by the composition of the consumption unit. Although a large proportion of the variation in consumption is explained by consumption unit size, the effects of income, price, stove type and cooking practice variables remain to be investigated.

Difference of means tests on survey subgroups suggest that households in the market town of Luuq consume at significantly different levels than households in the village of Cir Kud or in Maganey refugee camp. Differences in consumption between Cir Kud and Maganey groups are not observable. This statistical evidence is corroborated by other survey findings. Where most households purchase fuelwood in Luuq, the majority of households in Cir Kud and Maganey collect their wood. Daily cash expenditure levels are also considerably higher in Luuq than in Cir Kud and Maganey.

For Lower Shabeelle sites, statistical tests do not support the hypothesis that refugee and non-refugee subgroups consume fuelwood at different levels. This result may reflect the breadth of the population represented by the cluster of villages from which non-refugee data were drawn. The variance in mean fuelwood consumption figures is relatively high within the non-refugee group. When other factors affecting fuel consumption are combined in regression analysis, or when refugee and non-refugee consumption is compared after controlling for other factors, differences may prove statistically significant.

Table B.1

Hypothesis Tests for Differences in Mean Per Capita Fuelwood Consumption, Gedo and Lower Shabeelle Sites

Site	Mean Per Capita Fuelwood Consumption (kilograms)	Variance	Hypothesis	Test-Statistic*	Critical Value	Decision
Gedo						
Luuq	1.12105	0.05226	$H_0: \mu_L - \mu_Y = 0$ $H_a: \mu_L - \mu_Y \neq 0$	3.04785	1.671	null rejected
Cir Kud	0.93242	0.06265				
Maganey	0.94289	0.05445	$H_0: \mu_L - \mu_M = 0$ $H_a: \mu_L - \mu_M \neq 0$	2.98723	1.671	null rejected
Lower Shabeelle						
Refugee	1.05686	0.06745	$H_0: \mu_R - \mu_{NR} = 0$ $H_a: \mu_R - \mu_{NR} \neq 0$	1.07686	1.669	null accepted
Non-Refugee	1.19235	0.40069				

$$* \; t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}} \cdot \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}; \quad d.f. = n_1 - n_2 - 2; \; \alpha = .05$$

Table B.2

Hypothesis Tests for Differences in Mean Per Capita Charcoal Consumption, Muqdisho Sites

Site	Mean Per Capita Charcoal Consumption (kilograms)	Variance	Hypothesis	Test-Statistic*	Critical Value	Decision
Hodan	0.81613	0.3555	$H_0: \mu_H - \mu_W = 0$ $H_a: \mu_H - \mu_W \neq 0$	1.19682	1.671	null accepted
Wadajir	0.97277	0.1584	$H_0: \mu_W - \mu_X = 0$ $H_a: \mu_W - \mu_X \neq 0$	3.99586	1.671	null rejected
Xamar Weyne	0.66094	0.02431	$H_0: \mu_H - \mu_X = 0$ $H_a: \mu_H - \mu_X \neq 0$	1.3792	1.671	null accepted

$$* \; t = \frac{(\bar{x}_1 - \bar{x}_2) - (u_1 - u_2)}{\sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}} \cdot \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}; \quad d.f. = n_1 + n_2 - 2; \; \alpha = .05$$

Table B.3

Mean Per Capita Fuelwood Consumption Adjusted for Average Moisture Content, Gedo and Lower Shabeelle Sites

Site	Mean Per Capita Fuelwood Consumption (kilograms)	Average Percentage Moisture Content[1]	Adjusted Per Capita Fuelwood Consumption (kilograms)
Luuq	1.121	10.128	1.008
Cir Kud	0.932	16.300	0.780
Maganey	0.943	11.362	0.836
Lower Shabeelle:			
Refugee[2]	0.956	16.583	0.798
Non-refugee[3]	1.192	25.55	0.888

1 Percentage moisture content = $\frac{\text{wet weight - dry weight}}{\text{dry weight}} \times 100$

2 Samples cut from household wood piles during short rainy season, or second phase of Qoryooley camp survey.

3 Figures or moisture content suspect due to laboratory procedural errors.

Table B.4

Effects of Number of Consumers by Age Group on Household Fuelwood Consumption, Gedo and Lower Shabeelle Sites

Site/Equation		Intercept	Independent Variables: Number of Consumers Age 0 - 3	Age 4 - 12	Age 12 +	Statistics $\bar{R}^2$	F
Gedo							
Luuq	b_i[1]	4.2537*	0.765*	0.409*	0.505*	0.86	58.92
	Sb_i	0.40484	0.1277	0.1029	0.0435		
Cir Kud	b_i	1.4055*	0.259	0.7065*	0.3717*	0.66	19.15
	Sb_i	0.3734	0.159	0.1565	0.0956		
Maganey	b_i	1.7966*	0.4854*	0.7102*	0.5736*	0.55	12.86
	Sb_i	0.6664	0.2258	0.1654	0.1295		
Lower Shabeelle							
Refugee	b_i	2.115*	0.6714*	0.4721*	0.8091*	0.77	28.36
	Sb_i	0.5198	0.3304	0.1533	0.0972		
Non-Refugee	b_i[2]	4.9404*	-0.2252	0.6738	0.1667	0.08	1.95
	Sb_i	1.1132	0.5049	0.3529	0.1687		

* Coefficient for which null hypothesis that $\beta_i = 0$ is rejected at 0.05 significance level.

1 b_i = regression coefficient
Sb_i = standard error of coefficient

2 Questionable observations from Ugunji have been excluded from data set (n = 33).

Table B.5

Effects of Size of Consumption Unit and Site Location on Household Fuelwood Consumption, Gedo and Lower Shabeelle Sites

Site/Equation		Intercept	Independent Variables		Statistics	
			Total Number of Consumers	Site Location Intercept Dummy	$\bar{R}^2$	F
Gedo						
Luuq	b_i[1]	4.1328*	0.5307*		0.85	161.103
	Sb_i	0.3619	0.0418			
Cir Kud	b_i	1.3961*	0.4414*		0.63	48.284
	Sb_i	0.3907	0.0635			
Maganey	b_i	1.7276*	0.6163*		0.57	39.683
	Sb_i	0.6439	0.0978			
Lower Shabeelle						
Refugee	b_i	2.4096*	0.6455*		0.73	65.507
	Sb_i	0.5511	0.0797			
Non-Refugee[c]	b_i[2]	2.5475	0.2887*	2.6663*	0.19	4.776
	Sb_i	1.4968	0.1208	1.1512		

* Coefficient for which null hypothesis that $\beta_i = 0$ is rejected at 0.05 significance level.

1 b_i = regression coefficient
Sb_i = standard error of coefficient

2 Questionable observations from Ugunji have been excluded from data set ($n = 33$).

Table B.6

Effects of Number of Consumers by Age Group and Total on Household Charcoal Consumption, Muqdisho Sites

Site/Equation		Intercept	Independent Variables				Statistics	
			Number of Consumers					
			Age 0 - 3	Age 4 - 12	Age 12 +	Total	$\bar{R}^2$	F
Hodan	b_i[1]	3.4918*	0.0836	0.2125	0.2382*		0.62	16.97
	Sb_i	0.3850	0.2069	0.1349	0.0423			
Wadajir	b_i	2.1833*	0.4141	0.2845	0.5105*		0.59	15.07
	Sb_i	0.4409	0.2591	0.1626	0.0971			
Xamar Weyne	b_i	1.332*	0.4524*	0.4548*	0.4686*		0.65	19.51
	Sb_i	0.4949	0.1671	0.1167	0.0907			
Hodan	b_i	3.4549*				0.2322*	0.59	41.96
	Sb_i	0.3682				0.0359		
Wadajir	b_i	2.2432*				0.4292*	0.62	48.12
	Sb_i	0.4039				0.0619		
Xamar Weyne	b_i	1.347*				0.4575*	0.68	61.72
	Sb_i	0.4777				0.0582		

* Coefficient for which null hypothesis that $\beta_i = 0$ is rejected at 0.05 significance level.

[1] b_i = regression coefficient
Sb_i = standard error of coefficient

APPENDIX C

Cooking Methods for Foods Cited in the Household Survey

Prepared by

Zahra Cabdi Shirwa, Socioeconomic Counterpart

A. **Cambuulo** (grain or rice and beans)

- **galley iyo digir** (maize and beans)
- **sorghum iyo digir** (sorghum and beans)
- **qamadi iyo digir** (wheat and beans)
- **bariis iyo digir** (rice and beans)

The **galley, sorghum** or **qamadi** is first boiled until it is about ready (but not very soft). The **digir** is added and the whole is cooked together until ready. The **cambuulo** made from **galley** takes about two to two and a half hours, longer than the time needed for other types of grain, except for the **bariis iyo digir cambuulo,** where the **digir** is boiled first and the rice added when it is half cooked.

B. **Soor** (porridge)

Soor can be made out of maize or sorghum flour. The flour is first prepared by separating its very fine powder from the rest of the flour and cleaning it by taking out what is not needed, such as the skin.

Enough water is boiled for the amount of **soor** to be cooked. The flour other than the very fine powder is added to the boiling water. A special spoon **(ayiin)** is always used for stirring. The **soor** is cooked for about 20 minutes but not long enough for it to become hard (stiff). Salt is added while the **soor** is stirred from time to time. The fine powder is added just before the **soor** is finished and should be stirred very thoroughly. The **soor** is then covered and cooked for another 10 minutes on a very low fire.

C. **Canjeero** (light pancakes)

Canjeero, a very thin pancake can also be made out of **galley** or sorghum. The flour is soaked in warm water with salt (and garlic if desired) and taken to the wet grinder. White flour and water is mixed with the maize paste and left to sit until it rises. The **canjeero** pan (plate) is heated with a little oil and some of the batter spread around on the hot plate. Total cooking time depends on how much **canjeero,** or how many pancakes, are being made.

D. **Digir** (beans)

Digir is usually cooked with some other food, like rice, galley or sorghum. In most villages, people can be seen selling **bariya** (a fried bean flour cake).

The **digir** is soaked overnight. In the morning the skin is removed by washing and pressing the beans between the hands. It can then be ground by either the wet grinder or the traditional grinding stone. For **bariya,** the pasta is shaped with the hands into small

flat circles and fried in oil until it turns brown. (See the instructions for **cambuulo** for cooking **digir** with other foods).

E. **Muufo** (corn or sorghum bread)

Muufo is made primarily with **galley** but occasionally with sorghum. The **galley** paste is prepared in the same way as for **canjeero.** If it is too hard to form into circles, water is added to soften it. When the oven is heated and ready, the row of **muufo** is placed on the walls of the oven and covered for 10 to 20 minutes until brown.

F. **Bun** (fried coffee beans)

Bun is made from whole coffee beans. The desired amount of oil is heated and coffee beans are added to the hot oil and cooked for about 5 minutes. It is ready when the beans are gathered in the center of the pan or when the smell indicates that it is done.

G. **Cagaar**

Cagaar is green leaves, cultivated or not cultivated (wild), in various types. Although it mainly depends on individual cooking methods, **cagaar** is commonly cooked with water, salt and a little oil.

The common way to cook the wild **cagaar** that is eaten with **soor** is to cut away what is not necessary, wash it and boil it with oil and some salt. When the **cagaar** is soft and cooked, some onions and tomatoes are fried in a little oil. The cooked **cagaar** is stirred in and allowed to cook for 10 minutes.

H. **Hilib** (meat) or **Kalluun** (fish)

There are various ways to cook **hilib,** depending on the purpose or the desired side dishes. In general, it can be boiled, fried or made with a sauce (different sauces for different purposes). The ingredients also differ depending on an individual's cooking habits and the types of vegetables added.

To make sauce for **canjeero** or **soor,** the meat and vegetables are prepared. Some onions are fried in oil and the meat added to them and stirred for a while. The vegetables are added as desired, along with salt and spices and the desired amount of water, and the mixture is cooked for about 40 minutes.

The common ways of cooking **kalluun** are the same as for **hilib.**

I. **Bur** (fried cake)

The desired amount of white flour is cleaned and placed in a deep bowl. Eggs (two for each half kilo of flour) and sugar are added and mixed thoroughly with some water. After sitting for an hour, the cakes are fried in hot oil.

APPENDIX D

Questionnaire and Critique of Questionnaire

UNIT [ ]

VITA COOKING PRACTICES AND FUEL CONSUMPTION SURVEY

Village or Camp _____

Interviewer Name _____

Date _____

Time _____

Name of Respondent _____

_____

Description of Location

_____

Field Edit: _____

_____

_____

_____

Office Edit:

I _____ IIA _____ IIB _____

QUESTIONNAIRE I: COOKING PRACTICES

I. CONSUMPTION UNIT

1. For how many people do you usually cook?

AGE			TOTAL
0-3 yrs	4-12 yrs	12+ yrs	

(Interviewer: Do the columns add up to the total? If not, ask again and correct the table.)

2. Does the number of people for whom you usually cook change from one season to another? yes no
If yes, please tell us how many for each season, not including this season:

Season			
Number			

3. Who cooks the meals? Please tell us the age of the cook and the relationship of the cook to the head cook, for each meal. Include <u>all</u> cooks.

Meal	Age	Relationship to Head Cook	Stove Used
Breakfast			
Lunch			
Dinner			

II. STOVES AND COOKING PRACTICES

4. Please describe for us the stove(s) you possess. For each stove, tell us the material it is made of, and whether it is portable. For each food you cook on it, tell us the type of pot used, whether a lid is used, and the approximate cooking time in hours. Note also the muufo stove. (Interviewer: If there is a third stove, record information on back).

Stove	Material of Stove	Portable		List foods cooked (exclude tea)	Type of Pot		Lid Used		Cooking Time (from when fire is laid to when cooking is over)
		yes	no		Material	Size	yes	no	
I									
II									

5. Are any of these foods cooked simultaneously? If so, in what combinations?

_____

_____ _____

6. Where is each stove located, by season?

Season, Stove	Location		
	In Aqal	Outside Aqal Sheltered	Outside Aqal Unsheltered
Xagaa I			
II			
III			
Dayr I			
II			
III			
Jiilaal I			
II			
III			
Gu I			
II			
III			

7. Can you tell us what else you use the fire or stove(s) for?

   a. drying crops or crop residues specify _____
   b. lighting
   c. heating
   d. washing
   e. smoke for keeping out insects
   f. other specify _____

8. How many times per day do you usually heat water for washing or making tea?

   for washing _____
   for tea _____

9. Do you heat the water for washing or for tea during meals or separately?

during _____ separately _____

10. When you have finished cooking the food, what do you do with the embers?

a. let them die out, without using again
b. keep them hot, to use for non-cooking purposes
c. cover and put aside for later use

11. Does the stove(s) require maintenance?

yes _____ no _____

If yes, what? _____

_____

12. Tell us, in decreasing order of importance, what tires or bothers you most about cooking. (Interviewer: Number from 1-6, from most to least important).

_____ time
_____ heat
_____ smoke
_____ fetching fuel
_____ watching the fire (for burns, etc.)
_____ other (specify) _____

13. If you could improve your stove(s), how would you like to do so?

_____

_____

III. INCOME-OCCUPATIONAL GROUP

14. What is the primary occupation of the head of the household?

a. farming

hectares owned _____ hectares worked _____
principal crop(s) _____
proportion owned of production sold _____

b. herding (hired) _____ proportion of year _____

c. fuel or building materials collection, charcoal production

_____

d. commerce

retail shop, market _____
whole-saling _____
long-distance trade _____

e. government worker _____

f. other (specify) _____

g. none

15. What is the <u>primary</u> income earning activity of the head cook?

a. weaving, rope-making, potmaking _____

b. vendor of non-farm goods _____

c. transformation of and sale of farm produce _____

d. shop worker _____

e. fuel collection _____

f. water collection _____

g. domestic work, health, child care _____

h. other (specify) _____

i. none _____

UNIT [ ]

IDENTIFICATION

Village _____

Interviewer Name _____

Interview Time _____ to _____

QUESTIONNAIRE 2: FUEL CONSUMPTION

PART A

I. CONSUMPTION UNIT

1. For how many people do you usually cook?

AGE			TOTAL
0-3 yrs	4-12 yrs	12+ yrs	

(Interviewer: Do the columns add up to the total? If not, ask again and correct the table.)

2. Does the number of people for whom you usually cook change from one season to another? yes no

If yes, please tell us how many for each season, not including this season:

Season			
Number			

II. FUEL USE

3. What types of fuel do you use, by season?

	Xagaa	Dayr	Gu	Jiilaal
Wood				
Charcoal				
Crop Residues (specify)				
Other (specify)				

Of these fuel types, which do you prefer? _____

4. Do you or someone "eating from the same cooking pot" collect fuelwood or produce charcoal for use in the home?

wood yes _____ no _____

charcoal yes _____ no _____

If yes please tell us about it:

Collector/ Producer		Number of Trips per Week	Hours Each Trip	Transport			
Age	Sex			Donkey	Cart	Back	Other (specify)

5. Do you or someone "eating from the same cooking pot" purchase fuelwood or charcoal for use in the home?

Who provides the money in the household	Number of purchases per week	Price/unit at place of purchase	
		price	unit

6. Please list the home uses of charcoal or fuelwood. For each fuelwood use, list the species you actually use and the species you prefer.

Use	Fuel Type		Wood species actually used	Wood species preferred
	Charcoal	Wood		
Cooking				
Tea				
Washing				
Ironing				
Other (specify)				

7. What are your daily cash expenses? _____

What are your daily expenses for fuel? _____

8. Do you share fuel with friends or neighbors? _____

yes _____ no _____

If yes, how often? _____

9. Has the proportion of your time or expenses required for fuel increase, decreased, or stayed the same in the past year?

Increase	Decrease	Same

10. If the proportion has changed, have you modified your cooking practices as a result of this change?

    a. no modifications
    b. change from one fuel type to another
    c. change amount of fuel used
    d. change number of hot meals/day
    e. other (describe) _____

UNIT [ ]

PART B

Measurement Procedure:

1. Ask the family to set aside, in a separate pile, the wood or charcoal they use for cooking and tea. If possible, this pile should be enough for at least four days use.

   a. The fuel in this separate pile should be used only for cooking or tea-making purposes, and no other purposes.

   b. Only this separate pile should be used for cooking or tea. Fuel should not be added to it, unless the interviewer weighs what has been added.

2. Urge the family to cook as they usually do with respect to the type and quantity of food, and quantity and type of fuel. They should not change their habits because you are recording the weight of their fuel pile.

3. Take any piece of fuel from the separate pile that the family has constructed, make a cutting, and place the cutting in a plastic bag. (If both wood and charcoal are used, take two bags).

   a. Be sure to seal the bag(s) tightly so that the moisture does not evaporate.

   b. Label the bag(s) with the date and unit number. For fuelwood, write the local species name on the label.

4. For five consecutive days, visit the family at a fixed time. Weigh the pile with the spring balance and record the weight in kilograms in the table following (use pencil only).

   a. Verify conditions 1(a) and 1(b) with the family. If either condition has been violated and you cannot determine the weight of what has been added or what has been used for other purposes, start the weighing procedure over again as "Day 1."

5. a. If possible, submit the bags of fuel to the survey monitor immediately after you have completed the oral interview and weighing on "Day 1."

   b. If you encounter problems, contact the monitor immediately.

   c. After you have completed the weighing for five days under conditions 1(a) and 1(b), return the questionnaire to the monitor.

	Fuel Type	Weight in Kilograms
Day 1	wood	
	charcoal	
Day 2	wood	
	charcoal	
Day 3	wood	
	charcoal	
Day 4	wood	
	charcoal	
Day 5	wood	
	charcoal	

(For supervisor) Problems: _____

_____

_____

GROUP QUESTIONNAIRE

IDENTIFICATION

Village:_____

Meeting time:

from _____ to _____

PERCEPTIONS OF SCARCITY AND STRATEGIES FOR ADAPTATION

Procedure: This questionnaire is to be conducted informally and no paper or pencil should be necessary while you are conducting the interview. Retain 1) the consensus response and 2) the composition of the group (e.g., the number of elders, women's groups, and artisans). After the interview, organize notes according to the questionnaire. Remember that these written questions are to serve as a guide. The important consideration is the concept rather than the precise sequence or wording of the questions.

I. Group Composition

Number of people:

Position in the community (if there are several groups represented, record the approximate number from each group):

II. Perceptions of Scarcity

1. Have you noticed whether, over time, there has been a change in the availability of fuel in your community? (Note here methods of collection, marketing and/or transport in the community).

2. If so, what are the signs or indicators of this change?

   -- time spent in collection
   -- price per unit changes
   -- a larger proportion of people's income spent on fuel
   -- fewer trees and shrubs around the community
   -- other (specify)

3. If so, what is the cause of this change?

III. Strategies of Adaptation

1. How have people in your community adapted to changes in availability of wood fuels?

   -- changed the quantity of fuel used in cooking or other purposes (what are the other purposes?)
   -- switched from one type of fuel to another (from charcoal to wood, or from wood to crop residues)
   -- switched from one species of wood to another (from preferred species to available species)
   -- consume fewer hot meals/day
   -- start fewer fires, using embers or putting embers out after cooking has been completed

2. If they have adapted in some way, how has this affected their well-being or their health?

3. Can you think of other ways to cope with the change in charcoal and fuelwood availability?

   -- as individuals?
   -- as a community?

4. How have successful changes in technology occurred in the past? Give an example--such as a change in agricultural techniques, a change in types of pots used in cooking, etc.

   -- who introduced the change (merchants, leaders, government, etc.)?
   -- how did they introduce it (by word of mouth, by advertising, by setting an example, over the radio, holding group meetings)?

5. Would it be possible to relieve the burden of fuel collection or the amount of money a household spends on fuel through changing cooking practices or cooking technology?

6. If so, how would you:

   -- suggest changing the practices or technology?
   -- promote this change (merchants, leaders, government, other)?

7. If a stove relieved the burden or cost of fuel to the household, would the household be willing to pay a price for the stove?

   -- which households (income)?
   -- under what conditions (cosmetics, save fuel, reduce smoke, reduce cooking time)?

8. How would you introduce this stove?

CRITIQUE OF QUESTIONNAIRE

Prepared by Zahra Cabdi Shirwa, Socioeconomic Counterpart

It was very important to make the questionnaire we used suitable for all parts of the country in which we conducted the survey. With this point in mind, we first talked to people to gather basic information about those particular areas, which was then used to design our questionnaire. Along with the questionnaire, a list of enumerator guidelines and definitions was also prepared. The main purpose of these guidelines and definitions was to help the enumerators produce comparable results even if the questionnaire was used in different sites. To refine the questionnaire, we performed a pre-test in some sites in Lower Shabeelle. As a result, we excluded some questions from the questionnaire after testing several households.

At the end of this testing procedure, we realized that it was impossible to follow the guidelines literally in each household. We also realized that, if we continued the testing, we would have to tailor the questions to meet the individual characteristics of each household. Since we could not design a special questionnaire for each household, we developed a technique that allowed us to use one type of questionnaire for all households and sites. This technique differed somewhat from the original guidelines. The original guidelines stated that a question should only be phrased as it was worded in the questionnaire. If not understood by the respondent, the same question should be repeated, and if that did not work, a little explanation should be made. After doing the pre-test, we decided to initially state the question as written; if the question was not understood it was not repeated as written but was phrased differently, retaining its original meaning.

The sensitivity of the respondents to the questions differed from one individual to another, but almost everyone either did not like or was not comfortable with the questions about income activities, primary occupations, and cash expenditures. In the following section, specific comments are given for each question.

I. Questionnaire I: Cooking Practices

1. There was no problem with this question in non-refugee areas. In refugee camps, people often were concerned with food distribution and so tended to overstate the number of people they cooked for.

2. This question was difficult for almost half of the people we interviewed, because those who lived in towns seemed to know nothing about seasonal changes.

3. No problem with this question.

4. The tables in this question were hard to fill in and the requested information seemed silly to most of the respondents, especially regarding the cooking times. There was no point in asking if people used lids or not because 100 percent said they did.

5. Irrelevant because most people use ceramic and soapstone stoves and therefore cannot cook two or more dishes simultaneously.

6. Similar to question 2, this question asks for seasonal information. It was confusing, especially for people in Muqdisho who always kept their stoves in the same place.

7. This question was particularly appropriate for people in villages.

8-9. These questions should be combined.

10. This question was straightforward except for the fact that (b) and (c) were often confused.

11. No problem with this question.

12. The way this question is worded is all right but the problems listed did not seem to bother many of the women we questioned.

13. It was too abstract for most of the women to give any suggestion on this question.

14-15. The questions themselves are worded all right but not everyone felt comfortable telling how many **darab** or **jiibaal** they owned.

II. Questionnaire II: Fuel Use

1-2. See "I. Questionnaire I: Cooking Practices" above for comments on questions 1 and 2.

3. Instead of asking what type of fuel people use in different seasons, I think it would be easier if we asked what they use when it rains.

4-5. These questions seemed a bit confusing and if you are not careful with the way they are asked, you may only get an answer to one question when a respondent actually should have responses for both questions.

6. There is no particular problem with this question.

7. People did not seem to be happy with this question but after using the techniques mentioned above, we managed to obtain answers for this question.

8. No point in asking this question because they generally gave away burning fire or pieces of wood.

9-10. These two questions are straightforward and did not create any problems.

APPENDIX E

VITA Enumerators

Moxamed Cali Axmed
Zahra Cabdi Shirwa
Ali Hassan Goni
Faadumo Cabdullahi Mohamed
Cadar Mohamed Ismaacil
Safiya Farah Mohamed
Basra Mohamed Jaamac
Amina Cabdi Awad
Jaamac Ahmed Maxamed
Ali Mohamed Jaamac
Ahmed Dubad Jaamac
Jaamac Ahmed Nuur
Yaasin Cabdi Muse
Abdirizak Ducale Qambi
Suleman Cabdullahi Yusuf
Abdi-Hakim Cilmi Jaamac
Rashid Ibrahim
Faduma Dhaqane Farah
Cabdullahi Aden Xasan
Dahir Ahmed Qalombe
Maryan Ibrahim Issac
Mohamed Muhudin Mohamed
Abdirahman Ali Xusen