FOOD POVERTY PROFILE AMONG THE SETTLED AND SEMI-SETTLED PASTORAL HOUSEHOLDS OF LOWLAND MARSABIT: EVIDENCE FROM MICRO DATA.

By

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Declaration

This paper is my original work and has not been submitted for a degree in any other University.

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This paper has been submitted with our knowledge as the University supervisors.

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Dedication

This paper is dedicated to my beloved daughter, Eurellah A. O. Nyamori and to my late father, Mr Aloyce Nyamori whose love for education inspired me.

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Abbreviations and Acronyms

AIC	African Inland Church
ASALs	Arid and Semi Arid Lands
CBAHWs	Community Based Animal Health Workers
CBN	Cost of Basic Needs
DANIDA	Danish International Development Agency
EU	European Union
EVK	Ethno-Veterinary Knowledge
FEI	Food-Energy-Intake
FGT	Foster Greer and Thorbecke Model
FHI	Food for the Hungry International
GTZ	German Technical Corporation
KARI	Kenya Agricultural Research Institute
NORAD	Norwegian Agency for Development Corporation
OLS	Ordinary Least Squares
PRA	Participatory Rural Appraisal
RRA	Rapid Rural Appraisal
SIDA	Swedish International Development Agency
TLU	Tropical Livestock Unit
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
VIF	Variance Inflation Factor

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"May the Almighty God pour thy blessings unto thee"

I bear the responsibility for any error or shortcomings in this paper.

Abstract

This study sought to examine the seasonal food poverty levels and the contribution of livestock and market foods in attaining food security in the settled and semi-settled households of lowland Marsabit. This was necessary because households in this area and in other similar marginal areas have typically been left out in food poverty analysis studies, especially by the government. Where such studies are done, they are macro in focus, and deficient in evaluating the specific community needs. They also ignore food distribution at the household level and do not consider seasonal effects in household food acquisition.

The study established that the level of food poverty is high among the settled and semi-settled households in lowland Marsabit. About 64 per cent of the settled households are food poor compared to 61 in the semi-settled households in the dry season. During the wet season, level of food poverty among the settled households fall slightly to 59 per cent while that of the semi-settled households goes down by almost half upto 34 per cent. The variation in food poverty levels is due to high milk supply, especially to the semi-settled households, during wet season. Although income, especially that of trade, plays a significant role in food security, its effect is mainly felt in the settled households, which have a small number of livestock holding. Also due to geographical isolation, the semi-settled households face problems of accessing market foods, which is why the relation between income and food expenditure cannot be easily traced.

In conclusion, the study recommends micro policies aimed at incorporating the locals to alleviate food poverty. The study proposes a strategy of portfolio mix, adoption of the theory of comparative advantage and promotion of commodity exchange. If implemented appropriately, these will go along way in alleviating food poverty in ASALs.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Kenya's national food security was promulgated in Sessional Paper No.4 of 1981. Omiti and Irungu (2002) note that prior to this policy paper, the government pursued broader policies within the agricultural sector that were expected to spur agricultural growth and translate into adequate food at household level. After 1981, emphasis shifted towards production of foodstuffs, particularly maize, to enable the country achieve food self-sufficiency without recourse to food imports (RoK 1994). The policy favored grain farming and was oriented towards meeting food needs of urban dwellers or those with economic ability while ignoring food security needs of pastoralists who occupy fragile and less productive Arid and Semi-Arid Lands (ASALs). Pastoralists are the most vulnerable with the highest incidence of poverty in Kenya (GoK 1999). They face the dilemma of coping with harsh environment and the fragile ecosystem, scarce resources, limited technological progress, poorly developed infrastructure and low human resource development, while trying to maintain acceptable standards of food security.

The issue of food security in pastoral communities is delicate, complex and challenging. In most developing countries especially in Africa, pastoral communities have been neglected and marginalized from the national development programmes. They receive very limited provision of basic facilities that guarantee food security. The communities also face frequent but transitory food poverty due to natural shocks and as a result resources have been depleted leading to chronic

food poverty. The ASALs also have limited income-generating opportunities with livestock marketing as the core economic activity. However, high transaction costs caused mainly by inadequate infrastructure contribute to poor marketing of both livestock and livestock products. This financially incapacitates most households in accessing adequate foods.

World Bank (1986[a]) defines food security as *access by all people at all times to enough food for an active and healthy life.* In this definition, the old concept of food reserves and avoidance of transitory shortfalls in aggregate food supply is replaced by a new one that recognizes lack of access to adequate food by households and individuals due to low income or entitlements (Abassa 1995). Access to adequate food refers to the availability of enough food with nutritional value that fulfills all requirements for all members of the household throughout the year (UNICEF/ESARO 1993). Adequate food can be obtained by a consumer unit, which in our case is a household, through financial, physical and biological means. Financial access refers to the proportion of total household income that is used to purchase food while physical access refers to own production or time taken to reach foods. Biological access links the body health condition and food consumption; poor body health leads to low absorptive capacity, which makes consumption of enough and nutritious food not sufficient to guarantee security[1]. A household is therefore considered insecure if it cannot obtain food within a reachable distance, if its purchasing power is too low to acquire the food needed, and if access to means of own food production is lacking or inadequate.

As much as accessibility to food is important for security, self-sufficiency is also a factor that cannot be ignored. Abassa (1995) defines self-sufficiency as the state of being capable of effecting one's

[1] This study will not concentrate on biological access, as this requires bio-medical information which was unavailable for the study.

own end or fulfilling one's own desires without aid of others. This concept is important in our analysis since persistent drought experienced in the fragile ASALs of northern Kenya have led to acute shortfalls in food supply. This has resulted in massive commercial imports of food grains by the government that drain foreign exchange reserves.

For a long time, pastoralists have relied almost solely on livestock foods but as of late, market foods increasingly contribute to food security of the settled and semi-settled households, yet the issue remains largely misunderstood. The proposed study will review the seasonal food poverty levels of these households within the Gabbra and the Rendille communities of lowland Marsabit and examine the role of livestock and market foods in household food security.

1.2 Statement of the Problem

Increasing human population growth combined with the frequent and severe droughts experienced in ASALs push many pastoralists out of the traditional livestock monoculture and accelerates settlement. Unlike nomads who access traditional livestock foods at all times, the settled and semi-settled households have limited access, which makes them more vulnerable and hence food poor. They therefore strive to reduce their food poverty levels by supplementing the limited supply of livestock foods with the market foods.

There are few studies, if any, on food poverty levels in ASALs. The Welfare Monitoring Surveys (WMS) conducted by the government of Kenya in 1994 and 1997 captured food poverty levels of all districts with the exception of most ASAL districts including Marsabit. The reason frequently given is that inhabitants of ASALs are nomads who are difficult and expensive to reach. But in

cases where food poverty studies were carried out, the regional and seasonal effects on food acquisition were assumed not to vary. However, chronic food shortage experienced in some parts of the ASALs especially during dry seasons is a confirmation of regional and seasonal desegregation in food acquisition. Also, the macro analysis of food poverty, as the case has been, often lead to formulation of policies that do not adequately address specific food needs of ASAL communities in the marginal lowlands. The relief food distribution, which has become almost permanent in these areas, is a clear indication of formulation and implementation of inappropriate policies.

Since there is limited information on food poverty levels and income shortfalls for the pastoral communities in ASALs, this research paper is to provide information on the same by analyzing the seasonal food availability among the settled and semi-settled households. This will enhance formulation of micro-policies specially designed to address specific food needs of these marginalized communities.

1.3 Objectives of the Study

The study intends to establish seasonal food poverty levels and analyze the roles of livestock and market foods in attaining food security among the settled and semi-settled pastoral households. The specific objectives to address in this study therefore include the following:

1. To establish the seasonal food poverty levels and income shortfalls in the settled and semi-settled households in the marginalized lowlands of Marsabit District.

2. To identify factors, which influence seasonal consumption expenditure and assess the contribution of livestock and market foods in attaining food security in the settled and semi-settled households of lowland pastoral communities.

3. To identify appropriate portfolio-mix and recommend policies for attaining food security among the settled and semi-settled households.

1.4 Justification

The chronic food poverty experienced in pastoral communities is a clear manifestation of inappropriate policies, which the government has continued to implement since independence almost four decades ago. The policy failures may be attributed to lack of focus on specific seasonal food requirements of the settled and semi-settled households in ASALs. The study endeavors to put emphasis on seasonal and sedentarization effects in order to focus on issues that adequately address the problem of food poverty.

This study therefore offers important micro policy prescriptions for alleviating seasonal food poverty in the settled and semi-settled households of the lowland ASALs. Furthermore, it adds to the scarce empirical literature and serves as a reference material to policy makers, development agencies and scholars.

1.5 Hypotheses

1. Most of the settled households are food poor both in wet and dry seasons.

2. Food poverty levels vary widely by season both in the settled and semi-settled households.
3. Market foods contribute a greater portion of the foods accessed by the settled households.

1.6 Pastoralism as a Way of Life

Pastoralists regard livestock as the most reliable and stable insurance against food shortage (World Bank 1995). They have, despite numerous constraints, tried to build up their stock when climatic conditions are favorable. The production system is, however, constrained by drought, poor infrastructure, disease incidences and shortage of grazing land[2] (Goldsmith 2000). An Increasing number of households therefore face starvation and have been forced to compromise their future as pastoral producers and adopt non-pastoral activities for livelihood.

In times of drought, which hits them often and severely, upto 50% of the livestock may be decimated (*World Bank 1995*). During the past three decades, the ASALs experienced frequent droughts such as those of 1968-1976, 1982-1984, 1992 and 1996. In these droughts numerous livestock succumbed making some households complete destitutes. This has no doubt increased the level of poverty amongst pastoralists. During these droughts, the pastoralists migrate to urban centers in search of relief food and some quit pastoralism as a way of life (GoK 1999). Besides droughts, floods also impact negatively on the livelihoods of the pastoralists. The El Nino floods of 1997 and 1998 is one such example in which pastoralists were severely affected. In Marsabit

[2] Shortage of grazing land is mainly caused by encroachment of high potential areas by farmers, fencing off the drought fallback areas for wildlife management and non-utilization of the conflict prone areas

District, the respective estimates of 20 per cent and 50per cent mortality in camels and small stock were recorded (Owambo, 1999). Many pastoralists in the district were left with no option but to seek alternative means of livelihood, which include migration to nearest towns that supply relief food.

The recurrent severe droughts together with increasing human population have contributed to the upsurge in the number of settlements and subsequent environmental degradation. These environmental and demographic changes have greatly influenced the way of life of the pastoralists (Goldsmith 2000). In the process of transition, three categories of pastoralists have emerged: settled, semi-settled and mobile. The groups adopt quite varied strategies to enhance food security within households. A brief description of the strategies follows:

Settled Households:

These are established within towns and have immovable shelters with a few livestock if any. Most households seem to rely on market foods for livelihood, which increases their demand for money. To ensure food security, they engage in varied income generating activities like micro-trade[3], and wage employment[4] among others. The income earned is mainly used to purchase foods like maize, beans, maize meal, rice, sugar and tea leaves from the local markets. However, households that generate much income invest in

[3] This involves small-scale sale of beads, strings, coloured soils for body decoration, tobacco, bungles, magadi, salt, match-box, livestock drugs and many other small items.
[4] These range from casual unskilled labour like fetching firewood and water, livestock management and watchman to more skilled labour like teaching.

children's' education and livestock after acquiring enough food. Also lately, some of these households keep poultry to provide meat and eggs for consumption or for sale.

Semi-Settled Households:

These are situated in the radii of between 5 km to 25 km from the town center and have shelters that are movable from time to time within the settlement area. The larger the livestock holding, the further away the household is located from town. Most of their livestock stay away in *satellite* camps to avoid further degradation of the settlement's surrounding environment. This limits supply of livestock foods to the majority of household members who remain in the main settlement. As a result, they are prompted to adopt other strategies to acquire supplementary foods. They mix portfolios of livestock holding, micro-trade and wage employment to earn their living. Their level of exposure including school enrolment is lower than that of the settled but higher than that of the mobile households.

Mobile Households:

Mobile households do not have specific settlement areas. The whole family constantly moves with livestock from place to place in search of water and pasture. They mainly rely on milk and meat from livestock for livelihood and are much less exposed to current development activities. Illiteracy rate is highest in this category. They are found in the Gabbra community though the number is declining. The analysis in this paper focuses exhaustively on the first two groups. This group of mobile households has been left out

because enough data was not collected, as it was difficult to access them within the limited time allocated for the survey.

The efforts by the two household categories to access adequate food have achieved limited results. This is evidenced by constant distribution of relief food as a supplement. Food production from both livestock and farming is poorly organized, lacks good government support and adequate structure[5]. They are therefore made to rely almost exclusively on cereals, which are either purchased or given as relief food. On average, these pastoral communities have not attained a level of nutrition commensurate with good growth and development, good health and satisfactory working efficiency (Abassa 1995).

The future of pastoralists is bleak unless something serious and sustainable is done soon. According to Goldsmith (2000),

> *"The ability of the population to continue their pastoral way of life has become increasingly difficult. The pressure of increasing human and livestock population on a limited area together with the constant drought incidences have accelerated environmental degradation. As a result, the milk yield has reduced to the extent that it can no longer support the food requirements of the increasing population. The deteriorating range resource condition has also contributed to poor livestock body condition leading to low meat supply or poor marketability. The communities have also lost livestock to drought, increased disease incidence and raids thereby reducing livestock per capita".*

[5] The structures refer to markets, veterinary services and infrastructure among others

In the event of natural control of livestock population and productivity, human population has been on the increase leading to a reduction in livestock per capita. Lack of adequate resources, geographical isolation, poor infrastructure and poor integration with the rest of the economy implies limited growth opportunity. Due to low livestock productivity, increasing human population and poor infrastructural development, arid lands experience high incidence of poverty.

Because livestock remains the main source of livelihood for most of the ASALs inhabitants; and, at least ideally, the main engine of transition to a more diversified local economy, restoring the market nexus and improving livestock productivity have been central components of many contemporary development strategies for the area (Goldsmith 2000). For the past several decades, the primary focus of arid lands development has fluctuated between livestock production and range resources upon which pastoral households depend. Numerous programs have been initiated to achieve these goals but they appear to have had limited impact. Some of the major projects that have been operational in pastoral communities include the Pastoralist Development Project funded by UNDP; water and soil conservation by SIDA; co-operatives - NORAD; schools, water and health – DANIDA. Other players in provision of development projects include Roman Catholic Church, African Inland Church (AIC), Inter Aid, World Vision, Food for the Hungry International (FHI) and Deutsche Gesellschaft fuer Techische Zusammenarbeit (GTZ). Also, the World Bank currently finances a major project under Arid Lands Resource Management Programme controlled from the Office of the President. The programme monitors drought and issues early warning to the target groups and relevant organizations to minimize loss on livestock. They work in close collaboration with the meteorological department and other related government departments.

1.7 Study Area: Marsabit

Kenya's ASALs cover about 80 per cent of the country's total land surface and support approximately 25 per cent of the human population and over 50 per cent of the country's livestock population (GoK 2002). These areas are ecologically fragile and receive low and highly erratic rainfall. The area is prone to incessant drought incidences, which impact negatively on social, economic and biological conditions of the inhabitants.

Marsabit is one of the districts in the Arid and Semi-Arid Lands of northern Kenya and covers about 11 per cent of Kenya's total land area. The district measures about 61,044 square kilometres most of which is arid to semi arid lowland range (Hendy and Morton 1999). The lowland areas have an altitude ranging from 400 to 700 metres above sea level interspersed with several hills and lava plateaus. The average rainfall amount is as low as 200mm per annum. It is rated as one of the poorest districts with 64.29 or 55.1 per cent of the population classified as absolute poor using poverty lines of 870 and 780 computed from Cost of Basic Needs (CBN) and Food Energy Intake (FEI) methods respectively (Mwabu *et al* 1999).

The Rendille, the Gabbra, the Boran and the Ariaal are the natives of the district. They have limited economic opportunities and livestock production is the economic mainstay. About 80 per cent of them are pastoralists who obtain their livelihood from livestock and livestock based industry, 10 per cent are agriculturalists who reside in the high potential areas, 5 per cent are in trade and the remaining 5 per cent are in wage employment (Shabaani and Walther 1991). Most of the pastoralists live in the lowlands where they keep dromedaries, cattle, small stock, and donkeys.

Dromedaries are the main source of milk and blood for subsistence even during drought (O'Leary 1985). As a primary determinant of wealth and social status, they provide high prestige value compared to other livestock species. They are also used to mark important traditional ceremonies within the pastoral communities. Cattle and to some extent camel bulls are sold to provide big incomes for major household transactions. Cows provide milk, even though they are more vulnerable to drought than all other livestock species. Goats provide income for small and recurrent domestic needs and can also be slaughtered for household consumption during dry season. Sheep is reared mainly for fat but also has monetary and ritual significance. Donkeys are increasingly replacing dromedaries as the mode of transport.

The area is vast with irregular settlement pattern. This combined with poor state of the roads and insufficient transport services have contributed greatly to the poor veterinary services in the area. The traditional Ethno-Veterinary Knowledge (EVK) is not in serious use because majority of the population has lost the knowledge while at the same time the herbal plants are either inaccessible or have completely disappeared due to settlements and drought. To provide livestock health services the government, non-governmental organizations and development agencies have resorted to recruiting and subsequent training of Community Based Animal Health Workers (CBAHWs). They, however, face formidable challenges of poor storage and inhygienic dispensation of drugs, overpricing and lack of proper diagnosis of diseases (Ndung'u *et al* 1999). Disease control remains a big problem to the community and highly affects livestock production. Increased insecurity also affects livestock husbandry leading to re-defined livestock management in ASALs. Tribal conflicts lead to underutilization of 40% of the range (GoK 1999). The limited livestock movement has led to overstocking and degradation of the utilized areas hence causing low livestock productivity.

1.8 Organization of the Rest of the Paper

The rest of this research paper is organized as follows. The next chapter reviews the relevant theoretical and empirical literature. Chapter Three presents the analytical framework and methodology while Chapter Four will outline the seasonal food poverty levels and identifies factors that influence seasonal food security and their contribution. The conclusion and policy recommendations of the paper are in the last chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Literature

Food poverty can be chronic (permanent) or transitory (temporary). Chronic food poverty in families increases vulnerability to diseases and parasites, reduces strength required to perform work and curtails benefit from human resource development activities (World Bank 1986). These may sacrifice output and income and make it difficult for families to break the viscious cycle of poverty.

The major causes of food poverty are low productivity and loss of purchasing power (World Bank 1986). In certain circumstances, local food prices barely rise and foods are continuously available yet victims are not able to buy for lack of purchasing power. An analysis of the cause of food poverty by World Bank (1986) reports that the main cause is not only lack of supply but weak purchasing power thus underlying the need to focus relief work on the decline in real income. As such, governments and relief organizations that have paid too much emphasis on food availability have sometimes failed to recognize other causes of famines resulting in misdirection of relief. The study by World Bank (1986) then concludes that the groups of people that typically fall victims to famine include small-scale farmers, landless agricultural workers, and pastoralists who get most of their food from livestock.

Lack of food security for the poor nations and poor people is attributed to lack of purchasing power. Based on the minimum calorie requirement standard, World Bank (1986) reported that in 1980, 340 million people in developing countries excluding China faced chronic food insecurity due to lack of enough income. If the standard was raised from the minimum calorie requirement to the levels that allow an active working life, the estimates increased to 730 million people, one fifth of which lived in the Sub-Saharan Africa (World Bank 1986). The report further explained that global food production has been higher than the population growth and prices of cereals have been falling yet many poor countries and hundreds of millions of people do not share in the abundance.

In assessing food poverty profile either in a macro or micro level, food poverty line has to be identified. Greer and Thorbecke (1986) defined food poverty line as the minimum amount of food an individual must consume to stay healthy. In setting the poverty line they considered the nutritional characteristics of food, the quantities of the foodstuff consumed and their monetary values. According to Greer and Thorbecke (1986), the food expenditure component includes both purchased foods and food consumption out of own production. They established that with information on household food expenditure and calorie consumption, it is possible to estimate the cost of acquiring a given calorie value using the cost of calorie log-lin function expressed as:

$$\ln X = a + bC$$

Poverty line, which is represented by Z, is therefore the estimated cost of acquiring the nutrient recommended daily allowance of calories (2,250 per adult equivalent). The poverty line is thus computed from the following model:

$$Z = e^{(\hat{a}+\hat{b}C)}$$

When estimating the poverty line, Greer and Thorbecke (1986) assumed that all individuals faced the same price and a common dietary taste pattern. They then adopted Engel's function where consumption is determined by the level of income. In such a case, household *j's* consumption of food item *i* (q_{ji}) becomes:

$$q_{ji} = q_{rj,i}(Y_j) + e_{ji}$$

Where;

Y_j = income of household j

$q_{rj\,i}$ = the Engel's function for food i for subgroup rj to which household j belongs

e_{ji} = household error term which takes care of particular food habit and other variables not considered

Once q_{ji} is known, the expenditure and the associated calorie value can be determined from the prices and the calorie per unit conversion coefficient respectively. Thus household expenditure on a basket of food is:

$$X_j = \sum_{j=1}^{n} x_{ji} = \sum_{i=1}^{n} p_{rji} q_{ji}$$

Also from quantities of food stuff consumed in the household, the equivalent calorie value can be computed by using the calorie content per unit of food *i*, c_i, giving:

$$C_j = \sum_{j=1}^{n} c_{ji} = \sum_{i=1}^{k} c_i q_{ji}$$

The poverty line, Z, can therefore be used to compute the food expenditure shortfall and hence poverty level to give:

$$P_\alpha = \frac{1}{n} \sum_{j=1}^{q} \left(\frac{Z - x_j}{Z} \right)^\alpha$$

Where

$\alpha = 0, 1,2$

If $\alpha = 0$, head count-proportion of the poor

$\alpha = 1$, food expenditure shortfall (income inequality)

$\alpha = 2$, poverty severity

Like food and income availability, household characteristics also play key role in determining food poverty levels. A study conducted in Russia by Milanovic and Jovanovic (1999) established that minimum income necessary to enable a family achieve specific level of welfare is mainly a function of household income and family size. High income and large family size lead to high aspiration of minimum income and vice-versa. This means that households of different income levels and family size are likely to have different poverty lines. The model below explains the relationship between minimum income and household size.

$$\ln MY_f = f(\ln Y_f, \ln N)$$

MY_f = minimum income for the family

Y_f = household income

N = household size

Van Praag referred to the variation on the minimum income as "preference drift", which can take the values of 0 and 1. If it takes the value 0, the subjective poverty line becomes absolute poverty line and if it takes the value 1, every increase in real income exacts the same percentage increase in what is perceived to be poverty line. According to Milanovic and Jovanovic (1999), most research done yielded values of preference drift between 0.4 and 0.7 implying that as people get richer, they set the necessary minimum higher but not as much as the rise in their income.

Engel also emphasized the effect of household characteristics on food poverty. He observed that for large families, a higher share of total expenditure goes to food than is the case for small families at the same level of total expenditure (Deaton and Muellbuer 1980). He also observed that the same was true for poor households over rich ones. Assuming that m_h is a minimum cost of maintaining household h at some welfare level and also assuming that a_h is a vector of characteristics of the household, which is independent of prices and welfare level, then the minimum cost can simply be viewed as:

$$M_h = m(a_h)$$

If the vector of characteristics, a_h, consists of age structure, sex and size then for uniform household comparison, the analysis considers adult equivalents. According to the Amsterdam scale of adult equivalents, the conversion rates are as follows:

Table 2.1

The Amsterdam Scale of Adult Equivalent

Age Group	Male	Female
Under 14 years	0.52	0.52
14-17 years	0.98	0.90
18 years and over	1.00	0.90

The scales are principally based on nutritional requirements. The demand functions, the direct and indirect utility functions and the cost functions are the same across households if expressed in equivalent adult per capita terms. In this view, the household characteristics can be standardized using the scale to a cost function as:

$$C_h(u_h, p, a_h) = m(a_h)c(u_h, p) = X_h$$

Where

$u_h = v_h(q_h, a_h) = v\left(\frac{q_h}{m(a_h)}\right)$, which is the direct utility function.

The household characteristics can also be used to derive a demand function in per capita form as follows:

$$\frac{q_{hi}}{m(a_h)} = g_i\left(\frac{X_h}{m(a_h)}, p\right)$$

The household demand function can then be used to get the budget share of specific item i, for household *h* as:

$$W_{hi} = \frac{p_i q_{hi}}{X_h} = \frac{p_i g_i\left(\frac{X_h}{m(a_h)}, p\right)}{\frac{X_h}{m(a_h)}}$$

Even though Engel's model standardizes the characteristics, it ignores the fact that needs of children relative to adults and economies of scale in consumption are not the same for every commodity. A household with different structure will have different food requirement. Engel was first challenged by Sydenstricker and King in 1921 and the approach was later modified by Prais and Houthakker in1955 to come up with the following model:

$$\frac{q_i}{m_i} = g_i\left(\frac{X}{m_0}\right)$$

Where m_0 is weighted average of individual commodity scales. A household with m_i times as much of each q_i would be as well off. According to Barten (1964), the direct utility function would be given as $U = v(q_1/m_1, q_2/m_2, \ldots, q_n/m_n)$, where the quantity in equivalent adult per capita of a commodity *i* is expressed as q_i/m_i. In such a case, commodities relative prices are considered instead of absolute prices. The commodity relative price is the product of the absolute price and the commodity scale, that is $p_i m_i$. Commodity prices are modified according to family composition such that a house with more children spends more on children's foods than adults' foods and vice versa.

2.2 Empirical Literature

As was explained in theoretical literature, food security is also a factor of off-farm income. In their study conducted in Malawi, Orr et al (2001) linked household maize production and food security. Their analysis revealed that the need for market purchases increased due to reduction in maize production. Increase in consumption expenditure was to fill the food gap created by low production. Household income, however, was not affected by decline in maize production but instead, market reforms created new opportunities for poorer households to raise income through commercialization, wage labour and micro enterprises. After realizing that maize production alone was not sufficient for food security, Orr et al (2001) focused their study on the economics of off-farm enterprises, composition of household income and the broad dynamics of changes in the composition of household income in rural Malawi to address the food security problem.

Since food security is influenced by different factors, Orr et al (2001) considered gender dissegrated household resource management together with proximity to commercial centres of Blantyre and Limbe that provide both jobs and market for smallholder crops. The data was collected through case studies in order to purposely select the different household clusters that had been identified. Household income sources were evaluated and divided into four to capture diversity. These include agriculture, casual labour, micro-enterprises and gifts. Their findings showed that while low maize production made households vulnerable, it did not necessarily make them food poor. The vulnerable households in the study had the highest maize deficit, but the high share of household income from off-firm sources was effective in providing them with security (Orr et al 2001). They stated that recent research has stressed on the importance of livelihood diversity

for household food security in Sub-Saharan Africa (Ellis 1998) with off-farm income identified as a major source of income for food insecure households (Von Braun, 1989; Reardon, 1997).

Chung et al (1997) conducted another study in India to identify alternative indicators of chronic and acute food insecurity to enhance fair distribution of food aid. The indicators are to be used in targeting the vulnerable groups or households for food aid. They used both quantitative and qualitative methods, where quantitative method considered both economic and nutritional factors while qualitative survey used ethnographic case studies of at risk households, participatory mapping of vulnerable households, food charts and seasonal charts.

They came up with two types of indicators of food-insecurity, which include:

a) Generic Indicators:

- household dependency ratio
- incidence of preschooler illness

b) Location Specific Indicators:

These indicators consider the fact that each particular area has specific conditions that must be well understood. Some of the conditions include unique climatic, cultural or socioeconomic factors. The location specific indicators can be defined by the production system suited to the area, local seasonal behavioral pattern or cultural feeding practices.

After establishing the indicators, Chung et al (1997) went further to associate these alternative indicators with the benchmark measure of food-security in order to understand the food situation at the household level. They assumed benchmark measure to be direct and accurate measurement of true food security status. The benchmark of household food security was taken to be energy adequacy, which is measured by assessing the calorie from food intake based on age, sex and physiological status. They set their benchmarks as follows:

a) benchmark measures for chronic and acute food insecurity are height-for-age and weight-for-height respectively
b) benchmark measures for preschooler food security are anthropogenic measures
c) benchmark measures for vitamin A and iron deficiency are based on biochemical indicators of nutritional status

The association between the benchmark indicators and the alternative indicators can be evaluated through a number of methods: correlation coefficients, factor analysis, cluster analysis, regression analysis, contingency tables and receiver operating characteristic curve (ROC analysis). In contingency table analysis, the significance of the association can be tested statistically, evaluated and ranked according to the criteria of sensitivity and specificity. Sensitivity is the proportion of truly food insecure individuals that is identified by the alternative indicator and specificity is the proportion of truly food secure that is correctly identified by the indicators (Chung et al, 1997). They found out that for an indicator to be effective in identifying the food insecure, both sensitivity and specificity must be high.

Food poverty was estimated among Kenyan small-holder farmers by Greer and Thorbecke (1986) using the integrated methodology. They then compared their results with those of other studies that used different methods as shown in the table below.

Table 2.2

Kenyan Small-Holders, Poverty Measurement Sensitivity to Changes in Methodology: A Comparison of Three Methods.

	Minimum Cost diet Based on Maize/Beans[a]			Linear Programming Diet with Cultural Constraints[b]			Calorie Cost Function Poverty Line		
Province	Poverty Line[d]	Poverty Severity	% Poor H/holds	Poverty Line[d]	Poverty Severity	% Poor H/holds	Poverty Line[d]	Poverty Severity	% Poor H/holds
Central (N=281)[c]	350.7	0.0155	20.8	774.2	0.1513	87.0	404.3	0.0283	32.7
Coast (N=64)	395.0	0.0786	53.8	889.5	0.3028	99.3	330.9	0.0462	41.5
Eastern (N=264)	306.5	0.0138	21.6	807.0	0.1847	89.2	357.7	0.0264	32.4
Nyanza (N=377)	257.6	0.0159	23.0	802.2	0.2220	97.8	327.3	0.0386	41.0
Rift Valley (N=83)	256.9	0.0103	20.8	781.1	0.2204	95.1	347.7	0.0387	44.7
Western (N=377)	283.3	0.0169	29.9	817.7	0.2527	97.6	339.8	0.0374	45.9
All S/holders (N=1274)	315.8	0.0186	24.8	819.1	0.2079	93.6	353.0	0.0340	38.6

Source: Greer and Thorbecke (1986)

a – Diet consisting of 70% maize and 30% beans which is the minimum cost diet eaten in sufficient quantity to provide daily calorie requirement
b – Food quantities for the linear programming diet taken from Alnwick (1979) who calculated diet using Nairobi prices and specifying minimum quantities for meat, milk, tomatoes, bread, sugar and fat. For the regions, a mix of Nairobi and local prices were used
c – Poverty line at 1975 prices in Ksh/year/adult equivalent. Poverty line calculated ignored regional taste and price differences
d – Household sample size

Greer and Thorbecke (1986) found out that imposition of additional nutritional requirements in a linear programming exercise increased poverty line from Ksh.316 to Ksh.819 per year per adult equivalent. Poverty went up from 0.0186 to 0.2079 and the percentage of households below poverty line increased from 25% to 94%. The cost of calorie method, which avoids the extremes of the linear programming approach, estimated overall poverty as Ksh.353 compared with Ksh.315 under maize/beans method. The estimation shows that the poor choose to get more than 70% of their calories from maize. However, income elasticities for different foods also vary widely such that

average composition is perceived to be a mix of very different diets of high, middle and low-income groups.

According to World Bank (1991), the Turkanas have succumbed to drought due to reliance on cultivation, in combination with more sedentary settlement patterns and limited movement of livestock. Stagnating livestock numbers and rapid population growth in the arid northern areas have threatened pastoral subsistence and led to chronic insecurity in procuring adequate food. These areas received food relief in more than eight years of the 1973 to 1983 period and the need for sustained food relief in the north of Kenya appears to be growing.

2.3 Overview of the Literature

Most studies reveal that food security is not primarily dependent on the level of production alone but also on income levels. They also confirm that household characteristics are important to food security analysis. When considering food security, the literature takes care of both quantitative and qualitative values of food. Body health condition is also considered together with the quantity and quality of food available to ensure food security.

CHAPTER THREE

ANALYTICAL FRAMEWORK AND METHODOLOGY

3.1 Analytical Framework

Food security is fundamentally influenced by household characteristics, which include size, age structure and sex. Size is important because it determines a household's level of food production and consumption. A big family typically has a large labourforce, which combined with other factors of production, produces more food than that of a small family. This assumes that active household members are fully engaged in varied productive ventures. The converse is true for consumption since there are many mouths to feed. Age structure and sex are also important because they determine supply of labour needed for food production while at the same time influence household food requirements. Labour supply varies by gender because children cannot offer the same labourforce as adults just like female cannot offer same labourforce as male. On the side of consumption, children's need for food is different from that of adults and therefore age is necessary for analysis. Household food poverty is a function of physical and biological access to food. In the context of this study, pastoralists' physical access to food is explained in two ways:

Livestock Foods:

This is influenced by the state of natural resources, labour supply and extension services. Productivity is expected to be high if there is enough good quality pasture and water, labour and

extension services, otherwise when there is shortage of these factors of production, then productivity declines. Livestock products are either directly consumed in the households or sold to generate income, which is used to purchase market foods.

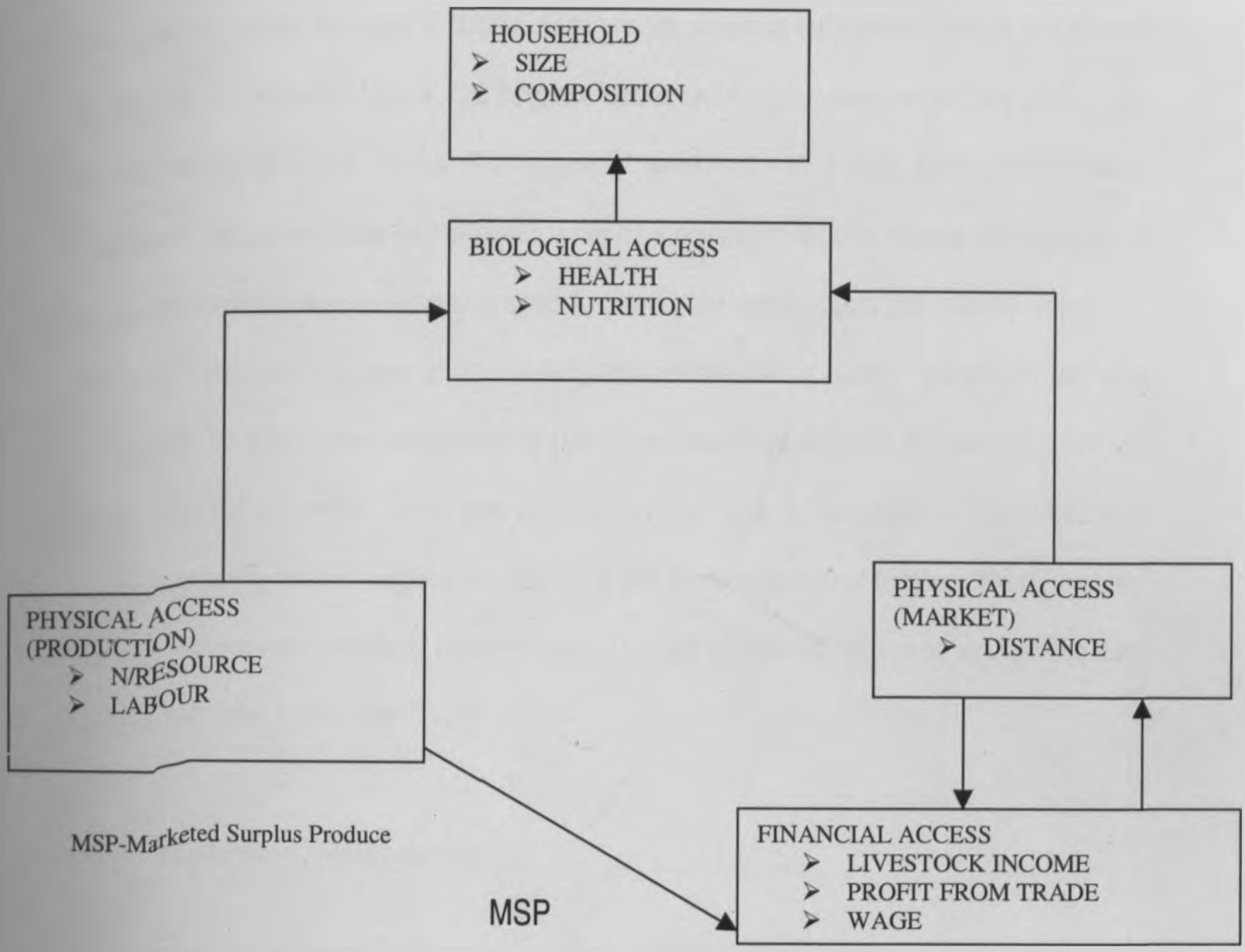
Market Foods:

The accessibility of these foods by households is influenced by proximity to markets and income level. Market foods cannot be accessed in adequate quantity if the purchasing power is low. At the same time, purchasing power has no use without foods for purchase. In our case, income from sale of livestock and its products, profit from trade and wage from employment determine the purchasing power.

The other important determinant of food security is body health condition. For an individual to be food secure, the body needs to be in a state of averagely good health so that the foods consumed are absorbed and assimilated into the system with minimum wastage and provide the required calories. A body that is in poor health remains food insecure despite the amount and nutritional value of foods consumed. However, in our case, health status of household members is taken as given since data was not collected on this variable due to technical limitations. The concept of household food security is summarized in the flow-chart below:

Fig. 1

Flow-Chart on Household Food Security



From the above chart, it is evident that foods can be accessed through own production and/or from market purchases. We assume that food is consumed within a given state of body health such that policy recommendations for attaining food security only consider varying livestock productivity, income opportunities and market proximity. The above framework also explains that income is only important if the market foods to be purchased are available and this is why distance to market is important.

3.2 Modeling

Two different models are used in this study to provide seasonal food poverty levels and income shortfall and to establish factors that influence consumption expenditure among the settled and semi-settled households in ASALs. The first model, which is the FGT index developed by Foster, Greer and Thorbecke (1984) was to evaluate the food poverty levels and income shortfalls. It is a simple mathematical expression that is used to quantify the levels, depth and severity of poverty. This model was used because of its popularity and regular use by poverty analysts. It was also successfully used by Greer and Thorbecke (1986) and Mwabu *et al* (1999) to measure poverty in Kenya. The second model, which was used to establish factors that influence household food expenditure is the classical regression equation linear in the logarithm of food purchases, income, livestock holding and household characteristics. The two models are explained in details in sub-sections 3.2.1 and 3.2.2 below:

3.2.1 Food Poverty Measurement

To generate seasonal food poverty levels and income shortfalls, the following FGT index is used:

$$P_{\alpha j} = \frac{1}{n_j} \sum_{1}^{q_j} \left(\frac{z - y_{ij}}{z} \right)^{\alpha} \quad \text{.....(1)}$$

$P_{\alpha j}$ = Food poverty levels (if $\alpha=0$)[6] and income gaps (if $\alpha=1$)[7] in region j: (j=1,2).

[6] Poverty measure P_0 becomes headcount index indicating percentage of households below poverty line, Z.

[7] P_1 is the average poverty gap, or the average income shortfall of all households calculated as a proportion of the poverty line

Y_{ij} = Total monthly food expenditure in poor households i, within region j: (i=1,....,q)

Z = Food poverty line

α = FGT parameter

n_j = Sample size for region j

As pointed out by Mwabu *et al* (1999), an important property of equation (1) is that as the FGT parameter varies, the poverty measure assumes several interpretations, that is for α=0, the poverty measure P_0 becomes the head count index, which indicates the percentage of households below the food poverty line; for α=1, P_1 is the average poverty gap or the average income shortfall calculated as a proportion of food poverty line. In the model, if Y_{ij} is greater than or equal to Z, there are no poor people but as FGT parameter approaches infinity the magnitude of poverty is wholly accounted for by the poorest households (Mwabu *et al* 1999).

The fundamental step in food poverty measurement is estimation of food poverty line, Z, which is the level of expenditure that enables a household to attain a specific level of welfare (calorie value). Using the Food-Energy-Intake (FEI) method, food poverty line is computed from the following equation:

$$Z = \alpha + \beta C \quad \text{.....(2)}$$

Where C is the standard monthly per capita adult equivalent calorie value of 67,500 (Mwabu *et al* 1999). The parameters α and β are unknown and can be estimated by Ordinary Least Squares (OLS) method from a log-lin equation expressed as:

$$\log E = \alpha + \beta C \quad \text{.....(3)}$$

Where E is the total household expenditure on food that generates a certain level of calorific value, C. Equation (3) is generated from the fundamental equation of consumption expenditure, which is expressed as the exponential of calorie intake from the foods purchased as shown below:

$$E = e^{\alpha+\beta C} \quad \text{.....(4)}$$

After establishing the food poverty levels and income gaps, the study further evaluates the factors that influence household consumption expenditure to enhance appropriate policy formulation.

3.2.2 Household Consumption Expenditure

To examine household consumption expenditure, the analysis assumes that household incomes are only enough to purchase the main food items, which include maize, maize meal, beans, sugar, tea leaves, milk, rice and meat. We further assume that the foods are basic such that change in their prices does not significantly influence their demand. The classical linear expression is used to capture the effects of different income sources, household characteristics, livestock holding, market proximity and season on household consumption expenditure as expressed below:

$$E_i = \alpha_i + \beta_{il} L + \sum_{k=1}^{2} \beta_{ik} Y_k + \eta_i N + \varepsilon_i \quad \text{.....(5)}$$

where

E_i = Total monthly expenditure on main food items within region i

L = Livestock holding in Tropical Livestock Unit (TLU)

Y_k = Income from micro-trade and wage employment

N = Household size in adult equivalents

α_i is the autonomous expenditure on main food items

ε_i is the error term which is assumed to be normally distributed

To be able to interpret coefficients as elasticities, we take the natural logarithm of equation (5). This is important in determining the marginal effects of each variable for policy formulation. The equation to be estimated is thus expressed as:

$$\log E_i = \alpha_i + \beta_{il} \log L + \sum_{k=1}^{2} \beta_{ik} \log Y_k + \eta_i \log N + \varepsilon_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

The coefficients, which are elasticities, measure the responsiveness of consumption expenditure to livestock holding (L), income (Y_k) and household size (N) for the settled and semi-settled households (i) in different seasons. The settlement and seasonal effects are captured by running separate regression analyses. The expected signs of the coefficients are as follows:

β_{il} measures the responsiveness of consumption expenditure to a change in livestock holding. There is no apriori expectation of the sign of this variable; it could be n*egative* if an increase in livestock holding increases supply of livestock food for direct consumption implying a reduction in

food expenditure and p*ositive* if increase in livestock and livestock products result in increased sales and the proceeds used to purchase more market foods.

β_{ik} measures the responsiveness of consumption expenditure to a change in income. The sign is expected to be *positive* for a normal good but as income increases, marginal propensity to consume reduces.

η_i measures the responsiveness of consumption expenditure to change in household size. The sign is expected to be *positive* since a large family requires more food and vice-versa.

3.3 Data Type and Sources

This study utilizes primary cross-sectional data obtained from a household survey conducted between July and September 2000[8] at Korr and Kalacha for the Rendille and the Gabbra communities, respectively. Before the survey was carried out, Participatory Rural Appraisal (PRA) and Rapid Rural Appraisal (RRA) were conducted to, among other things, identify gender roles in household food security[9]. Household members who earn income were found to be actively involved in food purchase while women were in-charge of management.

The survey targeted settled and semi-settled households in both the Rendille and Gabbra communities. The local chief's data-base for relief food distribution, which covered all households,

[8] There was serious drought during this time.
[9] This was to enable the interviewers to target the right household members who engage in real food acquisition and management considering that these pastoral communities have strong cultures regarding gender roles.

was used to randomly sample households for survey from each category. Due to a relatively homogenous lifestyle in these communities, coupled with time and financial constraints, only 97 households were interviewed with 56 and 41 from the settled and semi-settled households, respectively. A standard questionnaire was designed and used to collect information from household members (see appendix 2)[10]. The questionnaire was initially pre-tested at Kargi in the Rendille community to determine its effectiveness. The responses were then used to fine-tune the questions to focus on relevant issues. As a matter of triangulation, observation and informal interviews were also used.

The main variables considered during the survey include household size and composition, wealth status, distance from market and the main food items accessed by households in different seasons. A brief explanation of the variables follows:

Household size and composition

In the survey, all family members, including the husband, wife, children, any other relative and/or friend who lives in the house and a house help, if any, were recorded. Further information on every household member's age, sex, education and training level and occupation was also captured to enhance a clear understanding of the structure, capabilities and food requirement of every household. Since some family members rarely stay at home, we collected information on the

[10] The questionnaires were administered by the author and fellow KARI research officers together with Ministry of Agriculture extension officers through the assistance of a consultant (Dr Goldsmith). The study is part of my normal socio-economic research work at the KARI's National Arid Lands Research Center – Marsabit.

duration within which every family member stays at home in a year to enhance accurate estimation of the household food requirement.

Household wealth

The past surveys conducted by the Kenya Agricultural Research Institute (KARI) within the study area revealed that wealth is no longer measured solely in terms of livestock numbers but also by income from wage employment and trade. In view of this, data on livestock holding and income levels was collected. Information on the livestock includes the structure, ownership and main reasons for keeping them while that of income targeted employed members, nature of their jobs and level of earnings, type of trade if any, business ownership and management, terms of trade, average revenue generated by the enterprise per season and finally, overall utilization of incomes within the household.

Main Food Items

From PRAs and RRAs, the main foods were defined as those that form the core diet of household members. In this regard, interviewees were asked to mention the main foods that sustain them during dry and wet seasons and their respective sources. We went further to record the frequency of consuming every food item in a week and to concretize this, the information on the quantity of every food item consumed per meal was captured. For market foods, cash and credit prices in both dry and wet seasons were recorded to enable us compute consumption expenditure.

3.4 Data Processing and Analysis

The raw data collected from the survey was first summarized and then coded. To avoid complication in data analysis and interpretation of results, the data was standardized. To aggregate and compare ruminants, livestock holdings were converted to TLUs through the conventional scale where 1 TLU is equivalent to 250 kg of livestock weight (Bukere *et al* 1991) quoted by Nduma *et al* (2001). Household members were converted to adult equivalent using the Amsterdam scale as shown in the literature section. Standardization was to make the demand, utility and cost functions the same across households. In doing this, we assumed homogeneity and economies of scale in consumption of every commodity. The data was then inputted into excel spreadsheet through the help of staff from the KARI Socio-Economics and Biometrics department at the National Agricultural Research Laboratories (NARL). The data was then cleaned and thereafter subjected to descriptive and regression analyses using Intercooled Stata 6. However, before the analyses, diagnostic tests on multicollinearity and heteroskedasticity were carried out to ensure that the coefficient estimators had minimum variance.

CHAPTER FOUR

STUDY RESULTS

4.1 Introduction

This section reports on the findings of the study. Initially, it gives a general account of the socio-economic characteristics of the settled and semi-settled households. This is followed by the measurement of seasonal poverty levels and income shortfalls required to enable a household attain minimum calorie requirement. Finally, the section evaluates the factors that influence consumption expenditure to enhance formulation of appropriate food policy.

4.2 Household Characteristics

Settled Households

A total of 56 households were randomly sampled and interviewed. Analysis of data from these households revealed that they are located within an average radius of 0.6-km from town centers. The average household size is 4.3 adult equivalent and ranges from a minimum of 1.5 to a maximum of 9.3 adult equivalent. Children of less than 14 years compose about 29 per cent of the total household size while adults of age 14 years and above constitute the remaining 71 per cent. These households generate average monthly incomes of about Ksh.1,104 and Ksh.1,046 from

trade and wage employment, respectively. The maximum monthly income from trade is Ksh.10,500 while that from employment is Ksh.7,000. Livestock holding is about 7 TLU. Their main food items during dry season include maize, maize meal, sugar and beans, which together account for about 84 per cent of the total amount of foods consumed. However, the situation is different in wet season as milk contributes about 60 per cent of foods consumed followed by maize meal and maize, respectively (see appendix 1).

Semi-Settled Households

In this household category, a total of 41 households were sampled and it was established that they are located at an average radius of 12.3 km from the town centers. The average household size is 4.7 adult equivalent with a minimum of 1.5 and a maximum of 8.7. Children of less than 14 years constitute 26 per cent of the total household size while adults of age 14 years and above form 74 per cent. The average monthly incomes from trade and wage employment are Ksh.185 and Ksh.341 with maximum limits of Ksh.1,200 and Ksh.5,000, respectively. Livestock holding is about 20 TLU, which is almost three times more than that of the settled households. The main foods consumed during dry season include maize, maize meal and milk, which together contribute about 83 per cent of the total amount of foods consumed. The situation in wet season is different with milk alone contributing about 93 per cent of the total amount of foods consumed (see appendix 1).

The table below summarizes the socio-economic characteristics for the settled and semi-settled households.

Table 4.1

Summary of Household Characteristics

	Average Distance from Town (Km)	Average Household Size in Adult Equivalent	Average No.<14 years (%)	Average No.>14 years (%)	Average Trade Income/ Month (Ksh)	Average Wage Income/ Month (Ksh)	Average Herd Size (TLU)	Main Food Items	
								Dry Season	Wet Season
Settled	0.6	4.3	29	71	1104	1046	7	Maize Posho Sugar Beans	Milk Posho Maize
Semi-Settled	12.3	4.7	26	74	185	341	20	Posho Maize Milk	Milk

Note: Posho = Maize meal

From the table, it is evident that settled households are nearer to the markets than semi-settled households. The semi-settled households are larger in size than the settled households but the age distribution is almost the same in both cases. Incomes from trade and employment are higher by about six and three times, respectively in the settled households than the semi-settled ones. Livestock holding in the semi-settled households is almost three times higher than in the settled households. While settled households rely on market foods both in dry and wet seasons with a bit of milk supplement in the wet season, the semi-settled households rely on milk in both seasons supplemented with a substantial amount of market foods in the dry season.

4.3 Food Poverty Profile and Income Shortfalls

Food poverty levels and income shortfalls are computed from the FGT model in equation (1). The fundamental step towards establishing the food poverty levels is to compute the food poverty line. Food poverty line is used to identify the food poor households, that is the households whose food consumption level falls below the line. Since the food situation in pastoral communities vary widely

with season, we computed two poverty lines that were used to assess seasonal food poverty levels in both settled and semi-settled households. We computed the food poverty lines using FEI method in equation (2), which was previously used to derive poverty lines in Kenya (Greer and Thorbecke 1986; Mwabu *et al* 1999). The crucial steps in FEI method involve determination of a food basket bought by almost all households and their calorific value. From the response of interviewees, we constructed a food basket consisting of 8 items commonly consumed by almost all households. Their prices and calorific values were then used to establish the household consumption expenditure and the accompanying level of calorie intake. We then used the UNICEF's standard daily per capita calorie value of 2,250 kilocalories per adult equivalent to compute food poverty lines. The results for lowland Marsabit are summarized in Table 4.2 below:

Table 4.2

Seasonal Food Poverty Lines 2000

	Dry Season	Wet Season
Food Energy Intake (FEI)	807.4	1473.4

Source: Computed from the survey data, 2000

The figures in the above table show seasonal food poverty lines derived from a calorie cost function based on the minimum cost of a diet that yields 2,250 kilocalories per adult equivalent per day. The food poverty line during the dry season is Ksh.807.4 while that of the wet season is Ksh.1,473.4. It is instructive to note that the food poverty line is higher in wet season than in dry season because monetary value of foods consumed increases due to improvement in milk supply. These poverty lines were then used to establish the seasonal food poverty profile and income shortfall for the settled and the semi-settled households as shown in table 4.3.

Table 4.3

Food Poverty Profile and Income Shortfalls

	Dry Season		Wet Season	
	Poverty Level (%)	Income Shortfall(%)	Poverty Level(%)	Income Shortfall(%)
Settled	64	19	59	26
Semi-Settled	61	21	34	11

Source: Computed from the survey data, 2000

Food poverty levels in the settled households

Food poverty profile of the Gabbra and the Rendille settlements in marginal lowlands of Marsabit District is reported in table 4.3. The measures show that during the dry season, about 64 per cent of the settled households are food poor, that is their expenditure on food is below food poverty line. During the wet season, about 59 per cent have total food expenditure below the food poverty line and thus they are food poor. The food poverty level reduces slightly in the wet season and the reduction can be explained by a slight increase in milk supply during wet season. Milk supply is low in the settled households because they own small number of livestock in a highly degraded environment[11].

Food poverty levels in the semi-settled households

Measures in table 4.3 indicates that during the dry season, about 61 per cent of the semi-settled households have their food expenditure fall below the food poverty line while during the wet season only 34 per cent are food poor. The food poverty level reduces by almost half, and can be attribute

[11] Due to environmental degradation, livestock is always kept away in the satellite camps thus limiting milk supply to the settled households almost all year round.

to substantial increase in milk supply, which is also easily accessible since livestock is within the main settlement. It is also important to note that, semi-settled households are endowed with large per capita livestock holding and are therefore bound to receive higher milk supply than the settled households.

Income Shortfalls

This is the proportion of income that is required to enable a consumer unit to attain the minimum level of food requirement. Since the average size of the settled households is 4.3 adult equivalents and the poverty line during the dry season is Ksh.807 per adult equivalent in a month, the amount of money a household needs to acquire minimum calorie is Ksh.3,470 per month. Analysis therefore shows that during the dry season, a food poor settled household has average income shortfall of about Ksh.659, which is 19 per cent of the minimum consumption expenditure. During the wet season, the food poverty line increases to Ksh.1,474 and the minimum household food expenditure also increases to Ksh.6,338 per month. In this case, the food poor settled household faces an average income shortfall of Ksh.1,648 per month, which is 26 per cent of the average minimum consumption expenditure.

The semi-settled households have an average size of 4.7 adult equivalents. During the dry season, the minimum household food expenditure is Ksh.3,793 per month. The 21 per cent income shortfall during this period implies that a food poor semi-settled household requires an additional amount of about Ksh.797 per month to attain the minimum level of calorie requirement. During the wet season, minimum household expenditure on food increases to Ksh 6,928. The income shortfall reduces to 11 per cent, which implies that a food poor semi-settled household has an average

shortfall in income of about Ksh.762. The variation in income shortfalls experienced in the settled and semi-settled households is explained by the fact that settled households get low milk supply and are forced to supplement through purchase of the same from the semi-settled households that have surplus. Since food poverty line also captures the monetary value of home produced milk, income gap for the settled households increases while that of the semi-settled households reduces.

From the analysis, it is evident that most of the settled and semi-settled households are food poor during dry season but settled households are more food poor with 64 per cent of the households below food poverty line. During the wet season, food poverty rate reduces by almost half in the semi-settled households while in the settled households, it remains high at about 59 per cent. The average income shortfall increases for the settled households but reduces by almost half among their semi-settled counterparts during wet season.

4.4 Determinants of Household Food Expenditure

The model to be used was outlined earlier as:

$$\log E_i = \alpha_i + \beta_{il} \log L + \sum_{k=1}^{2} \beta_{ik} \log Y_k + \eta_i \log N + \varepsilon_i$$

The model analyzes the marginal effects of endogenous variables, which include income from trade (Y_1), wage (Y_2), livestock holding (LTLU) and household size (NiAE) on total food expenditure of the settled and semi-settled households during dry and wet seasons. Although price is a key

variable, it was left out because it is exogenous to the households. As is normal with most econometric analysis, it is important to carry out diagnostic tests to avoid errors. The tests on multicollinearity and heteroscedasticity were carried out as shown in sub-sections 4.4.1 and 4.4.2, respectively.

4.4.1 Multicollinearity Test

If the model is estimated by OLS in the presence of multicollinearity, the standard errors increase leading to underestimation of the *t* and F-statistics. This may lead to type II error where the null hypothesis is accepted when in reality it should be rejected (Gujarati 1995). We used the pair-wise correlation among regressors to detect correlation and the results are as shown in table 4.4.

Table 4.4

Pair-Wise Correlation among Regressors

	LTLU	Y_2	Y_1	NiAE
LTLU	1.0000			
Y_2	-0.0235	1.0000		
Y_1	-0.0182	-0.1202	1.0000	
NiAE	0.1791	0.0795	0.0856	1.0000

If the pair-wise or zero order correlation between two regressors is high, say in excess of 0.8, then multicollinearity is a serious problem (Gujarati 1995). From table 4.4, the highest correlation is about 0.18, which is between livestock holding (LTLU) and household size (NiAE). The results show that there is no serious multicollinearity among regressors. This condition is just sufficient and not necessary since multicollinearity can exist even with low correlation. Due to this, we performed further test using variance inflation factor (VIF). With this method, the variable tested is

said to be highly collinear if its VIF exceeds 10. In our case, none of the individual variables had VIF of upto 1.2 and the mean VIF for all variables in settled and semi-settled household samples were 1.11 and 1.09, respectively. Since VIF value of 1 implies no correlation, we therefore confirm that multicollinearity is not a problem.

4.4.2 Heteroscedasticity Test

An important assumption of classical linear regression model is that the variance of each disturbance term is constant, that is homoscedastic. But in case of heteroscedasticity, estimation by OLS leads to large confidence intervals and large error terms that reduce the value of t and F-statistics. This may result in statistically insignificant coefficients and conclusions drawn may be very misleading. Using Cook-Weisberg test for heteroscedasticity, average total expenditure values were fitted for the settled and semi-settled households and the following results were obtained.

Settled Households	Semi-Settled Households
H_0=Constant Variance	H_0=Constant Variance
Chi-Square = 0.00	Chi-Square = 0.11
Prob.>Chi-Square = 0.964	Prob.>Chi-Square = 0.738

From the results, Chi-square is not significant in both cases implying that we do not reject the null hypothesis. We therefore conclude that there is no heteroscedasticity.

After carrying out the necessary statistical tests and confirming no multicollinearity and heteroscedasticity problems, we moved a step further to identify factors that influence seasonal consumption expenditure using equation (6) and the results are as shown in table 4.5.

Table 4.5

Elasticity of Consumption Expenditure

	Season	C	LOGY1	LOGY2	LOGLTLU	LOGNiAE	R-SQ	F-STAT.
Settled	Dry	6.99***	0.036***	0.003	0.082**	0.602***	0.459	10.81
		se-0.219	0.011	0.011	0.033	0.150		
		(31.973)	(3.327)	(0.297)	(2.438)	(3.999)		
	Wet	7.41***	0.025	-0.009	0.106**	0.618***	0.293	5.28
		se-0.304	0.015	0.015	0.047	0.209		
		(24.402)	(1.617)	(-0.508)	(2.288)	(2.953)		
Semi-Settled	Dry	7.08***	-0.0007	-0.005	0.027	0.535***	0.188	2.09
		se-0.331	0.015	0.020	0.056	0.193		
		(21.371)	(-0.046)	(-0.271)	(0.470)	(2.764)		
	Wet	7.97***	-0.012	0.015	0.153***	0.402**	0.272	3.37
		se-0.334	0.015	0.020	0.057	0.195		
		(23.891)	(-0.758)	(0.744)	(2.696)	(2.064)		

Source: Computed from the author's survey data, 2000
Se = standard error; t-values are in parentheses
***-significant at 1 per cent; **-significant at 5 per cent; * - significant at 10 per cent

For the settled households, the F-statistics is significant at 1 per cent. This means that the coefficients are significantly different and should be estimated separately. For the semi-settled households, the coefficients are significantly different at 5 per cent during the wet season but there is no significant difference during dry season. Among the settled households, income from trade, wages, livestock holding and household size explain about 46 per cent of the consumption expenditure in the dry season while during the wet season, they explain only 29 per cent. As for the semi-settled households, the same variables explain about 27 per cent of the consumption expenditure in the wet season but this reduces to 19 per cent during the dry season.

Table 4.5 further shows that, in the settled households, trade income and household sizes significantly influence consumption expenditure at 1 per cent while livestock holding is significant at 5 per cent during dry season. In view of this, unit percentage increases in trade income, household size and livestock holding are bound to increase consumption expenditure by about 0.04, 0.60 and 0.08, respectively. However, in the wet season, it is only the household size and livestock holding that are significant at 1 per cent and 5 per cent, respectively. During this season, unit percentage increases in household size and livestock holding lead to increase in consumption expenditure by 0.62 and 0.11, respectively. The results suggest that households, which earn good incomes from business and with more livestock holding, are at low risk of food poverty. This should be accompanied by an averagely small household size.

The low income and livestock elasticities may be due to the nature and classification of the foods under consideration as basic and necessary for livelihood. Also, the low-income levels within these communities explain the inelasticity because small changes in the low incomes from trade have no significant effect on consumption expenditure. As for livestock holding, the responsiveness may be low because livestock stays away from the settlement almost all the year round and however much food is produced from livestock, they are always inaccessible to family members.

Table 4.5, also indicates that during the dry season, significant influence on food security among the semi-settled households is from the household size. A unit per cent increase in household size in the dry season leads to increase in consumption expenditure by about 0.54. But during the wet season, both household size and livestock holding are significant at 5 per cent and 1 per cent, respectively. In this season, unit percentage increases in household size and livestock holding lead

to increase in consumption expenditure by about 0.40 and 0.15, respectively. The results indicate that small families with more livestock are food secure.

In the semi-settled households, the responsiveness of the consumption expenditure to income is very low due to long distances to the market centers that limit food purchase. Also, during the dry season, the responsiveness of consumption expenditure to livestock holding can be explained by stocking of small and almost standard number of milking herd by all households within the settlement. The limits to the number of milking herds were initiated by Environmental Management Committees (EMCs) as a measure to improve management of environment and reduce degradation. Despite the variation in total number of household livestock holding, the number of milking livestock retained within the settlement during dry season is almost uniform within households. Household size also plays an important role in influencing food security and therefore needs to be controlled. Finally, these households depend more on social security as a means of food insurance than the settled households and this makes it difficult to relate wealth and food consumption.

The main factors that influence seasonal food security in the settled and semi-settled households of pastoral communities of the Gabbra and the Rendille are mainly trade income and livestock holding. These are summarized in the table below:

Table 4.6

Summary of Seasonal Determinants of Food Security

	Main Sources of Food	
	Dry Season	Wet Season
Settled Households	Y_1	Y_1 and LTLU
Semi-Settled Households	LTLU	LTLU

Y_1 = Income from Trade
LTLU = Livestock holding in Tropical Livestock Unit

Income from trade plays an important role in attaining food security for the settled households during the dry season. In the wet season, they strive to achieve food security through trade income, which is supplemented by livestock production. However, the semi-settled households mainly rely on livestock for livelihood in both seasons.

CHAPTER FIVE

CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 Conclusions

The objective of this research paper was to assess the seasonal food poverty levels and income shortfalls and analyze factors that influence seasonal access to foods in the settled and semi-settled households of lowland Marsabit. The following conclusions seem to emerge from the analysis.

1. The general level of food poverty is very high in these marginal lowlands of Marsabit. Food poverty levels of between 59 and 64 per cent are high and this implies that majority of households cannot afford to access the standard level of minimum food requirements.

2. Food poverty is higher during the dry season than in the wet season for both settlements. During the dry season, 64 per cent of the settled households and 61 per cent of the semi-settled households are food poor. This is very high compared to the wet season food poverty rates of about 59 per cent and 34 per cent for the settled and semi-settled households, respectively.

3. Settled households are more food poor than the semi-settled households, both in the dry and wet seasons. The variation is wider in the wet season when 59 per cent of the settled households are food poor while only 34 per cent of the semi-settled households are food poor. This wide variation can be explained by high increase in milk supply to the semi-settled households during the wet season.

4. Market foods play important role in the food security of the settled households while livestock foods are significantly important in the semi-settled households both in the dry and wet seasons.

5.2 Policy Recommendations

Increased settlement in ASAL areas has been accompanied by controversial arguments on the best mode of production that minimizes environmental degradation and improves nutritional status of pastoralists. One school of thought argues that nomadism is the most appropriate production method since acceptance of pastoral settlement programmes in the fragile ASALs amounts to suicide in an ecology characterized by low and erratic rainfall. Another school of thought argues that pastoralists like anybody else in the world are entitled to enjoy modern development facilities such as education and health services, which are only found within settlements. In order to attain food security in pastoral communities, this study analyzed fundamental factors that influence livelihood in both settled and semi-settled households within the lowlands of ASALs.

The traditional notion by the government and other development agencies including relief food providers, that pastoralists are never food poor during wet season has been disapproved by this

study. We have established that food poverty is severe in settled households all year round. In view of this, we propose that measures on food poverty alleviation be focused more on settled households than in semi-settled households. To achieve this objective, settled households should concentrate on trade and combine with a bit of livestock holding. Since they cannot exist in isolation, their counterparts in semi-settled households should concentrate more on livestock management with a bit of trade. The two household categories should then be encouraged to interact and transact business freely.

The ASALs do not have many income generating opportunities and for the few that exist, it is not clear yet as to whether they are optimally exploited. Since our first recommendation is to encourage the settled households to concentrate on appropriate business, we further propose that more studies on income generating opportunities be commissioned. This would enhance a clear understanding of the available opportunities within ASALs and promote optimal utilization of resources to generate income.

During the wet season, food poverty reduces substantially in the semi-settled households because of high milk supply. But due to wastage, most of these households become food poor during dry season. To avoid milk wastage during the wet season and achieve "consumption smoothing", we recommend a study on milk preservation that will generate cost effective technologies to be used by pastoralists. Since milk supply depends on livestock productivity, we further recommend improvement in livestock extension services and more research on range resource management and utilization, which include areas like conflict mitigation, wildlife-livestock conflict and agro-pastoralism among others.

One of the key findings of the study is that family size has a great bearing on seasonal food security in the settled and semi-settled households. To achieve food security, there is need to control family size to a reasonable level that matches available household resources. In view of this, we recommend introduction of socially acceptable family planning techniques. Since the issue is sensitive within the ASAL communities, a study on this should precede.

Other Recommendations

(i) Overreliance on few food items is one of the main contributors to food poverty in pastoral communities. These areas are endowed with other foods like fish, chicken and eggs among others but due to socio-cultural beliefs and practices, they do not form major part of pastoralists' diet. To reduce the risk of food poverty, pastoralists need to be encouraged to increase the range of foods for consumption to include many other non-traditional foods like the ones mentioned earlier. The socio-cultural constraint can be overcome by encouraging the locals who have been exposed to these foreign foods to create awareness on the advantages of the same.

(ii) Frequent and serious droughts have been identified as the main cause of settlement as numerous livestock succumb. Pastoralists have always tried to build their herds during good times but lose almost everything to the subsequent droughts. There is need therefore for promotion of livestock off-take at opportune times to minimize the loss. To achieve this, livestock marketing research should be intensified while at the same time, the government should put the right infrastructure in place to promote sales.

(iii) Marsabit District has several pockets of high potential highlands mainly occupied by agro-pastoralists. These areas have great agricultural potential, which if exploited properly, can assist in food poverty reduction in the dry lowlands. However, it is important to mention at this point that these areas face serious threat of extinction due to overexploitation and land use conflicts. There is need therefore for intensive study on land use practices in these high potential areas.

References

Abassa K. P. (1995): "Improving Food Security in Africa": The ignored contribution of livestock. Joint ECA/FAO Agriculture Division, Monograph No.4. Addis Ababa, UNECA/FAO.

Barten, A.P. (1964): Family Composition, Prices and Expenditure Patterns

Bennett, J. W. (1988): The Political Ecology and Economic Development of Migratory Pastoralist Societies in Eastern Africa. In D. W. Attwood, T. C. Bruneau, and J. G. Galaty (Eds.) Power and Poverty. Boulder: West View Press.

Bukere Solomon, Peter N. de Leeuw, Barabara E. Grandin and Paul J.H. Neate (1991): An Analysis of Livestock Production System of Maasai Pastoralists in Eastern Kajiado District. Kenya International Livestock Center for Africa Ststems Study (Now ILRI): Addis Ababa-Ethiopia.

Chung Kimberly, Haddad Lawrence, Ramakvishna Jayashree and Riely Frank (1997): "Identifying the Food Insecure": The Application of Mixed Method Approaches in India, IFPRI Washington D.C.

Deaton, Angus and Muellbauer, John (1980): Economics and Consumer Behaviour. Cambridge University Press.

Ellis, F., (1998): *Household strategy and Rural Livelihood Diversification*, The Journal of Development Studies, Vol.35, No.1, pp1-38

Foster, J., Greer J., and Thorbecke (1984): *A Class of Decomposable Poverty Measures* at Econometrica, 52, pp 761-5, Quoted in Mwabu et al (1999); Poverty in Kenya: Profiles and Determinants

Fratkin, Elliot (1991): Surviving Drought and Development: Ariaal Pastoralists of Northern Kenya. Boulder Co.West View Press.

Fratkin, Elliot (1992): Maa Speakers of the Northern Desert. Recent development in Ariaal and Rendille Identity. In T. Spear and R. Waller (eds), Being Maasai: Ethnicity and Identity in East Africa. London. James Currey.

Fratkin F (1998): Ariaal Pastoralists in Kenya: Surviving Droughts and Development in Africa's Arid Lands. Printed in the United States of America.

GoK (1999): "National Poverty Eradication Plan 1999-2015"

GoK (2002): "National Development Plan 2002-2008"

Goldsmith P. (2000): "Natural Resource Management in Marsbit District": Case Studies of Pastoral settlements, Analysis and Recommendations. Project No.6.ACP.KE.061, KARI Report – ARSP II

Greer Joel and Erik Thorbecke (1986): *Food Poverty Profile Applied to Kenyan Smallholders.* Journal of Development Economics Vol.24

Gujarati, Damodar N. (1995): Basic Econometrics, Third Edition. Printed by McGraw Hill Book Company – Singapore.

Hendy, Cary and Morton, John (1999): "Contingency Planning for Drought Time Grazing Resources and Management in Pastoral Areas of Northern Kenya". Draft Discussion Paper, Nairobi, DFID ASSC Multilateral Links Programme.

Jenkins S.P., and Lambert P.J., (1997): "Three I's of Poverty Curves", with an Analysis of UK Poverty Trends, Oxford Economic Papers; (Discussion paper in Economics, No.97/1, Department of Economics and Related Studies, University of York, Heslington, York, UK)

Little, P. D. (1985): Social Differentiation and Pastoralist Sedentarization in Northern Kenya. Africa 55(3).

Milanovic B. and Jovanovic B. (1999): *Changes in the Perception of Poverty Line During the Depression in Russia, 1993-96.* The World Bank Economic Review Vol.13 No.3

Mwabu G., Masai W., Gesani R., Karimi J., Ndeng'e G., Kariti T.,Munene F., Chemengich M and Mariara J. (1999): "Poverty in Kenya: Profiles and Determinants". Report on Collaborative Research between University of Nairobi and Ministry of Finance – Kenya.

Ndung'u J.N., Nyamori B.O., Kuria S.G., and Njanja J.C. (1999): "Participatory Rural Appraisal on Livestck Management Practices of the Rendille Pastoral Community at Korr". A KARI Report.

Nduma Immaculate, Kristjanson Patty, and McPeak John (2001): *Diversity in Income Generating Activities for Sedentarized Pastoral Women in Northern Kenya*: Human Organization, Vol.60 No.4. Society for Applied Anthropology.

O'Leary M.F. (1985): "The Economics of Pastoralism in Northern Kenya". The Rendille and the Gabbra. IPAL Technical Report Nairobi: UNESCO.

Omiti J. and Irungu P. (2002): Institutional and Policy Issues Relevant to Pastoral Development in Kenya. Discussion Paper No.031/2002; Institute of Policy Analysis and Research.

Orr, Alastair; Mwale, Blessings and Saiti, Donata (2001): *Market Liberalization, Household Food Security and the Rural Poor in Malawi*: The European Journal of Development Research. Vol 13, No.1, pp47-69

Owambo T. (1999): "Marsabit District Emergency Programme". Project No. 96-99/KEN/13414. Food for Hungry International Report

Reardon, T., 1997: *Using Evidence of Household Income to Inform Study of the Rural Nonfarm Labour Market in Africa*, World Development, Vol.25, No.5, pp735-47

RoK (1994): Sessional Paper No.2 of 1994 on National Food Policy

Shabaani and Walther (1991): Range Management Hadbook of Kenya. Vol II.1 Marsabit District

UNICEF/ESARO (1993): "Household Access to Food and Nutrition in Eastern and Southern Africa". UNICEF, Nairobi, Kenya.

Van Praag, Bernard M.S. (1971): *The Individual welfare Function in Belgium*: An empirical Investigation: European Economic Review Vol.2 No.3

Von Braun, J., 1989: "The Importance of Non-Agricultural Income Sources for the Rural Poor in Africa and Implications for Food and Nutrition Policy", Reprint No.189, Washington, DC: International Food Policy Research Institute

World Bank (1986[a]): "Poverty and Hunger": Food Supply-Developing Countries. A World Bank Policy Paper. Library of Congress, Washington DC, USA.

World Bank (1986): "Poverty and Hunger": Issues and Options for Food security in Developing Countries, A World Bank policy study, Washington D.C USA.

World Bank (1991): "Kenya Food and Nutrition Policy". Report No. 8351 KE. A World Bank Sector Report. Agriculture Operations Division, Eastern Africa Department.

World Bank (1995): "Kenya Poverty Assessment". Report No. 13152 KE. Population and Human Resource Division, Eastern Africa Department, Africa Region.

Zeller M., Schrieder G., Von Braun J. and Heidhnes F. (1997): "Rural Finance for Food Security for the Poor". Implications for Research and Policy, Food Policy Review 4. International Food Policy Research Institute, Washington DC

Appendix 1: The Quantities and Costs of the Main Foods Consumed

Monthly Expenditure and Quantity of Foods Consumed in Settled Households

	Quantity Consumed per Month				Monthly Expenditure			
	Dry Season		Wet Season		Dry Season		Wet Season	
	Qty(kg)	%	Qty(kg)	%	Exp(Ksh)	%	Exp(Ksh)	%
Maize Grains	30.70	**35.0**	14.96	10.6	774.23	**23.9**	380.27	9.5
Beans	9.20	10.4	5.27	3.7	461.80	14.3	258.23	6.5
Maize Meal	22.51	**25.6**	23.14	**16.3**	642.19	**19.8**	639.61	16.0
Sugar	11.29	12.8	8.97	6.3	624.57	**19.3**	495.30	12.4
T/leave	0.84	1.0	1.02	0.7	251.95	7.8	304.91	7.6
Milk	8.25	9.4	84.62	**59.7**	164.96	5.1	1692.39	**42.3**
Rice	2.29	2.6	2.05	1.5	112.14	3.5	102.68	2.6
Meat	2.81	3.2	1.72	1.2	205.09	6.3	124.02	3.1
TOTAL	**87.90**		**141.75**		**3236.93**		**3997.41**	

Source: Computed from the survey data, 2000

Monthly Expenditure and Quantity of Foods Consumed

	Quantity Consumed per Month				Monthly Expenditure			
	Dry Season		Wet Season		Dry Season		Wet Season	
	Qty(kg)	%	Qty(kg)	%	Exp(Ksh)	%	Exp(Ksh)	%
Maize Grains	26.95	**27.1**	2.83	1.0	697.27	**21.8**	81.46	1.3
Beans	4.39	4.4	0.34	0.1	219.51	6.9	17.07	0.3
Maize Meal	29.58	**29.7**	11.06	3.9	798.31	**25.0**	306.87	4.9
Sugar	8.12	8.2	5.17	1.8	453.79	14.2	283.29	4.5
T/leave	0.79	0.8	1.01	0.4	236.20	7.4	302.49	4.8
Milk	26.25	**26.4**	263.08	**92.7**	525.07	16.5	5261.66	**83.7**
Meat	3.49	3.5	0.44	0.2	262.68	8.2	32.20	0.5
TOTAL	**99.57**		**283.93**		**3192.83**		**6285.04**	

Source: Computed from the survey data, 2000

APPENDIX 2: QUESTIONNAIRE

NATIONAL ARID LANDS RESEARCH CENTRE
MARSABIT

A SURVEY ON HOUSEHOLDS SIZE & COMPOSITION, WEALTH STATUS AND FOOD CONSUMPTION

1. Respondent:_____ 2. Enumerator: _____ 3.Mayantta: _____
4. Date: _____ 5. GPS _____ 6. Distance from Town:_____7. Season: _____

Household size and composition
Household members (last one year)

Name	Age (Y)	Sex I.M 2.F	Level of education	Relation to Respondent	Occupation		No. of months resident	Comments
					Main	Others		

Level of Education
1. No formal education
2. Nursery
3. Primary
4. Secondary
5. College
6. University
7. Others (Specify)
8. Others (Specify)

Relations to Respondent
1. Self
2. Spouse
3. Son
4. Daughter
5. Paid worker
6. Relative
7. Friends

Occupation
1. No specific duty
2. Herder
3. Employee
4. Business
5. Student
6. Casual worker
7. Others (Specify)

Resident
1. Fulltime
2. Most of the times
3. Sometimes
4. Rare
5. None

Livestock Ownership

Species	Numbers						Main reason keeping the livestock species	Who manages Fora herd	Who manages Home heard	Comments
	M	F	WM	WF	SM	SF				
Camels										
Cattle										
Sheep										
Goats										
Donkeys										
Poultry										
Others (Specify)										

M- MaleF-Female WM-Weaner Male WF-Weaner Female SM-Suckling Male SF-Suckling Female

Main reason for keeping

1. Cash income (Sale)
2. Meat (Household)
3. Milk (Sale)
4. Milk (H/Hold consumption)
5. Social Prestige
6. Dowry (Marriage)
7. Baggage
8. Eggs (Sale)
9. Eggs (H/Hold consumption)
10. Others (specify)

Who manages home/fora herds

1. Husband
2. Brother to husband
3. Son
4. Daughter
5. Relatives
6. Friends
7. Casual Worker
8. Other (Specify)

Other Income Sources

Income (Wages, Loan, Assistance etc	When received	Who gives (Source)	Comments

Income from Business/Trade

Dry Season

Main Trade Items	Quantity Purchased per Month (Kg)	Cost per Unit Purchased (Kshs)	Source of Supply	Quantity Sold per Month (Kg)	Price per Unit Sold (Ksh)		Market Outlet	Who Owns Business	Who Manages Business	Comments
					Cash	Credit				

Wet Season

Main Trade Items	Quantity Purchased per Month (Kg)	Cost per Unit Purchased (Kshs)	Source of Supply	Quantity Sold per Month (Kg)	Price per Unit Sold (Ksh)		Market Outlet	Who Owns Business	Who Manages Business	Comments
					Cash	Credit				

Seasonal Household Food Requirement and Supply: Gender Roles

Dry Season

Main Food Items for H/hold Consumption	Quantity Consumed per Meal (Kg)	Frequency of Consumption per Week	Who Consumes	Who Controls Consumption	Supply Source	Price per Unit		Quantity Supplied per Day (if not Purchased)	Who Controls Supply
						Cash	Credit		

Wet Season

Main Food Items for H/hold Consumption	Quantity Consumed per Meal (Kg)	Frequency of Consumption per Week	Who Consumes	Who Controls Consumption	Supply Source	Price per Unit		Quantity Supplied per Day (if not Purchased)	Who Controls Supply
						Cash	Credit		

Who Consumes/ Controls Consumption or Supply

1. Husband
2. Parents
3. Young children
4. Youth
5. Youth and Children
6. Youth and Parents
7. All
8. Other (Specify)

Supply Source

1. Livestock
2. Market
3. GoK
4. NGOs
5. Church
6. Others (Specify)