

HOUSEHOLD FOOD ADEQUACY AND THE  
NUTRITIONAL STATUS OF PRESCHOOL  
CHILDREN IN A CHILD SURVIVAL PROJECT  
AREA, NAMELOK, KAJIADO DISTRICT

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DECLARATION

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## DEDICATION

This work is dedicated to my parents, Martin and Catherine Muthoka, for the love, care and support they have continuously given me.

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## GLOSSARY

**Child survival project:** refers to a project aimed at improving the health status of children through improved nutrition, immunization, improved environmental sanitation and improved health services.

**Cash crop:** refers to a crop mainly grown for commercial purposes.

**Food crop:** refers to a crop grown mainly for household consumption.

**Food security:** refers to the ability of a household to secure enough food to ensure adequate dietary intake, for all its members, to lead a healthy life.

**Food self-sufficiency:** refers to the ability to produce enough food to adequately sustain nutritional requirements of a household.

**Homestead (boma):** refers to a joint residential unit composed of various households that share herding and domestic duties, and can be related or not.

**Household:** refers to members of a family who share the same livelihood resources and are served from the same pot.

**Household access to food:** refers to the access to food, adequate in quality and quantity, to fulfil the nutritional requirements for all members of the household throughout the year.

**Household food adequacy:** refers to the household daily diet being able to meet, for all its members, enough of all the essential nutrients as compared to the recommended daily allowance.

**Malnutrition:** refers to a condition in which there is an impairment of healthy growth or physiological functioning resulting from failure of a person to obtain all the essential nutrients in proper quantity or balance. It refers to both over and under nutrition. In this context malnutrition will be considered synonymous with under nutrition.

**Nomadism:** refers to the state of shifting residence that is dependant on the state of pasture and supply of food or seasonal factors.

**Pastoralism:** refers to the keeping of livestock as the main economic base by communities in the arid and semi-arid areas.

**Sedentarization:** refers to the state of staying in one locale as contrasted to nomadism.

**Stunting:** refers to a form of malnutrition which is caused by chronic food shortages or undernutrition. The child being shorter than the reference height for that age.

**Unimix:** refers to a baby food in form of flour which contains 25% soya and 75% maize. It is used to make light porridge for the children.

**Wasting:** refers to the form of malnutrition as a result of acute or current food shortages. The child being of less weight compared to the standard weight for that age.

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## ABBREVIATIONS

ACC/SCN	Administrative Committee on Coordination/Sub Committee on Nutrition
ANP	Applied Nutrition Programme
ASAL	Arid Semi-Arid Land
AWF	Animal Wildlife Foundation
CCF	Christian Children Fund
CHW	Community Health Worker
CISS	Community Initiative Support Services
CRS	Christian Relief Services
CSP	Child survival program
FAO	Food and Agricultural Organization
FPFK	Free Pentecostal Fellowship of Kenya
FOC	Friends of Conservation
GOK	Government of Kenya
GREP	Group Ranch Educational Program
HAF	Household access to food
HAZ	Height for Age Z-score
HFA	Height for Age
IFAD	International Fund for Agricultural Development
KWS	Kenya Wildlife Services
MAP	Medical Assistance Program
NCHS	National Centre of Health Statistics
NGO	Non Governmental Organization
SPSS	Statistical Program for Social Science
TBA	Traditional Birth Attendant
UNICEF	United Nations International Children Education Fund

WAZ Weight for Age Z-score  
WFA Weight for Age  
WFH Weight for Height  
WVK World Vision International Kenya  
WHO World Health Organization  
WHZ Weight for height Z-score

## ABSTRACT

### HOUSEHOLD FOOD ADEQUACY AND THE NUTRITIONAL STATUS OF PRE-SCHOOL CHILDREN IN A CHILD SURVIVAL AREA, NAMELOK, KAJIADO DISTRICT

A cross-sectional survey on food adequacy and nutritional status of pre-school children was conducted in 191 rural households within the child survival project area in Namelok, Loitokitok Division, Kajiado District, Kenya. The study was intended to investigate the food adequacy among the Maasai, nutritional status of their pre-schoolers, the activities geared towards household access to food and the household resource base and food purchases. The data collection methodologies used were the food frequencies, food purchases of the households and two 24 hour recalls on a sub-sample of 30 % of the study population. Anthropometric measurements were collected for all preschoolers (251) aged 12-60 months residing in these households.

Access to food for the household was dependent on the male household head who controlled the household resources and made the final decision on their allocation.

The average nutrient adequacy per consumer unit for energy and iron was found to be 73% and 45 % respectively whereas protein and Vitamin A were adequate in the diet. The household food adequacy was predicted by the household wealth ( $p < 0.05$ ), the number of pre-

school children in the household ( $p < 0.05$ ) and the household expenditure on food ( $p < 0.05$ ). One-third of the households were at risk of being food insecure with the energy adequacy of below 60 % of requirement.

The study found that about 60 % of the children were stunted and 9 % wasted. Another 28% were found to be underweight. Prevalence of underweight was significantly higher ( $p < 0.05$ ) among boys compared with their female counterparts but there was no significant difference in stunting and wasting. Children of age-groups 12-23 months and 48-60 months were the most vulnerable to undernutrition. Illness from diarrhoea, fever and vomiting were common among the young pre-schoolers (12-23 months old). Malnutrition due to inadequate dietary intake was observed, mainly among the older children (48 months and above).

Intervention is needed to address the food consumption and dietary patterns and to create awareness in order to improve the health and sanitation in the area and to come up with activities which are geared towards improving the income of women.



## CHAPTER 1

### INTRODUCTION

Malnutrition is caused by insufficient dietary intake and infection or the interaction of the two, and are in turn results of three underlying causes: poor household access to food, poor household access to adequate health services, unhealthy environment and inadequate maternal care. Each of these components is necessary but by themselves not sufficient for adequate nutrition (Mwadime and Baldwin, 1994). Because of the importance of resource in achieving adequate levels of these three underlying factors, the poor and those in arid areas are highly prone to malnutrition. Identifying the cause of malnutrition is a major step in identifying the strategies to solve the problem.

Alleviation of malnutrition can be achieved through community based health care, child survival projects, improved maternal and child care and improved food accessibility and availability, food production and improved food consumption patterns.

In many parts of the African continent much efforts are geared towards increasing food production, aiming at achieving self-sufficiency and food security (Nestle,1989). This is in crop production as well as in livestock production, both of which have important implications from the stand point of human nutrition.

Among the pastoralists efforts to improve livestock production have

achieved little success. They are still herdsmen or shepherds and attach great importance to the number of their stock rather than their productive efficiency (Nestel,1989). Most efforts call for a change in their pastoralic lifestyle, a life that they have skilfully perfected, both socially, economically and with a pattern closely associated with constraints imposed by the environment (Nestel,1989).

Notwithstanding, some developmental efforts encourage the Maasai pastoralists in Kenya to enter the cash economy through the sale of animals and introduction of crop production (Nestel,1989), especially where the ecology allows. Some factors that have led to this are : (i) the increase in family size which is largely the result of progressive improvement in health care; (ii) government's emphasis on sedentarization coupled with improved communication networks and infrastructure to improve marketing, and accessibility to education, water and health services; (iii) the inability to support the growing population, particularly during droughts thus necessitating relief food. The assumption is that the shift from pastoralism to agricultural production will improve their access to developmental services, and infrastructure and to self sufficiency in food. However, with the increase in family size within an environment of limited resources and carrying capacity, it is then expected that the household access to food may be a serious constraint unless the households have adopted alternative means to acquire food.

## 1.2 STATEMENT OF THE PROBLEM

Child survival programs (CSP) aim at improving infant and child health. When the project is functional it is expected to increase the number of children surviving in participating household with reduced malnutrition, reduced infant mortality rate as well as improved household access to food (HAF). However, survival of the child does not imply a good life if food is inaccessible and the environment remains unhealthy. Therefore, the child may be surviving but at worsened environment and reduced resources (care, space and food per capita) in the household. There is need to get up-to-date information on the household access to food, the activities geared towards achieving it and the current nutritional status of the pre-school children.

## 1.3 JUSTIFICATION AND PURPOSE OF THE STUDY

Carrying out the study was justified for the following reasons: 1. The prevalence of malnutrition in Kajiado District, relative to the other areas, in terms of Weight for height, (see appendix 2), are still high even at continued widespread intervention programs by various Non-Governmental Organizations (NGOs) and agencies in the district. This is an indication that the positive effects of child survival and decreased mortality rates over the years may have been offset by the worsening climatic conditions that have resulted in reduced economic and food base of the Maasai and the increased food demand as a result of higher household sizes.

2. Changing living patterns among the pastoralists, with increased sedentarization and increased involvement in agriculture and changes in eating patterns could have had either positive or negative impact on food accessibility by households. However, existing information indicate inadequacy in the nutrient consumption (Mwadime and Mammo, 1991; Nestel and Geissler, 1993).

3. Most dietary surveys have been conducted to determine nutrient adequacy on various population groups in Kenya. Among the Maasai most of the studies are more than 10 years old while a lot of changes have taken place in that period. It then become important to have information about the possible trends in food consumption and the changes in nutritional status. The rate of uptake of agricultural practices and the possible changes in both food consumption patterns and nutritional status are necessary in this period when most organizations attach importance to base-line quantitative data.

4. Few studies have been documented in Kenya and particularly among pastoralists, which investigate the implication of household size on household food accessibility.

The study was intended to investigate the food adequacy among the Maasai, their nutritional status, and the household access to food (HAF) and the activities geared towards achieving it.

The results of this study are expected to provide information that could be used by the government and by organizations interested in developing the area in order to alleviate malnutrition in the community. In addition, it could be used to assess the long term implications of child survival projects among pastoralists.

#### 1.4.1. STUDY OBJECTIVES

The specific research objectives were:

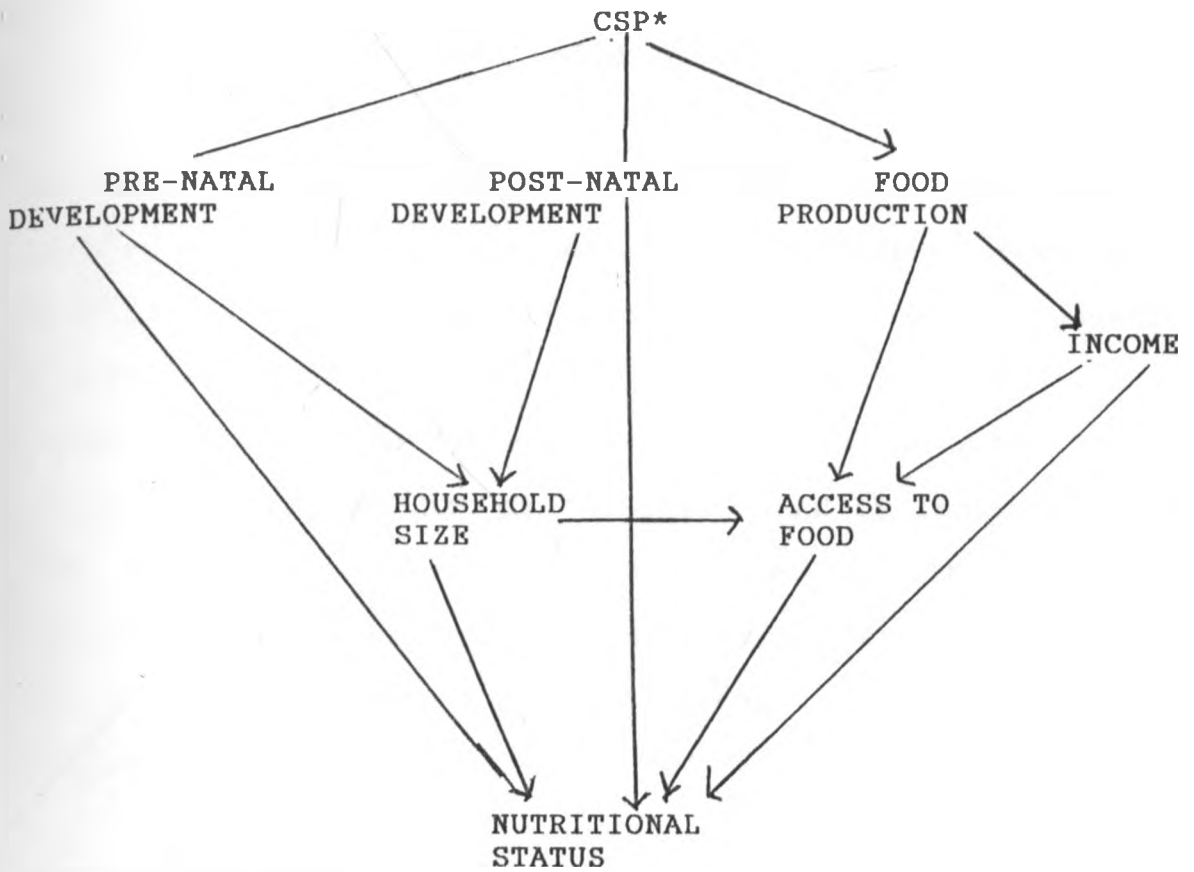
- (i) To determine the factors likely to predict household nutrient adequacy and food variety among the households participating in child survival project.
- (ii) To determine the nutritional status of pre-school children within the study area and their health conditions.
- (iii) To investigate the activities geared towards improving household access to food within the study area.
- (iv) To determine the household resource base and food purchases among the study group.

#### 1.4.2. THE CONCEPTIONAL STUDY FRAME WORK

This frame work for analysis shows the relationship between child survival componets, i.e. pre-natal, post-natal and food production and household size. It is assumed that the positive contribution leads to increased household size which consequently affects the household food adequacy and the nutritional status especially of the pre-school children.

Trends of many studies show that to reduce child mortality and to improve the child nutritional well being, improvement in the utilization of the health facilities, environmental sanitation and adequate feeding at the household level are a prerequisite. The interactions are presented in fig.1.

Fig.1 Relationship between child survival program components, household size and the nutritional status of the pre- school child



\* child survival programs

The conceptual framework sub-heading to be discussed in detail in the literature review are:

1. The child survival components, household size and nutritional status.
2. Household food security and food production.
3. Household size and household access to food.
4. Household access to food and nutritional status.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Child Survival Components, Household Size and Nutritional Status of Pre-school Children

The child survival programs aim to reduce child mortality through reduced malnutrition, improved child growth, development and child nutritional status. The success of the program is fundamentally important to the long-term solution to malnutrition and can be achieved through the cycle: from improved mother's nutrition which in turn determines that of the infant and by implication affects the nutritional status of the future mother. The child survival components emphasized towards achieving these aims are improved pre-natal development, post-natal development and household access to food.

##### 2.1.1 Factors that affect nutritional status.

Nutritional status is estimated from anthropometric measurements i.e. age, weight, height and arm circumference, which are converted into standardized nutritional indices e.g. wt/age. These indicators show both the long term and short term energy deficit.

Nutritional status is affected by many factors. First, an individual's nutritional status greatly depends on ones nutrient intake. These are available in different foods and consumption of adequate amounts of different food varieties ensures adequacy in



both the food quality and quantity. The health status of an individual also determines ones nutritional status, in that poor health may interfere with the body's physiological functioning thus resulting to poor nutritional status despite good feeding practices. Finally the genetic makeup also determines ones nutritional well being, e.g. those suffering from illnesses such as obesity and diabetes. The presentation of the condition may be masked or made worse by poor environmental sanitation, poor feeding patterns and poor health status.

### 2.1.2 Maternal and child nutrition

It is now an accepted fact that the mother and child are a vulnerable group from a health and nutrition view point. They not only require more dietary intake but are also more susceptible to adverse health consequences following nutritional deprivation (ACC/SCN, 1991). To achieve normal growth, adequate amount of energy and other nutrients are required. In this context, the pastoral communities are worse off as they have to content themselves with inadequate energy supply from their main staple foods (Galvin and Waweru, 1987; Gradin et al, 1991).

Proper pre-natal development is crucial as it is now established that even from conception, growth in *utero* is affected by nutrition and has effects throughout the individuals life (Mason, 1994). As such, maternal nutrition is crucial to the outcome of her pregnancy. Therefore, under conditions of deprivation a vicious

cycle can be set up which perpetuates malnutrition throughout ones life. For example, small maternal size leading to low birth weight which may be accompanied by growth failure in children leading to small adults (Galloway et al, 1994).

To remedy low birth weight, it is important to target intervention at the appropriate stage. For instance by ensuring as much growth as possible particularly in girl child who was of low birth weight, she is able to have infants who have adequate birth weight when she becomes a mother. Low birth weight infants are documented by Norton (1994) to have less chance of survival, and when they do survive, they are more prone to disease, growth retardation and impaired mental development.

Another factor is child spacing. This is important as it gives the mother time to replenish the already depleted nutrients from the previous pregnancy thereby being nutritionally sound for the next pregnancy.

Moreover, exercise is important although overworking should be avoided to reduce stress to the mother. A case study in Western Europe, during the 2nd World War showed that interactions of nutrition deprivation and excessive physical exhaustion, lack of rest contributed to the low birth weight of infants (Ebrahim, 1987).

Maternal immunization is another factor that can be considered. This emphasizes elimination of neo-natal tetanus which accounts for 25% of foetal death globally. The tetanus toxoid immunizations are given before or during the pregnancy. The immunization provides a long-term protection against tetanus for the mother and protects the child during the early weeks of life especially when delivery occurs under poor sanitary conditions. Study findings by Gause (1994) show that neo-natal tetanus tends to affect the poorest people in developing countries.

Protecting the mother from infection is an added precaution. A series of continuous infections will influence the maternal nutrition in terms of reduced food intake, poor nutrient absorption and through food avoidance thus reducing the supply of nutrients to the foetus. The foetus could also get infected thus impairing its growth and development.

The interaction of food shortage, heavy demands for work and infections coincide to increase stress thus rendering mothers at advanced stage of their gestation period more at risk of low birth weight infants.

Post-natal development in children as the other integral components of the child survival program. This is because it is important for the continual survival and well being of the child. Adequate feeding of the children is an important factor but proper feeding

habits and practises are necessary to facilitate adequate feeding. Breastfeeding the child for at least two years is recommended (Jelliffe and Jelliffe, 1979; WHO/UNICEF, 1989).

During the first four months, the child should be breastfed exclusively. The weaning period is recommended to begin after the fourth month of life. The weaning diets should be well prepared, and adequate in the nutrient composition in order to provide the requirements of the growing child. Frequent small feedings of high nutrient density low bulk food are more efficient to meet the child nutrient requirements as opposed to the practice of feeding children with bulky, low nutrient density foods (Zumrawi, 1991; John and Gopaldas, 1993).

However, good feeding alone is not sufficient for proper growth and development of the child. Other necessary requirements include, immunization of the children against childhood diseases, the utilization of the available health facilities, improved environmental sanitation and most of all adequate care from the mother. This is in the form of stimulation, affection and support. Maternal care has a direct effect on growth and the development of the young child in that it affects the time of release of growth hormones and matching of nutrient intake in the requirements (Longhurst and Tomkins, 1995). Interacting with all these is the need for more attention to education and literacy in women.

### 2.1.3 Child survival program components and household size.

The effect of improved child health are reflected in a lowered death rate in childhood and normal birth weight infants. As such the infants are less prone to infection and malnutrition unless it occurs later in their life, i.e. after 4-6 months when they are introduced to weaning foods. This means that only more healthy children survive. With more children surviving the population increases and at the household level, the household size also increases.

The increased household size means more mouths to be fed, and that more health and social services have to be provided. In the African context, large families are desirable so as to assist in farming. Furthermore, the more girls one has the more wealth from bride price. However, to maintain a healthy adult population, adequate food, both in quality and quantity should be available.

This is why the child survival program advocates for healthier children that the household can comfortably raise within the available resources and not so much the large family size (Jelliffe and Jelliffe, 1991).

## 2.2 Household Food Security and Food Production

The current world food situation is drastically different from that of the early to mid 1970s. Much effort has been directed towards increasing food production in order to cope with the growing population and massive food shortages faced earlier on. Policies

aimed at increasing agricultural production were stressed thus many of these improved agricultural technologies have gone a long way in reducing hunger (Kennedy and Haddad, 1994). Reduction in hunger has been through increased agriculture, employment as well as indirectly through lower food prices and non-agricultural employment.

Presently these efforts are targeted towards improving self-sufficiency and food security in food. This is both in crop production as well as improving livestock production. These two have important implications from the stand point of human nutrition and trade (Nestle, 1989). However, national food self-sufficiency has been seen as a proxy for household food security as several studies by Kennedy and Haddad (1994), have shown populations of 20-30 % consuming less than 80 % of the caloric requirements even when the per capita supply is at or above 100 % of need.

The improved food production is ideally expected to improve the food available to the household aiming towards being food secure, as well as to boost the economic base of the household through sales of crops especially cash crops, or animals and animal products. The nutritional status of the household members is expected to improved with the increasing availability of food and income. However, this is not always the case as portrayed from studies by Per Pinstруп (1981), whose findings showed that increased food production alone does not automatically translate

into improved nutritional status. In order for the agricultural projects to contribute towards the alleviation of malnutrition, there is need for the projects to be linked and targeted on the improvement of nutrition.

### 2.3 Household Size and Household Access to Food

The household's ability to obtain food is related to its purchasing power or resources available as entitlement - to enable them get adequate food for all household members.

The household size and composition seem to influence the household access to food. Kigutha et al (1994) and Kavishe and Mushi (1993), show that increased household size favour resources contribution to the household. As such there is more food available for household consumption and consequently an improvement in the nutritional status of the household members. However, both documentations Kigutha et al (1994) and Kavishe and Mushi (1993) argue that in cases where the dependency ratio is high and the number of consumers of the available resources in the household are more than the contributors, less is available to share among themselves hence compromising on their nutritional well being.

Alternatively as a survival measure, during shortages in food resources, the household consumption behaviour changes as documented by Timmer et al,(1985). The household tends to

substitute the foods they eat (superior foods i.e. cereals and animal protein) with cheaper foods (i.e. root crops and plant protein). As a result the diet eaten is of a lower quality. When the nutrient deprivation period continues, poor health status may result and may eventually present in the different forms of malnutrition. Other outcomes of inadequate food intakes are : i) reduced working capabilities due to hunger.

ii) reduced body resistance to infection due to impaired immunization system, hence one constantly falls ill and consequently becomes more weak.

iii) Due to food deficiencies and illnesses, the body's physiological functioning is also impaired making the situation even worse.

iv) In the event of poor nutrition and disease, death is the ultimate outcome.

#### 2.4 Household Access to Food and Nutritional Status

Household access to food is hereby defined as the household's ability to get adequate food for all household members, at all times, to maintain an active healthy life. The ability may be physical or financial. The physical access to food mainly being from own farm production. The financial access to food is only dependable if one has a constant income source that enables him to purchase food for the household from the market. Nevertheless, some studies (Katona- Apt, 1983; Tripp, 1982; Leisle, 1985), show that



the income available in the household is used differently, depending on who within the household controls resources or income. The studies have also established that only a small proportion of income from cash crops and that which is controlled by the male household head, is allocated to food unlike that which is controlled by women. A greater proportion of the women's income is allocated to the household food budget

Therefore the income available in the household does not imply better food availability for household consumption. For example, research by International Food Policy and Research Institute and other studies found that the income controlled by women, particularly in Africa, is more likely to be spent on food. Also at similar levels of income, households with more women-controlled income are more likely to be food secure.

Other findings suggest that '*lump-sum*' sources of income such as large payments for cash crop remittance, are less likely to be spent on improving household food security. Thus although an increase in income at the household level is a necessity on its own, it is not sufficient condition for improving the nutrition of women and children.

Other factors which contribute to the household food insecurity include :1. The cultural set-up which bind the household. This influences the household food distribution.

2. Inadequate food consumption which is as a result of i) large household size thus the food available in the household for consumption is not enough to meet every member's requirement. The situation is even worse if the household has more dependants; ii) chronic illness or malnutrition which incapacitates oneself thus resulting to low activity performance and consequently reducing productivity; iii) recurrent drought and/or famine hence the household runs a continually high risk of inability to meet the food needs of the household members and especially those households that devote a larger portion of their available resources to food and yet fail to achieve adequate food (Jonsson and Toole, 1991); iv) The access to food is also influenced by the intra-household food distribution and the market policies of the day. The policies influence the availability of foods in the market and its price and consequently, its availability for household consumption.

## 2.5 GAPS IN KNOWLEDGE

The change of land ownership from free holding to communal and individual ownership has forced the Maasai to a more sedentary lifestyle and with possible changes in food consumption patterns too (MoA, 1982). This has forced them to pick up agricultural practices to meet their increasing food demands (Juma, 1991). However, only a third, (30 %) of the households in Namelok area are practising some form of agriculture (Mwadime and Mammo, 1991). There is then the need to know the present household food

adequacy levels and the extent of agriculture as well as the factors which contribute to the household food adequacy and the household access to food.

## CHAPTER 3

### STUDY SETTING

#### 3.1 Geography and Climate

Kajiado district is one of the Arid-Semi Arid (ASAL) districts in Kenya and is located at the Southern tip of the Rift valley. It covers an area of 21,105 km<sup>2</sup> which is 3.5 % of the total area in Kenya (Appendix 1). The district is administratively divided into five divisions of which Loitokitok is one, covering an area of 6090km<sup>2</sup>. It lies at an altitude of 1960m above sea level.

Namelok is a centre in Entonet location, Loitokitok division. It covers an area of 175 km<sup>2</sup> and is situated 35 km from Loitokitok town (Appendix 1). It is also the centre of the child survival project area which covers among others four sub-locations namely Clmakau, Osoit, Embaruetin, Sumuneria, Inkoroshoni and Isinet. These comprised the study site. Most parts of Namelok area are swampy with permanent water sources unlike the rest of Kajiado District which is semi-arid and covered with tall savannah grass interspersed with acacia trees.

The area has bimodal rainfall pattern with an annual mean rainfall of 600 mm. The short rains occur in November to December whereas the long rains are from March to June. The soils are highly variable depending on the substrate and topography. On the open plains they are typically heavy clays of black cotton soils which are shallow, poorly drained and

extremely difficult to work on. They are often water logged in the rainy season and very dry in the dry season. The plain soils have been derived from recent volcanic activity and are usually shallow and very porous with little water holding capacity. The volcanic hills consist of either rock with little or no soil cover or of highly porous erodible ash. Generally, the soil is not suitable for arable crop production although small pockets of better soils can be found in the area (Mammo, et al 1989).

### 3.2 The People

The Maasai are pastoralists who inhabit the Rift-Valley province in Kenya. Those in Loitokitok are the southern rift Maasai. Their traditional residential patterns are based upon the *ekang* (boma) which is an enclosure that holds about 10-12 family units. Four or five of these *ekangs* are then grouped to form clusters referred to as *emuruas* and holds about 40-50 family units (households). These households share common resources such as water supplies and grazing ground. The *emurua* also represents the basic social unit. The typical Maasai hut is low and constructed of mud or cowdung with grass thatched roofing. The Maasai social organization is based on the age-set system except that the women do not have age-sets like the men but are associated with the age set of *moraans* they sang for while they (*moraans*) were being circumcised. Most of these women eventually get married to these young men.

Namelok has a population of about 4,500 people and the Maasai are the main ethnic group and have been there for the past ten years. They were formally pastoralists who survived the 1984 drought. Having lost their animals in the drought, they were attracted to this area by the availability of permanent water from the springs and river and the unoccupied land. The other ethnic groups in the area are the Kikuyu and the Kamba who have recently moved to the area to escape the mounting population pressure in their areas of origin.

### 3.3 Study Population

The study consisted of households within the child survival area. The respondents were the Maasai. The survey covered 191 households in the six clusters surrounding Namelok. Only houses with at least one pre-school child of the age range 12-59 months were considered. The interviews were mainly administered to the head woman of the selected household as they were more available compared to the male household heads.

### 3.4 Agro- Economic Activities

The major economic activities stem from tourism and livestock husbandry. Agriculture is becoming increasingly important as an economic activity and the Maasai are engaged in subsistence/cash crop farming based on simple irrigation using hand dug furrows. The area under crop has increased in the last past years. This has been in an effort to increase food availability to the

household prompted by the increasing population with the continuing sedentarization process. The increased area under crop and crop production has not been without other effects such as reduced grazing area and other developmental projects e.g shopping centres, kiosks, posho mills among others.

Agricultural crops grown are maize, beans, tomatoes, onions and to a lesser extent green leafy vegetables. Agricultural extension services are provided to the farmers by the government agencies as well as the operational non governmental organizations. These include the World Vision, Ambassador, The Christian Children Fund and the Friends of Conservation.

### 3.5 Food and Feeding Habits of the Maasai

Traditionally, the Maasai diet was predominantly of animal products. That is, milk, meat and blood. Their diet was also affected by cultural beliefs that restricted consumption of milk after a meat meal or taking of fat after a meal of milk or meat. Various food taboos were set for pregnant mothers and children thus most mothers experienced nutritional anaemia and hypoglycaemia especially during pregnancy (Allego, 1993). With increased pressure for land resulting from overgrazing and land alienation, the Maasai people began the transition from that of a traditional subsistence system into that of a market economy which resulted in a rapid change in their diet (Nestel, 1986). Today the staple diet of the Maasai consists of milk and maize

meal. Meat, although an important food, is consumed irregularly and cannot be classified as a staple food. Fat and butter are still important and are used in cooking food. Blood, however, is rarely drunk (Nestle, 1986). The change in the diets may not necessarily imply nutrient adequacy, as shown in recent studies by Mwadime and Mammo (1991), Nestel (1989) and Nestel and Geissler, 1983). The studies showed that cereals contributed 51-71% of the total energy and 47-70% of total protein and also that their contribution decreased with income. The diets were also found to be deficient in micronutrient.

### 3.6 Health Facilities and Infrastructure

Namelok is poorly served with health facilities as it has only one dispensary and the next nearest clinics/ hospital are far, ranging from 18-35 km away. The health facility offer mainly out-patient services. Apart from curative services it also offers preventive services in form of immunizations (mother and child), ante-natal, post-natal and family planning services. All emergencies are referred to the district hospital in Loitokitok, 35 km away while a private clinic, situated 18 km from the centre, serves those who can afford to pay for treatment. The main health problems reported in the area include malaria, whose prevalence is highest during the wet seasons. Pneumonia, especially among the children and anaemia among the women and worse, the pregnant mothers. Eye problems and sexually transmitted diseases are also common.



Transport infrastructure is poor with no tarmac road and many secondary and tertiary access roads are almost impassable during the rainy season. The mode of transport mostly used is walking as the hire vehicles or matatus are few and operate during the early morning and early evening hours only. They also charge exorbitantly even for short distances. Occasionally people can get lifts (usually chargeable) from construction lorries operating within the area.

2.1

### 3.6 Child Survival Program

The child survival program in Loitokitok which is implemented by the World Vision International, Kenya, was started in 1987. Initially, it was a pilot project and covered four locations namely Kimana, Mbirikhani, Lenkism and Entonet. The pilot central point became Namelok which is located 15 km from the main feeder road, the Emali-Loitokitok main road. In 1991 the project was established though at a reduced scale covering a radius of 35 km from Namelok due to the financial and other administrative and logistic constraints faced by the organization at that time. The aim of the project was to reduce infant and child mortality rate through immunization against childhood diseases, improved maternal immunization, improved health care and environmental sanitation, improved utilization of oral rehydration solution in the management of diarrhoeal diseases and growth monitoring.

### 3.7 Projects in the Area

A number of non governmental organizations have shown interests in the development of the area. These include the World Vision, Catholic Relief Services, Christian Children Fund, Kenya Wildlife Services, Group Ranch Educational Program and Friends of Conservation. The main areas the organizations promote, either singly or in collaboration with others include: 1). The promotion of health care services and training of community health workers and traditional birth attendants. 2). Improving agriculture in the area. 3). Relief food and rehabilitation program. 4). Development logistics through support of women groups with the provision of small grants for projects, infrastructure and building of rural access roads. 5). Promotion of education through child sponsorship, building of schools and promotion of adult education. 6). Wildlife conservation and 7). Spiritual guidance.

### 3.8 Implication of Drought on the Economic Resources

The Maasai have experienced a series of droughts over the 1980's and in the early 1990's. The severe droughts occurred in 1984 and 1992 and left most of the livestock dead. Since livestock are their main wealth, the Maasai were left economically poor and without food thus also affecting their productivity. In order to survive they were then forced to adopt to some survival strategies. These included: 1). The sale of the land to their neighbouring non-Maasai's to get some income to enable them buy

food.

2). Search of employment in other nearby towns. 3). Involvement in agriculture especially in areas with permanent water sources and 4). Involvement in small scale trading business.

## METHODOLOGY

## 4.1 Study Design and Sample Size Determination

This was a descriptive cross sectional study carried out over a period of 4 months running from December 1994 to March 1995. It consisted of general information data collection i.e demographic, socio-economic food production practices and health conditions; and a repeated 24 hour recall which was done on a subsample (30%) of the study sample size.

## Sample Size Determination

A sample size of 194 households each with at least a pre-school child of age 12-59 months was to be used for the study. The number was determined statistically based on the annual mean energy intake among the Maasai, 1320 Kcal (Nestel and Geissler,1993); the mean energy intake among Maasai women, 1216 Kcal (Nestel,1989) with a standard deviation of 505.5 and a desired power level of 80%, (7.849). The sample size was then calculated using the formula (Ott,1984).

$$N = \frac{SD^2 (z_a + z_b)^2}{(U_0 - U_1)^2}$$

whereas SD = standard deviation (505 Kcal/person/day)

$(z_a + z_b)^2$  = power level of 80% (7.849)

$U_0$  = annual energy intake among maasai's(1320 Kcal/person/day)

$U_1$  = mean energy intake among maasai women (1216  
Kcal/person /day)

N = sample size

Thus the calculated value of N was 185. An allowance of 5% for non response was added to the calculated sample size to get a figure of 194 households. Assuming one woman per household, and with the child to household ratio being 1:1, the sample size was composed of 194 households.

#### 4.2 Sampling Procedure

Sampling was carried out during the pre-testing phase. The sampling procedure was as follows:

- i) Registration of all households within the six clusters in the area that had at least one child aged 10 - 56 months. This was to ensure that the children were within the age frame 12-59 months by the time the anthropometric measurements were taken. A total of 209 households were registered.
- ii) Systematic random sampling of the households within the six clusters. A total of 191 households were then selected. This was arrived at by use of proportionate sample size of each cluster as shown in Table 4.1.
- iii) Each cluster was then coded and each selected household numbered to avoid mix up of the households in the different clusters. The name of the female head of household was also

indicated along side the household number.

TABLE 4.1 Proportionate calculation of the sample in each cluster.

Cluster	registered households	proportionate sample size
Inkoroshoni	54	25.8 %
Embaruetin	22	10.5 %
Isinet	41	19.6 %
Osoit	35	16.8 %
Sumuneria	23	11.0 %
Olmakau	34	16.3 %
TOTAL	209	100.0 %

### 4.3 Study Tool Development

Prior to the study, a pre-testing phase lasting three weeks covering 25 households with similar characteristics as those studied was undertaken in a different cluster, Engumi. During this phase questionnaires were developed and tested and appropriate measurement techniques were developed and practised. The phase was also used to recruit field assistants who had to be residents of the area, well known in the community and O'level school leavers competent in English, Kiswahili and the Maasai language. Training of the field assistants by the researcher was also conducted for a period of two weeks based on the research subject, handling and the use of the research tools and the actual exercising of the research tools. The sampling of the study population was carried out during this phase. The pre-coded questionnaires were then developed and used to record data on food consumption frequencies, anthropometric measurements, child

morbidity patterns and agricultural coverage. The training was later continued for a week at the beginning of the actual survey to accommodate for the changes made in the development of the final research tools.

#### 4.4 Exercise and Flow of Study Activities

Data collection was done using two questionnaires. One set of the questionnaires was used to collect the general household and the child (ren) information and the second one used to collect information on 24 hour dietary recall. The questionnaires were administered to the mothers of selected households by trained field assistants and the information entered into pre-coded questionnaires. The general questionnaire covered the general households characteristics, demography, agricultural production, acreage, and methods of cultivation, food frequency, the under-five anthropometric measurements, immunization status and morbidity patterns. Two rounds of 24 hour recalls on household consumption were done on a months interval but only to a sub-sample (30%) of the study population. The descriptive picture on the community was realised from the demographic data, households characteristics and income data. At the time when the questionnaires were administered, the researcher accompanied the each field assistant on alternate days to the respective households. For clusters that were far away such as Sumuneria and Isinet, the World Vision facilitated the transport, otherwise movement was basically by walking as the other clusters were

about half an hour's walk.

All anthropometric measurements were done in the study households and all eligible children in each household had their measurements taken. The measurements taken were body weight and length/height of the children. These were taken once during the study, by the field assistants. However, for purposes of analysis an index child was selected per household using the following criteria: i) if the pre-school child was the only one in the household and within the age frame of 12-59 months. ii) where the pre-school children were more than one, the child between the age of 2 -3 years was selected. At this age undernutrition is most pronounced (Mason, 1992). iii) In a household with two pre-school children and none within the 2-3 years age frame and the youngest is not yet two years then the elder one is selected.

Weight was measured to the nearest 0.1 kg using the digital display Tafel scales placed on a flat surface. The children wore light clothing, no shoes. For children aged 12-24 months they stood with their mothers after initializing the mothers weight and the child weight was recorded. Children aged 25-60 months stood upright with the head in a horizontal plane and their weight recorded.

The length was measured using a stadiometer which had a fixed head rest and a movable foot piece which was placed on a flat



surface. For children aged 12-24 months their supine length was measured whereas those aged 25-60 months had their vertical height taken (UN,1986). Care was taken to maintain the subjects head in an upright position, with legs stretched to a full extent and feet at right angles with the legs. The supine length or vertical height measurements were recorded to the nearest 0.1 cm using a non stretchable measuring tape.

Age of the child was obtained directly from the child's documentation e.g clinic cards or for those without the documents, the mother's were asked to identify another child who is of the same age as hers who had documentations.

Energy and nutrient intake were determined using the household 24 hour recall and a weekly food frequency. The 24 hour recall was conducted twice within a month's interval. The person who prepared the dishes was asked to describe all the dishes that were prepared in the house the previous day, as well as all the ingredients that went into each dish. The person was then asked to use the same utensils as in the previous day and measure replicas of similar ingredients like the day before, where possible, and weights recorded to the nearest grams. For the liquid ingredients, water was used to estimate the volume. This also applied to the food dishes of mixtures, where the final volume level was estimated and if the actual ingredients used the day before was not available. Additional information on food

available to the household was obtained from data on agricultural practices, production and other main source of food.

Immunization status of the child was obtained from the Ministry of Health clinic cards, to determine whether the child was fully, partially or not immunized.

On child morbidity, the mothers were asked to state signs and symptoms of illness which they had noticed in each child seven days prior to survey.

Qualitative data was gathered from two focus group discussions. This provided additional information which was helpful in the interpretation of the empirical data. The key informants comprised the World Vision community motivators, staff coordinators, the health personnel, the group ranch leaders and the researcher's field assistants.

#### 4.5 Data Analysis

Data obtained in the study was cleaned then entered and analyzed using d-Base III+, SPSS/PC+ V.3 and ANTHRO Programs. The general population characteristics were obtained by running descriptive analysis. The weight, height and age measurements were converted into Weight for Height (Wt/Ht); Weight for Age (Wt/Age) and Height for Age (Ht/Age) indices using the anthro program. The corresponding standard deviation scores (Z-Scores) were

calculated with reference to the National Centre for Health statistics (NCHS) population as suggested by the World Health Organization (WHO,1983). A WHZ score of 2 or -2 means that the child is 2 SD above or below the median weight for height. Respectively, a HAZ refers to Z-score for Height for Age while WAZ refers to the Z-score Weight for Age. Children who were below the -2 SD of the NCHS references were considered wasted, stunted and underweight respectively.

The mean household food production was computed from the household previous season's harvest. The total energy derived from each harvested crop was calculated using the food composition tables (Sehmi, 1993).

The area experiences two planting and harvesting seasons at a six month interval. The data collect was on the long rain harvest (April-August) thus the energy derived from the harvest was estimated to last until the next harvest in February. The daily estimate household mean energy produce was then calculated, in megajoules, using the following formula:

household mean energy produced (Kcal) x 4.184

1000 x 180 days

where: 4.184 /1000 = conversion constant of kilocalories  
to mega joules

180days = days in the season (6 months)

The percent nutrient adequacy was computed using the formula:

$$\frac{\text{Total nutrient produced/(available) in household/day} \times 100}{\text{nutrient requirement/cu/day} \times \text{Hcu}}$$

where: cu = consumer unit

Hcu = Household consumer unit (ref appendix 11)

The available nutrients for consumption was derived from the formula:

$$2/3 \times (\text{Total nutrient produced} - \text{nutrient sold}).$$

NB: This was what remained after the sale of part of the harvest less a third of the remaining as part of losses during storage.

The conversion of measurements table (Appendix 12) was used to convert foods measured in volume or using other containers into grams. The conversion table was developed through standardization of the household measuring containers during the survey. The household foods consumed were then converted into nutrient adequacy for calories, proteins, using the Kenyan Food Composition Tables (Sehmi,1993).

From the household food frequency, the dietary variety adequacy score was computed, that is, each food consumed in the household in the last one week was placed into one of the five food

categories according to the nutrient composition of each food i.e. meat and dairy products; starches; fruits; vegetables; fats and oils (Appendix 6). The consumption of a food item from each class at least once a week earned the household one point as such the food score ranged from 1 to 5.

To determine the relationship between the independent variables and the outcome variables correlations and regression analysis were done. Multivariant analysis was performed to determine the actual contribution of the independent variables to the outcome variables. These independent variables were selected from previous correlation analysis and had to be significant at 5% level. They were then entered into the model using the step-wise method.

#### 4.6 Monitoring and Evaluation of the Study Activities

The researcher maintained close supervision of the daily activities of the field assistants to ensure accuracy and quality of data. In the course of the interviews supporting documents such as clinic cards for the pre-school children were examined in order to validate the information sought. The researcher also cross checked every filled questionnaire for its completeness and where information was missing another visit was made to the household to obtain it.

The accuracy of the equipment was checked midway of the study. Scales were used to weigh different objects of known weights twice and then checked for any variation. The stadiometer tape was checked for any buckling. A gantt chart was used in monitoring the progress and timing of study activities.

## CHAPTER 5

### RESULTS

The study was intended to investigate the food adequacy among the Maasai, the pre-schoolers nutritional status and the possible related health conditions, and the household access to food and the activities geared towards achieving it.

#### 5.1.1 Characteristics of the population

The sample population comprised 1090 people of whom 534 were males and 547 were females. Proportionally there was no difference although the females were slightly more. The permanent residents in the area comprised 96.6% of the people, as shown in table 5.1, whereas the remaining were away most of the time either in boarding schools, in case of the children, or in other nearby town centres where they worked in the case of the adult men. The under-five year old contribute 23.9% of the total population whereas the school going children and the adolescents make up 35.9% .

The study consisted of 191 households of which 93.7 % were male headed and 6.3 female headed. Distribution of the households by demographic characteristics is as shown in Table 5, in which the results show that the majority of the household heads were traditionist and most (88 %) had no formal education, and about a fifth had secondary education and only 1.6 %, all males, had attended adult education classes. Most households (87 %) had

more than four to eight persons, while the remaining 13 % had less than four persons. The mean household size was found to be 5.7 persons per household.

TABLE 5.1 Demographic Characteristics of the Sample Population

Characteristic	number	percent
Sample population	1090	
male	543	49.8
female	547	50.2
Residence		
permanent	1053	96.6
not permanent	37	3.4
Number of households	191	
sex of household head		
male	179	93.7
female	12	6.3
Religion of household head		
traditionist	112	58.6
christian	79	41.4
Education level of household heads		
secondary education	9	4.7
primary education	11	5.7
adult education	3	1.6
none	168	88.0
Household size by category		
0-3 persons	25	13.1
4-8 persons	152	79.6
8-14 persons	14	7.3
Household consumer units		
<2.5	24	12.6
2.6- 8.7	163	84.8
> 8.7	4	2.6
mean (persons/household)	5.7	(2.02)

Figures in parenthesis is standard deviation



### 5.1.2 Household Assets Ownership and Socio-Economic Characteristics

The household ownership of the Maasai is shown in table 5.2. Most of the houses (95.3%) were semi-permanent as they were built of mud or cowdung walls and grass thatched roofs. Only 4.7% had built permanent houses of stone with iron sheet roof. Sale of animal and animal products was the main source of livelihood for 81.1% of the households; casual employment, crop farming and relief food were the next major sources in 24.3%, 37% and 18% of the households respectively. The rest (20.7%) mainly depended on either employment, business or donations.

The main sources of water varied in the study population mainly due to the citing of the homes in relation to the various water points. Most households (87.5 %) had been receiving relief food for one year prior the study. Majority of the households (95%) mostly used firewood as cooking fuel, and only 2.1 % of the households used both firewood as well as charcoal and/or kerosine. Collection of firewood on average took about 2 hours per day.

Households that owned at least a radio, bicycle or a car comprised 30.9 %, 11.5% and 1.5% respectively. Wealth was measured based on the Loitokitok Livestock Unit (LLU) (see appendix 3). The mean LLU per household was 19.30 with a standard deviation (SD) of 28.55. Wealth distribution in the area, as

TABLE 5.2 Household Ownership and Socio- Economic Characteristics

variable	number	percent
Number of household	191	-
Type of housing		
semi-permanent	182	25.3
Wealth <sup>‡</sup> Distribution (LLU)		
<15	49	25.7
16-50	93	48.6
57-100	34	17.8
>100	15	7.9
sources of livelihood		
sale of animals/casual*	46	24.3
sale of animals/crop product	70	37.0
sale of animals/relief	34	18.0
others	50	20.7
Relief food distribution		
received in last 12 months	167	87.5
not received any	23	12.0
Cooking Fuel		
Firewood	182	95.3
Ownership of household items		
radio	59	30.9
bicycles	22	11.5
Water sources		
river	109	57.1
borehole	54	28.3
spring	28	14.6
Latrines		
own latrines	9	4.7
Sponsored children <sup>†</sup>	95	49.7
Needy farmers <sup>††</sup>	16	8.4

<sup>‡</sup> Wealth based on Loitokitok Livestock Unit

\* temporary employment

<sup>†</sup> children whose education is sponsored by World Vision International

<sup>††</sup> farmers assisted by World Vision International

shown in figure 2; indicated that most (74.3%) of the households were above the lowest class category i.e not considered poor.

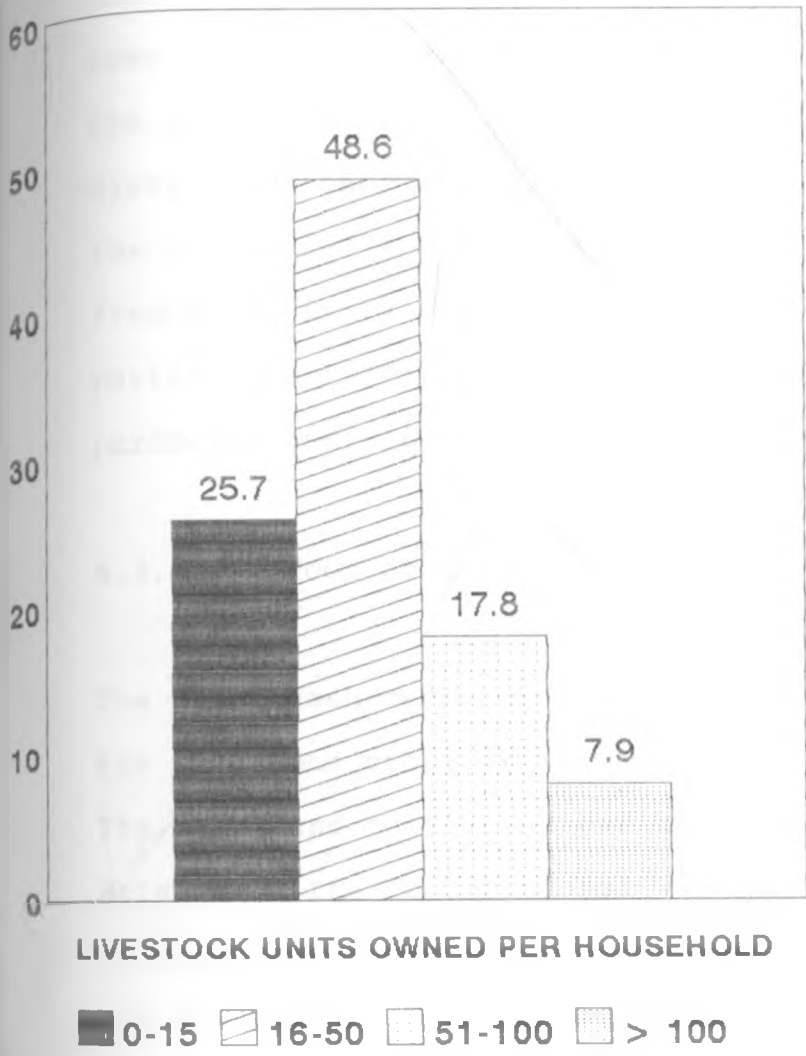
Majority of the households (57%) used river water and the rest got their water from the borehole and the spring. Only 4.7% of the households had a latrine within the compound.

The household mean monthly income was on average Ksh.500 with the income range being 0-2000. A few extreme cases of incomes greater than Ksh 3000.00 were omitted in the analysis. Remittance of money to the households was mainly to the mother of the household by her brother(s) and the mean amount of money given was Ksh 302 (SD 161.4) per month; extremely high values were excluded from the mean analysis.

World Vision gave assistance to the poor households in the form of educational sponsorship to children and farm inputs such as seeds and fungicides to the farmers. Nearly half of the households (49.7%) had benefited from the child sponsorship scheme whereas 8.4% had benefited as needy farmers.

FIG.2 WEALTH \* DISTRIBUTION IN THE STUDY AREA

PERCENT OF HOUSEHOLDS



with based on Ioltokitok livestock unit

## 5.2 Food Availability

The food available to the households came from different sources. Some of the food was from own farm production or purchased from the market. At times households got the relief food that was distributed once a month. The food consumption was analyzed from the household 24 hour recalls and the weekly household food frequency. Fifty three percent of the households did not participate in any form of crop production and thus relied on purchased and/ or relief food.

### 5.2.1 Food production

The major cash crops grown were onions, tomatoes and chillis and the main food crops grown were onions, tomatoes and chillies. The mean land cultivated per household was approximately 1.3 acres. All the food produced was converted into nutrients yielded of calories and protein. This was in order to be able to compute the household nutrient adequacy of the produced and actually consumed foods. The household mean food nutrient produced and nutrient adequacy are shown in table 5.3. The formula used to derive these results are described in section 4.5.

Fifteen percent of those who planted crops were able to produce 80% and more of the household energy requirement to last the season (six months), whereas 22% of them produced less than 60% of their household energy requirements to last the season. The

remainder (63 %) produced between 60 -80 % of their energy requirements.

The crops harvested realised 73.9% of the required energy, per consumer unit, for the season and 295.8% of the required protein. However, the energy and protein from the harvest; after adjusting for harvest sale and food loss while in storage, met only 18.8% and 31.1% of the required nutrients respectively.

TABLE 5.3 Mean Nutrient Produced, Nutrient Adequacy and the amount Consumed as a proportion of the requirement (CU)\*

Nutrient produced	mean MJ/d	Own production as a % of requirement	Consumption from own production as a % of requirement
calories	40.5 (34.6)	73.3	18.8
protein	35.6 (67.7)	295.8	31.1

figures in parenthesis are the standard deviation (SD)

\* cu= Kcal/person /day.

n= 90

### 5.2.2 Food purchased

The main foods purchased were maize, beans, rice, fat and sugar.

The total calories purchased comprised 39.5% of their monthly requirements while the purchased protein comprised 48.2%.

### 5.2.3. Food consumption

The food consumption results were analyzed from the 24 hour recalls and from food frequency data. The energy and protein adequacy and their sources are shown in table 5.4. The diets of the Maasai were not deficient in protein as their consumption on average was 415.9% of their requirement. The animal protein was the main source providing 81.8 % of the total protein.

Much of the energy consumed was mainly from plants (60.5% of total energy) and provided on average 42.5% of the energy requirement. The caloric adequacy in the diet was 73.1% (SD 30.38) of the energy requirements of which 19% was from own produced food, 40% from purchased foods and the remainder (14%) was from relief food. Households that did not meet at least 60% of their energy requirements were 34.4%.

The dietary intake of vitamin A was high as it contributed 158% of the household requirement per consumer unit and was mainly from milk consumed. However the dietary iron was low meeting only 45% of their requirement.

Table 5.4 Mean household nutrient intake, (cu/day), by source and the nutrient adequacy

Nutrient	mean	SD	estimated RDA	adequacy of RDA	% consuming < 80% RDA
<b>Protein</b>					
animal	219.05	( 73.0)			
plant	30.47	( 13.98)			
<b>TOTAL</b>	<b>249.52</b>	<b>(171.18)</b>	<b>60</b>	<b>415</b>	<b>0</b>
<b>Energy (Kcal)</b>					
animal	814.37	(662.13)			
plant	1130.95	(524.47)			
<b>TOTAL</b>	<b>1945.32</b>	<b>(808.16)</b>	<b>2660</b>	<b>73</b>	<b>67.2</b>
<b>Vitamin A</b>	<b>1520.34</b>	<b>(826.83)</b>	<b>960</b>	<b>158</b>	<b>15.5</b>
(g)					
<b>Iron (mg)</b>	<b>17.92</b>	<b>( 7.44)</b>	<b>40</b>	<b>45</b>	<b>98.4</b>

The variety of foods eaten in the household over a period of seven days is shown in table 5.5. The most commonly consumed foods in the households were different types of meat/dairy products, starches and fats.

Table 5.5 Proportion of households consuming the listed food items over a period of seven days

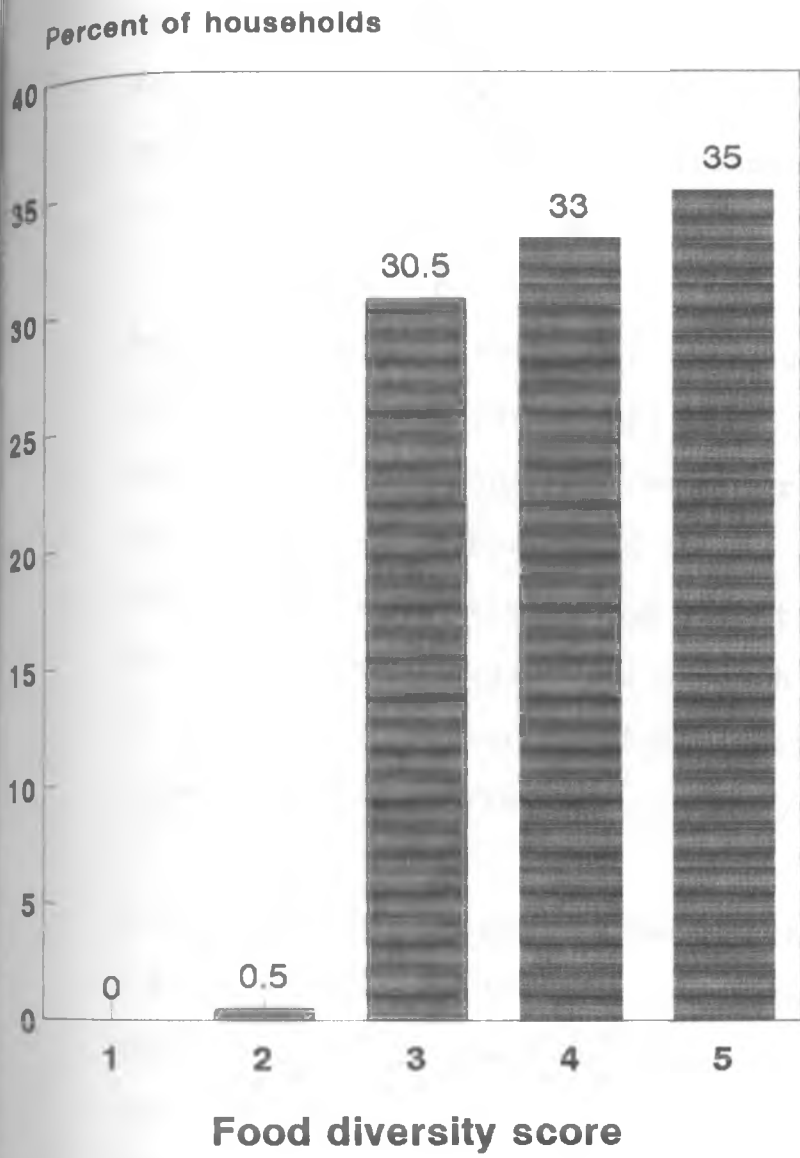
Food type	N=191	%
<b>Meats/Dairy products</b>	<b>182</b>	<b>95.3</b>
<b>Starchy food</b>	<b>191</b>	<b>100.0</b>
<b>Fats</b>	<b>191</b>	<b>100.0</b>
<b>Green vegetables</b>	<b>82</b>	<b>42.9</b>
<b>Fruits</b>	<b>95</b>	<b>49.7</b>



The food diversity score (Figure 3) was computed from the food frequency table and the food classification table (appendix 5). The food item eaten in the household at least once within the period of seven days prior to the day of the interview were classified according to the five food classes i.e. meats/dairy products, starches, fats, vegetables and fruits. Each of the food class from which a food was consumed was given a score of one.

The food diversity score was then derived from the total tally of the food class score per household. The food diversity score ranged from 2 to 5 with a mean score of 4.1. Results indicate that most households (99.5%) had eaten foods from at least three of the food classes.

FIG 3: Distribution of study households according to Food Diversity Score



### 5.3 Nutritional Status and health condition of Pre-school Children

The pre-school children considered in the survey were those aged between 12 and 60 months. Data collected included anthropometric measurements, morbidity, environmental sanitation and utilization of health facilities.

Anthropometric measurements i.e. age, weight and height, were computed into indices namely Wt/Ht, Ht/Age and Wt/Age for wasting, stunting and underweight respectively. The additional information which pertained to the children's health status, the environmental sanitation and the utilization of the health facilities for immunization of both the mother and child, as well as for growth monitoring of the child during its first year of life was also analyzed.

#### 5.3.1 The nutritional status of the pre-school children

A total of 251 children were included in the study and they comprised 23% of the total sample. The boys were 121 (48.2%) and the girls were 130 (51.8%). Their cumulative mean age in months was 37.05 (SD 14.29), weight in kilograms 11.99 (SD 2.55) and Height in centimetres, 84.26 (SD 12.1). The girls were slightly heavier and taller than the boys by 0.27 kg and 0.45 cm respectively.

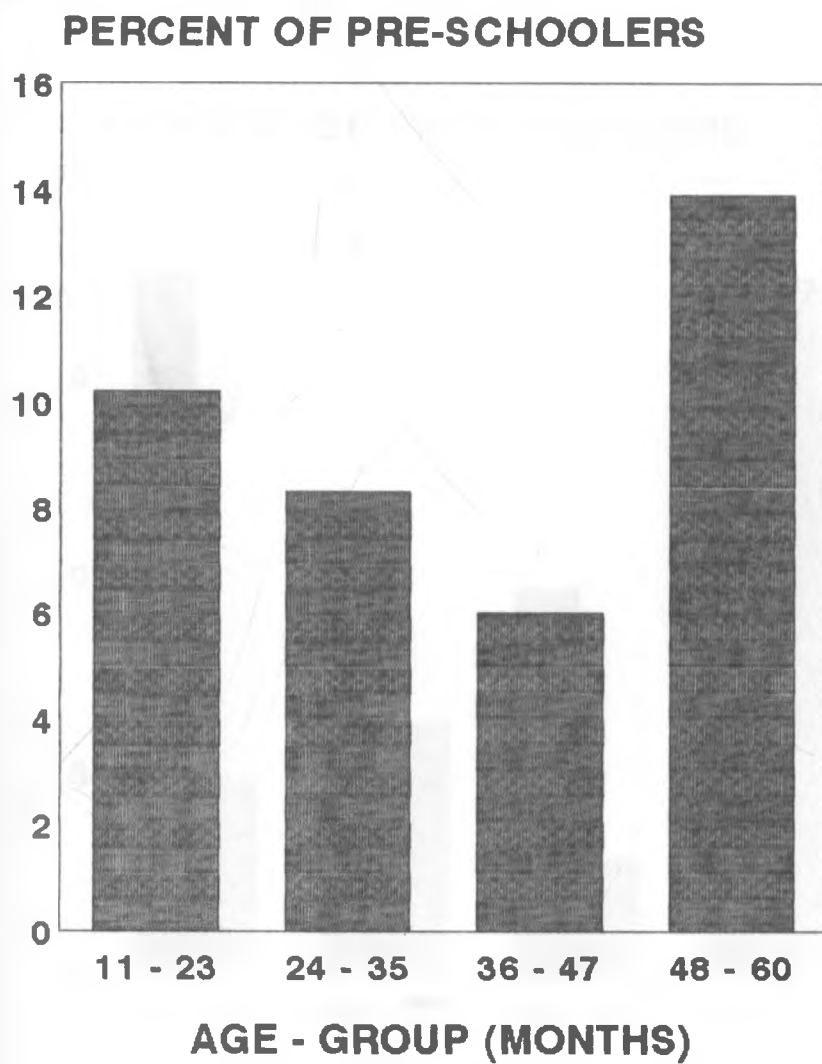
Distribution of the children within the four age-group categories used (Appendix 6), was almost equal with at least 60 pre-schoolers in each age-group. The girls (130) were slightly more than the boys (121) in most of the age-groups.

Prevalence of the different forms of malnutrition among the pre-schoolers, based on the Waterlow classification (1986) using the -2SD as the Z score cut off point for wasting, stunting and underweight showed that over half (56.5%) of the children were stunted, 8.9% wasted while underweight was observed in 27.7% of the children. Overall, 64.7% of all pre-schoolers showed one form of malnutrition or another (wasted, stunted or underweight).

Wasting, set at the -2SD cut-off point of the NCHS reference (WHO,1883), as illustrated in figure 4, showed the two most vulnerable age-groups were 12-23 months and 48-60 months. However, among the boys, wasting seemed to decrease with age whereas for the girls, wasting increased with age (figure 5). Stunting on the other hand, was observed in over half (56.5%) of the pre-schoolers, and seemed to increase with age although at 48 months and above, stunting was fairly low, at 30.9% (figure 6).

Prevalence of underweight by sex and age-group, as shown on figure 7, seemed to increase with age. Age-groups 12-24 months and 48 months old being most affected among the boys. For the girls the most vulnerable age- group was 24-47 months.

**FIG.4 PREVALENCE OF WASTING AMONG PRE-SCHOOL CHILDREN, BY AGE**



**FIG. 5. PREVALENCE OF WASTING AMONG PRE-SCHOOL CHILDREN, BY SEX AND AGE-GROUP**

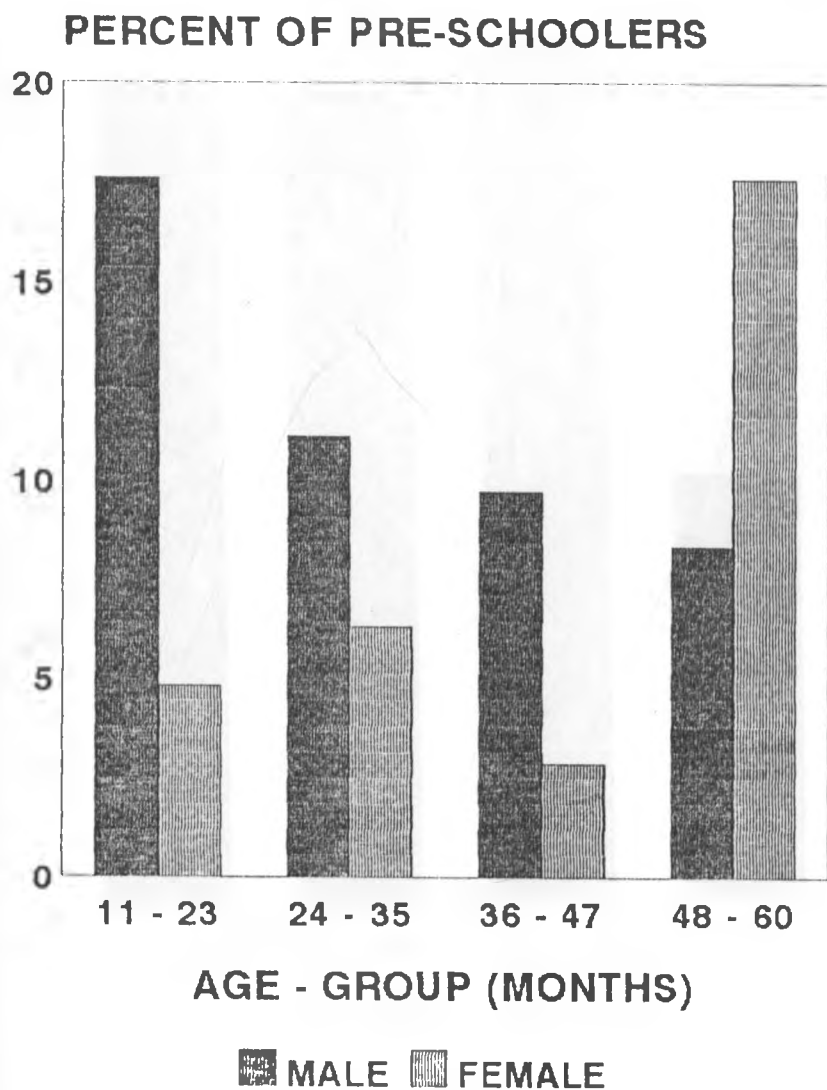


Fig 6: Prevalence of stunting among Pre-school children by age.

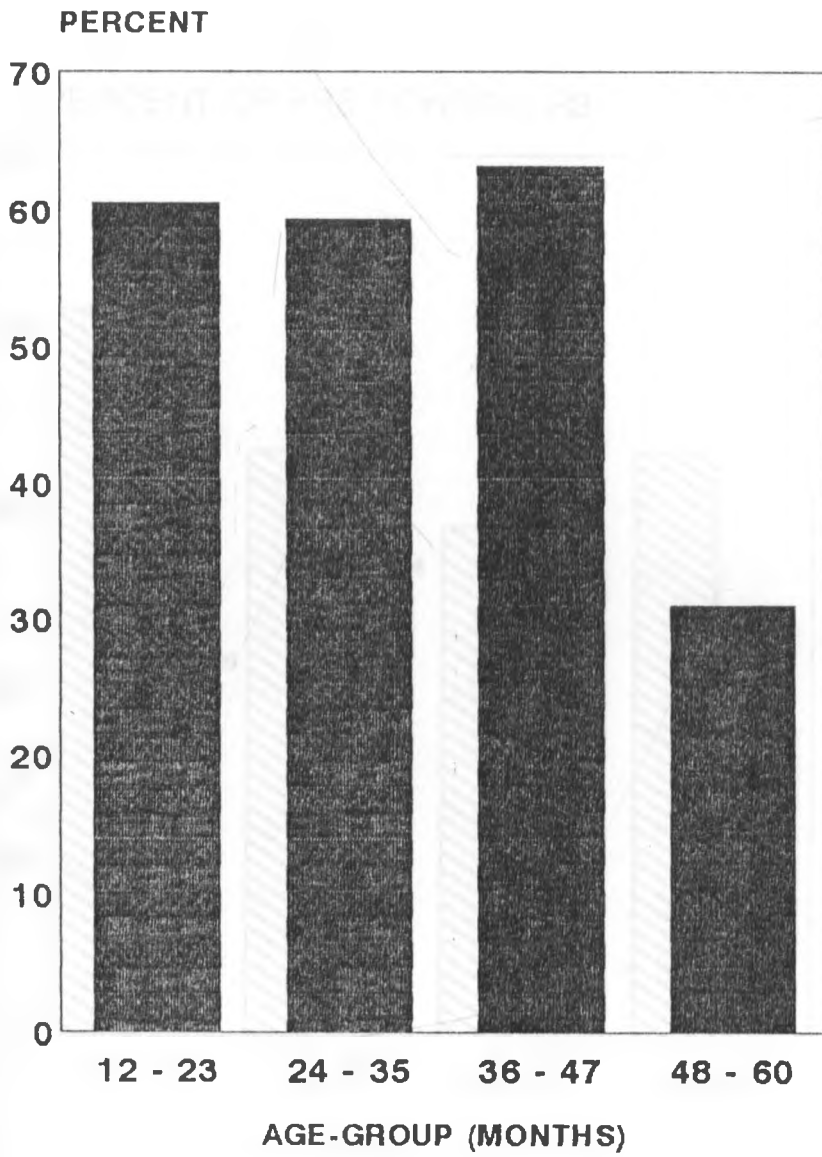
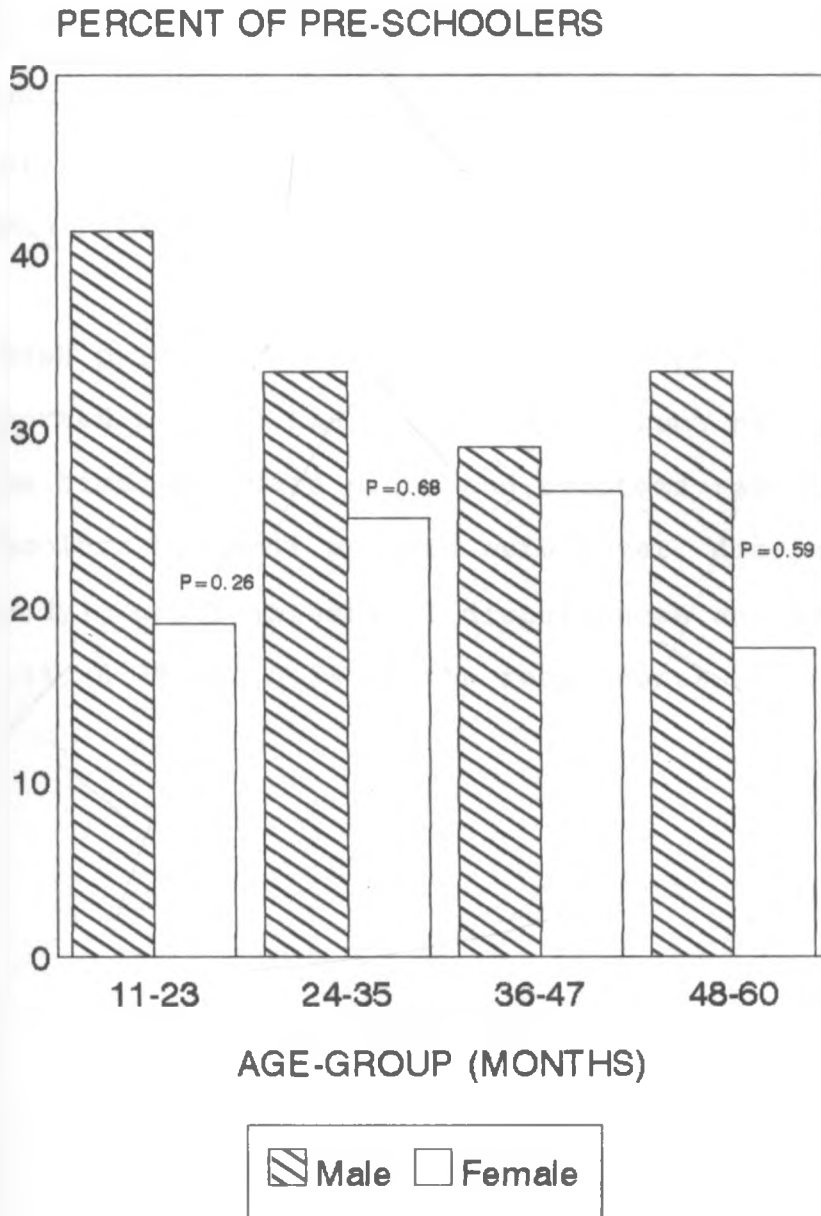


FIG.7. PREVALENCE OF UNDERWEIGHT AMONG PRE-SCHOOL CHILDREN BY SEX AND AGE-GROUP





### 5.3.2 The health condition of the pre-school children

As shown in Table 5.6, slightly over three quarters of the children (78 %) had more than 3 growth monitoring measurements taken in their first year of life whereas 12.4 % had no measurements. Complete immunization coverage was 74.1 % and 12.4 % of the children had not been immunized at all. Incomplete immunization (13.5%) was mainly against measles virus.

A week prior to the interview, 41.6% of the children were reported to have had signs and symptoms of illness(es) at the same time. The main signs and symptoms reported among the pre-schoolers by their mothers were fever, diarrhoea (normal and bloody), gastrointestinal disturbances and vomiting in 31.4%, 17.3%, 6.3% and 0.5% of the respondents respectively.

TABLE 5.6 The Health Conditions of the Pre-school Children in Namelok

variable	number	percent
Number of under fives	251	23.0
Sex distribution		
male	121	48.2
female	130	51.8
Growth monitoring promotion (No. of Growth Monitoring in the first year of life)		
0	31	12.4
1-3	24	9.6
3+	196	78.0
Immunization status		
complete	186	74.1
incomplete	34	13.5
none	31	12.4
Morbidity		
no illness*	99	39.4
one illness	119	47.4
two illnesses	33	13.1

\* illnesses considered were fever, diarrhoea and/or vomiting

#### 5.4 Relationships between Variables.

After the descriptive and correlation analysis of various variables (Appendix 7), the variables which gave significant relationship at 5 % level were then entered into the multivariant analysis model to show the contribution and influence of the selected independent variables on the outcome variables i.e. nutrient adequacy (energy) from the different sources and the child nutritional status. The final matrix is shown on Table 5.7. Correlation analysis and cross tabulations were performed to show

the relationship of child nutritional status, as an outcome variable and other selected independent variables. A total of 191 pre-school children were considered in the analysis; with each household represented (see section 4.5).

#### 5.4.1 Relation between the nutrient (energy) adequacy from crop production, food purchase and dietary intake and selected variables.

The outcome variable was the nutrient (energy) adequacy in the study households from the three main sources; own production, food purchase and dietary intake. Results from the final equation showed that the independent variables important in predicting the nutrient adequacy are wealth, measured by the Loitokitok Livestock Unit (LLU), the number of pre-school children in the household, and expenditure on food.

The number of pre-schoolers in a household was predictive on the household dietary adequacy only. Wealth was a factor predictive on the overall household nutrient adequacy indicators, whereas the expenditure on food was predictive factors on the purchased food only.

The household dietary intake adequacy improved with the increase in household wealth. Households with more than one pre-schooler had a better dietary intake adequacy compared to those with only one pre-school child.

Nutrient adequacy from both the farm produce and purchased food was influenced by the household wealth, and amount of money spent on food respectively.

TABLE 5.7 Step-wise regression of nutrient (Energy) adequacy, from farm produce, food purchase and dietary intake, with selected variables.

Variable	Nutrient		(Energy )		adequacy	
	produced B	T	purchased B	T	dietary B	intake T
Wealth+	0.90	3.95*	0.16	2.02*	0.28	2.28*
Income gene rating act.	0.08	0.67	0.11	1.37	0.24	1.96
Expenditure on food	0.16	1.39	0.04	2.91**	-	-
No. of < 5 /hhd	-0.09	-0.75	-	-	0.30	2.39*
Income	0.12	1.00	$-5.72 \times 10^{-3}$	-0.06	0.22	1.85
R <sup>2</sup>	0.16		0.05		61.05	
Adj R <sup>2</sup>	0.14		0.05		0.13	
Intercept	55.67#		18.59**		60.05#	

R<sup>2</sup> = regression coefficient

\* significant at p<0.05

\*\* significant at p<0.01

# significant at p<0.001

hhd =household.

Adj =adjusted.

+wealth = based on the Loitokitok Livestock Unit (LLU)

#### 5.4.2 Relation between the pre-schoolers nutritional status and other selected variables.

Results from correlation analysis with nutritional status of the pre-schoolers as the outcome variable are as shown on Table 5.8. Household size and number of children in the household showed a negative association with underweight and wasting, but positive correlation with stunting. Both household size and number of children in the household were significantly ( $p < 0.05$ ) associated to wasting and stunting. The relationship of both energy intake adequacy and food purchase adequacy to wasting was negative and significant at  $p < 0.01$ .

Analysis of the relationship between the pre-schoolers nutritional status, illness and malnutrition showed that the proportion of children found to be both malnourished and ill was: 35.3%, 37.0% and 24.5% for wasting, stunting and underweight respectively.

TABLE 5.8 Pearson correlation between nutritional status of the children with selected variables.

Variable	Nutritional status		
	wasting	stunting	underweight
Household size	-0.1656* (0.022)	0.1543* (0.033)	-0.0815 (0.263)
Own produce food	0.2166** (0.003)	0.1750* (0.015)	-0.1134 (0.118)
Sex (male)	-0.0589 (0.418)	-0.0749 (0.303)	-0.1468* (0.043)
No. of children /hhd	-0.1677* (0.020)	0.1677 (0.020)	-0.0667 (0.359)
energy intake adequacy	-0.3660** (0.005)	0.1590 (0.223)	-0.2388 (0.071)
Income	-0.0626 (0.390)	0.1096 (0.131)	-0.0214 (0.769)
Purchased food	-0.1884** (0.009)	0.1354 (0.062)	-0.1137 (0.117)
Age	-0.2075** (0.004)	0.1415 (0.051)	-0.0867 (0.233)
Illness	0.3799*** (0.000)	-0.2526*** (0.000)	0.2474*** (0.001)
Wealth	0.0627 (0.398)	0.0397 (0.593)	0.1142 (0.123)

\* significant at  $p < 0.05$ .

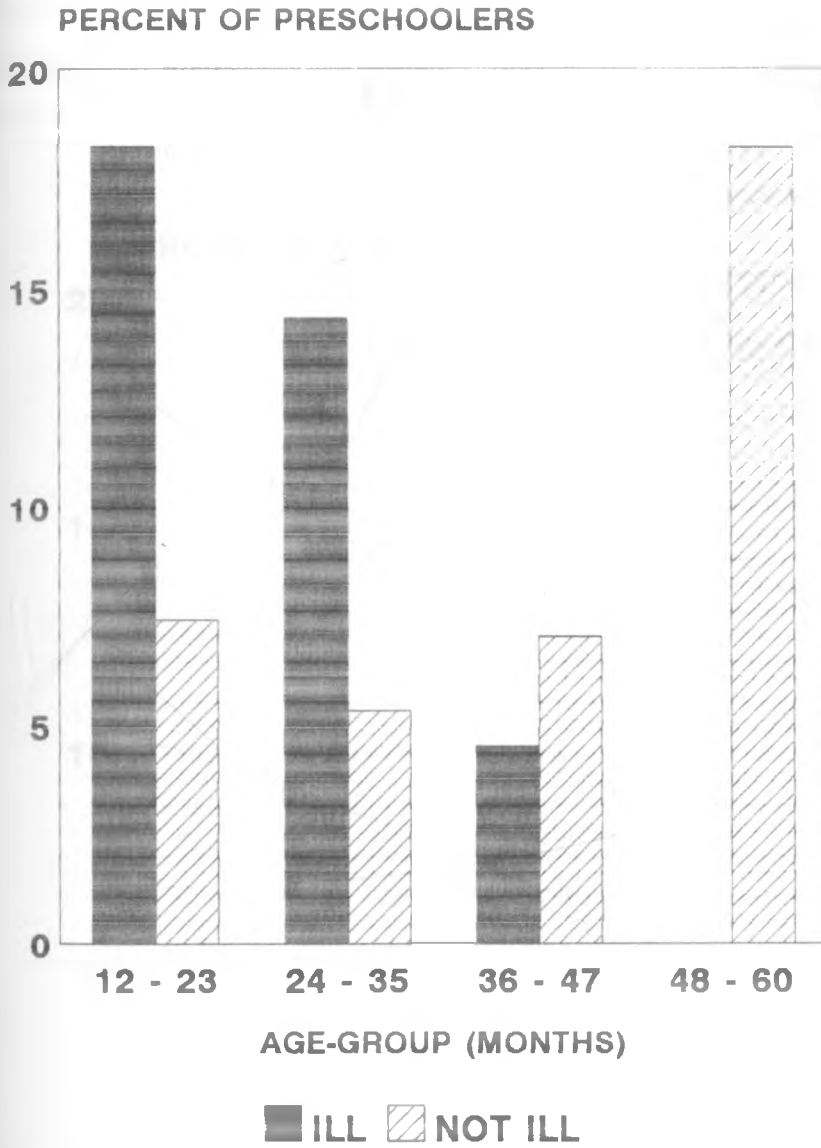
\*\* significant at  $p < 0.01$ .

\*\*\* significant at  $p < 0.001$ .

Analysis of the relationship between prevalence of illness among the pre-schoolers with age indicated that the illness episodes; (signs and symptoms) of fever, diarrhoea and/or vomiting, were mostly observed at the lower ages (12-24 months) and

progressively reduced in the older pre-schoolers as shown in figure 8 below.

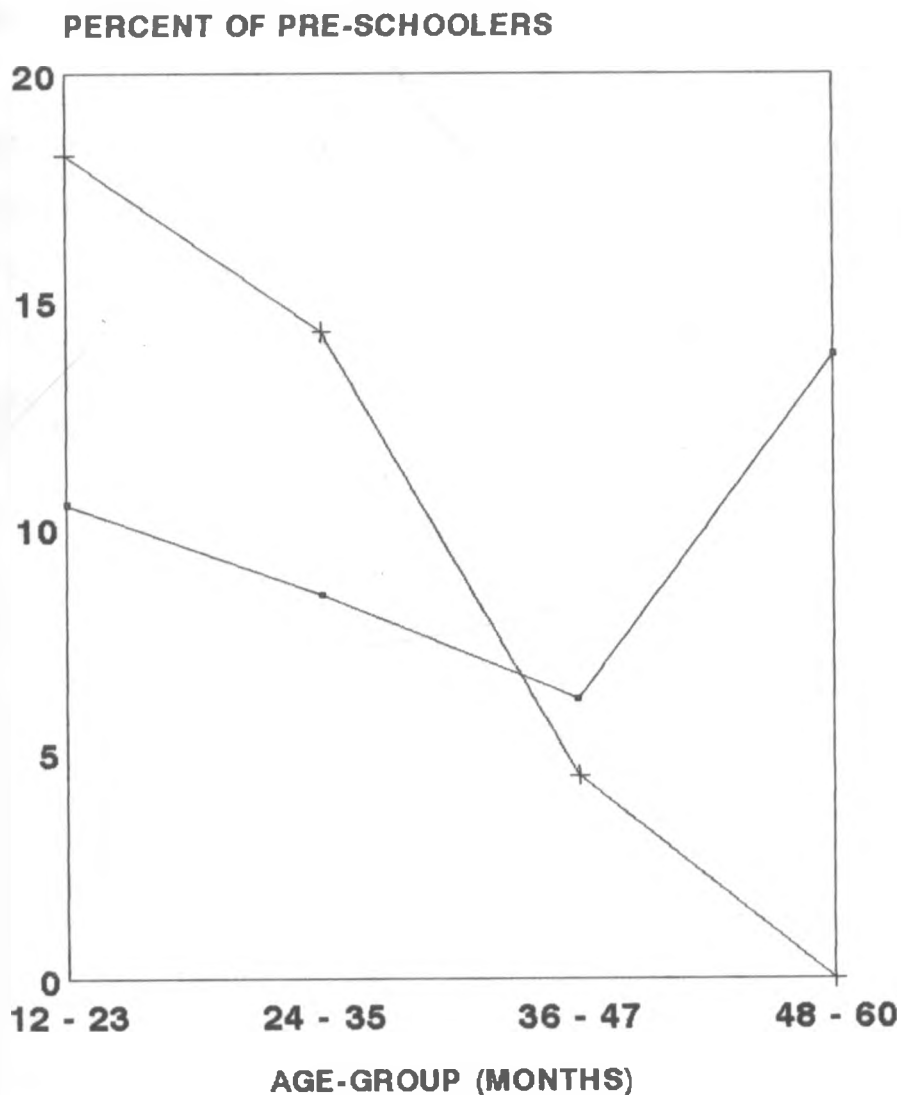
FIG 8: Prevalent of illness (signs & symptoms) among the pre-schoolers.



\* fever, diarrhoea or vomiting.

Analysis of the relationship between malnutrition and illness by age ( Figure 9), revealed that at lower ages the pre-schoolers were less malnourished although they had the highest incidents of signs and symptoms of illnesses. However, at older age this relationship is reversed and the children were more malnourished though less ill.

FIG 9: Relationship between malnutrition (W/H) and illness among the preschool children by age.



—●— %WASTED CHILDREN    —+— % ILL CHILDREN



#### 5.4.3 Relationship between income generating activities and selected parameters

Livestock keeping was considered the main source of livelihood although some of the study households had resorted to other sources of income to enable them meet their daily needs. The main activities of the households engaged in were cultural bomas in 41.9% of the households, cash crop production (40.8%), handicraft (37.7%), poultry rearing (36.1%), sale of food crops (10.5%) and small business (10%).

Income generating activities seem to contribute positively and significantly to the household produce ( $p < 0.05$ ) and income ( $p < 0.01$ ). However it is negatively correlated to both purchasing of foods and the energy intake whose linear association is very weak.

## CHAPTER 6

### DISCUSSIONS

The objective of this study was to determine the food adequacy among the maasai, nutritional status and health condition of the pre-school children, activities geared towards achieving household access to food and their resource base and food purchase.

Before discussing the findings of this study, it is important to put into perspective some major limitations inherent in this investigation. These being mainly the measurements of consumed food and the household adequacy estimates. Consumption of foods outside the home e.g, foods consumed at the neighbours house, hotels, which is a common habit among the Maasai men, was, in this study, not taken into consideration. This implies that food meant for people who have meals elsewhere is probably distributed among the rest of the household members, therefore, the individual intakes being underestimated. External to the household, addition of vitamins and fibre occurs through the consumption of wild fruits, vegetables, roots and wild game among the herding Maasai youths (Nestel,1986). Hence the possibility of underestimation of their vitamin and dietary fibre intake.

The calculation of the household adequacy was based on the recommended daily allowances (RDA) (Sehmi, 1993). The units used are estimates largely based on average, measured requirements, with surplus added to cater for those people with higher than

average requirements among population groups (Bender and Bender, 1986). As such it could be possible that the RDA estimates were over estimated and hence the household adequacy being underestimated, leading to the low levels reflected in the results.

#### 6.1. Factors Likely to Predict Household Food Adequacy and Food Variety among the Household

The factors identified from the study that would be predictors of the household nutrient adequacy include the household wealth and the household expenditure on food and the number of pre-school children in the household.

The household wealth, as measured by the Loitokitok Livestock Unit (LLU) (Appendix 3), seemed to influence the household food availability as well as the nutrient adequacy in the household. Increase in real wealth contributed significantly to the nutrient adequacy by increasing the food production by 20%, and about 5% of the purchased food. The number of under-fives coupled with wealth also improved the dietary intake adequacy by 16%. This was mainly because the amount of relief food distributed per household was dependent on the number of pre-schoolers in the household. Wealthy households had more land and livestock and thus were able to get more returns from the sale of products, animals and crops. As expected they had more food available for household consumption. As documented by Niemeijer et al (1991),

increase in wealth increases the purchasing power of the household, and prevalence of malnutrition usually higher among the poor, hence, the implication that with improved real wealth would lead to improved consumption of food. This then means that the nutritional status of children in poor homes is appreciably worse than those in wealthier households.

The improved food availability was, however, not sufficient to meet the nutrient requirements for the pre-schoolers in the large households. In Kwale, large households have more members contributing to the household budget, but their overall contribution is low and not able to meet the individual household members' requirements (Niemeijer et al, 1991). As such it was not unusual to find that children from large households (over eight persons), were nutritionally worse off compared to their counterparts in medium (4-8 persons) and small (less than four persons) household. The number of pre-school children aged 6-60 months was also predictive of the household nutrient adequacy. Households with at least two pre-schoolers were better off in their dietary intake adequacy compared to households with only one pre-schooler. The explanation for this unexpected observation could be that the households receive relief food aid 'UNIMIX' beside the normal food aid maize, beans and vegetable oil. Distribution of the 'UNIMIX', however, was according to the number of the pre-schoolers in the household. As such those with more pre-schoolers got more. Unfortunately for these children, the 'UNIMIX' was also shared by the whole family thus reducing

the amount available to the children and may have consequently contributed to their poor nutrition well being. Supplementary food meant for the pre-school children is often shared among the household members especially if the food resembles the usual food items (Field , et al, 1970).

Results show that one-third (34%) of the households had their energy intakes that met less than 60% of their requirements, whereas 33% managed to achieve a dietary intake of above 80 % of the energy requirements. This is an indication that one-third of the households were at risk of being food insecure and if the condition continues they might not be able to survive. This unexpected low energy intakes may be due to over estimation of the RDA values used, as the Maasai are less active. However, in a study among the Maasai by Nestel, (1986) and, another in Bangladesh by Hassan and Ahamed, (1986), a vast majority of the rural households in each of these studies had energy intakes that fell far short of their requirements and thee overall prevalence of stunting was high. Hence their dietary requirements are lower than expected requirements based on RDA estimates.

Own farm cultivation was in small acreage of land and a greater portion of it on production of cash crops mainly vegetables, i.e. onions, tomatoes and chillies. Maize and beans were the only food crops grown. To households that sold all or part of their food crop harvest, then the available nutrients further decreased compared to the total amount produced (see table 5.5).

The consumed food crops from own produce provided nearly one-fifth (18 %) of the household energy requirement per consumer unit and nearly half of their protein requirements. The total energy intake adequacy accrued from own produce, purchased food and relief food aid was 73%. The energy intake is within the range of earlier findings among the Maasai, i.e. 65-80% of the requirement (Shah and Froberg, (1980); Greer and Thorbecke, (1984), and Nestel et al, (1993)). Their energy intakes are still lower than those of agrarian population estimated at 80% of their requirement (Shah and Froberg, (1980); Greer and Thoberke, (1984)). this implies that their dietary intake would have been much lower were it not for supplementation of their diets with the relief food aid.

The dietary intake of vitamin A was derived from milk which is rich in available vitamin A. Availability of milk was high at the time of the survey as it was during the wet season, hence the probability that accessibility by the household was also high. Oil fortified with vitamin A was being utilized in preparation of foods therefor supplying small amounts of the vitamin. The low intake of Iron was due to consumption of foods that are poor sources of iron and/ or low consumption of iron rich foods such as meat and green vegetables. As such children and women were more prone to being anaemic and, should the condition persist, it will affect their growth and productivity level.

Most households (87%) were recipients of relief food and thus had access to at least the three food groups: starch, protein and fat/oils. The relief food package consisted maize, beans, vegetable oil and the UNIMIX flour. For those who consumed vegetables and fruits, then their food diversity score added up to five, and it could be assumed that their diets were balanced. However, it should be noted that the food diversity score did not measure the quality of food eaten in the household within the week but was used to give an indication of the food variety.

Increase in household income is usually expected to improve access to food through improved own food production and increased food purchases (Timmer, et al, 1985). In this study however, this is not the case. The probable explanation may be because the income is controlled by the household heads, who are mostly men, and they are the ones who decide how the income should be spent. Most, as also established by Mencher (1985) and Gulati (1980), spent it on purchase of more cattle and other non- food items.

The low production per acreage could have been attributed to the low mechanization, lack of inadequate technical techniques and wildlife menace. The agronomic practices were simple hand dug furrow irrigation and hand hoes. At times tractors were used to plough during the dry season. The chaggas, farm labourers from northern Tanzania, were more often than not left in charge of the farm operations until the crop was ready for harvest. The Maasai

farmer would then take over the marketing of the harvest. Most of the chagga farm labourers did not have formal education and relied on their traditional farm practices knowledge. Lack of other farm inputs such as fertilizers and pesticides as well as money to purchase them contributed to the poor harvest subsequently reducing access of food from own farm production.

Destruction of the crops by pests and animals (especially donkeys, elephants and monkeys) resulted in destruction in harvested stocks and thus, that available to the household. The food patterns of the Maasai are constantly changing. Maize cooked as *Ugali* and eaten with fresh or sour milk is currently the main staple as reported by Nestel, (1989) and Wahome, (1990). However, as established in the focus group discussions, during the dry season when milk is scarce, the *ugali* is eaten with a stew of potatoes or beans or with green vegetables purchased from the market.

Protein intake adequacy (415%) exceeded the household requirement (60 grams/cu/day) (Sehmi, 1993) whereas the energy intake adequacy was low at 73%, compared to the RDA (2660/cu/day). This confirms work by Nestle (1989), which shows that protein is not a deficient nutrient as energy has been and still is despite the introduction of new food crops in the diets. Use of green vegetables as reported in the earlier studies among the same population (Nestel, (1989) and Nestel et al, (1993)) was low.



Focus group discussions revealed low consumption of vegetables as an attitude factor. Vegetables are considered animal foliage especially by the elderly men. However, during the dry season when milk is not available, the vegetables are consumed a relish for the starch. Nonetheless, as reported by Nestel, (1989), the young men eat wild fruits, roots and hunt while herding, thus improving their micronutrient intake. The low micronutrient intake in their diet implies that most of the women and children are prone to anaemia and micronutrient deficiency symptoms.

## 6.2 Nutritional Status and Health conditions of Pre-school Children

Nutritional status is usually an outcome variable influenced by many factors. In this study the child nutritional status was mainly influenced by caloric intake and illness. Inadequate caloric intake affects the body physiological functions, body wasting and also reduces the level of body immunity thus making one more prone to infection. As such, if the condition continues unchecked, the child is bound to be malnourished.

The level of malnutrition among the pre-school children was determined from their anthropometric measurements and categorized as wasting, stunting and underweight. The anthropometric indices of the pre-school children show that the male child was disadvantaged ( $p < 0.05$ ) compared to the girl child. These results

are expected since it is documented that where under nutrition is prevalent girls are physiologically better able to remain closer to the normal growth curve than the boys (Nestle, et al, 1992; Tanner, 1978). In this study, the prevalence of malnutrition in the girl child was highest at the age of 48 months and above in comparison to the boy child of the same age. This could be contributed to the cultural set-up of the community, where the boy child is favoured more. In Asian communities, studies show that it is the girl child who suffers most. The culture idolizes boys dreading the birth of girls. More often than not, the girls are denied equal access to food, health care, education, employment and simple human dignity (SCN, 1991).

The nutritional well-being of the boy child can be explained by the fact that when the boy is 48 months and above, he helps in the herding of the goats and sheep ( usually not far from home). While herding he carries a gourd of milk and also eats what has been hunted or picked by the bigger boys.

The prevalence of wasting in the study area (9%) (at -2SD cut-off points), was higher than those reported in Kajiado District (6.6%), (GOK, 1994), and the current national figure of 6% (ACC/SCN, 1994). Compared with the other areas of similar geographical conditions, prevalence of wasting and underweight (27.7%) among the pre-schoolers was lower than for the pre-schoolers in Samburu (wasting 14%, with 20 % receiving food aid,

Underweight 50%); (GOK, 1994). The prevalence of stunting (56.5%) among the study pre-schoolers is high compared with the findings of the child survey by CBS, (1991), among the pre-school children in rural Kenya, which reported prevalence of the stunting as 18%. These results agree with the most recent survey carried out by the National Council of Population Development (NCDP) and reported by ACC/SCN, (1994), which indicated static or worsening nutritional conditions in all nutritional status indicators amongst children compared to the 1987 national survey. The decline in the nutritional status was caused by a number of factors, among them, the decline in the country's economic growth in the early 1990's; the rise in food prices and the poor utilization of health services as a result of government restructuring caused by the Structural Adjustment Programs (SAPs).

Large household sizes, and more so when the children are many, seems to negatively affect the nutritional status of the pre-schoolers with wasting and underweight being more prone than stunting. These results are similar to findings by Chaudhury, (1986), where the increased household size decreased the allocation of food per member reducing the individual nutrient intake thus affecting their nutritional status. The other reason being the type of weaning foods and the feeding frequency.

As shown by Kigutha et al, (1994), the quality of food consumed

(in terms of energy and nutrient density), might be a more limiting factor to child growth than the actual food availability. It is possible from this study that the lower rates of wasting observed could be attributed to the relief food in the households in the area. The relief food (i.e. UNIMIX), was made of components with high energy and nutrient density. The question we might ask ourselves, is: What would be the implication on the child's nutritional status once the relief food is withdrawn?

The results also indicate a covariation between both malnutrition and disease. Therefore, at early childhood, the children experience more episodes of illness and a fair proportion of them are malnourished. Similar findings were reported in a recent survey by the National Council of Population Development (NCPD) (1994), where high prevalence of malnutrition was attributed to diarrhoeal diseases and vomiting. Other contributing factors are poor feeding during teething, eating dirt (especially as they crawl and learn to walk) and exposure to poor sanitation hence they become malnourished. At later ages, (47 months and more), the relationship between malnutrition and disease is reversed, with children being more malnourished and at the same time less ill. Therefore, malnutrition among the older children is not attributed to illness but probably to inadequate dietary intake.

The poor use of available health facilities may have been another contributing factor to the poor nutritional well-being of the

pre-schoolers. The Maasai they attach strong beliefs on the traditional curing methods of treatment (medicine) which are however not always reliable. They have strong food taboos which restrict both the women and children from consumption of protein rich foods. All these factors are then compounded by the strong domineering males who virtually make all decisions affecting the entire household setup and lifestyle (Nestle, 1989).

The participation of the children in the Growth Monitoring Program was 78 %. This can be regarded as a rough indicator of the utilization of the health services. A more precise pattern of health utilization can be derived from the number of visits at the maternal and child care clinics during the first year of the child's life. In this study, 78 % of the children were reported to have had more than three visits. Although data on visits after the first year of life were not collected, results show that the number of children with incomplete immunization was large, most not vaccinated against measles.

Decline in the national immunization coverage; especially against measles, has been also documented in ACC/SCN, (1994). This suggests that the number of visits to the health centre ceased increasingly towards the end of the first year of the child's life. Seidel, (1992); looking at the nutritional status of children in Rombo, Tanzania observed a similar trend. this then implies that in case of a measles epidemic, most of the

unvaccinated children may get seriously ill and if malnourished may be unable to survive and this may likely elevate the infant mortality rate. The fall in the vaccination coverage from 77.4 to 74.1% can be attributed to the discontinuation of the mobile clinics to areas far from the centre, and the confinement of the services at the health centre.

It was also observed that most mothers associated child growth monitoring with the distribution of relief food aid, particularly the 'UNIMIX' flour, more so than the need to know about their child growth pattern.

### 6.3 Income Generating Activities

Although keeping of livestock and sale of animal products were the main sources of livelihood for the study households, 81% of the households were engaged in other forms of income generating activities. These included cash crop production, sale of food crop, making of handicrafts by the women, running the 'cultural bomas' curio shops, small business trade and poultry rearing. Farming, especially food crop production was the main income generating activity.

In this survey, income generating activities improved the household wealth but with little or no contribution to household financial access to food. These results were unexpected and the control of income by male heads of households is a probable

explanation. These results are not surprising as it has been documented (Kavishe and Mushi, 1993; ACC/SCN, 1989; and Nestel, 1989) that the accrued profits from the income generated activities are controlled by the male household head and only a small portion of it spent on food and the rest is diverted to other luxury consumption.

#### 6.4 Household Resource Base and Food Purchases

Among the study population the three main indicators of wealth were, type and number of livestock owned, the number of girl children and the size of land owned. Wealth in this study was categorized as per the community's concept of wealth; that is wealth in terms of the type and number of livestock owned. A wealth indicator, the Loitokitok Livestock Unit (LLU) was computed in order to establish a standard measure. Those with an LLU below 11 were considered poor. It should however be noted that no consideration was taken to categorize those who work and get salaries but do not own livestock.

Increase in wealth improved household food adequacy significantly ( $p < 0.05$ ). These results were expected as those with large LLU tend to be rich members of the community and also own large pieces of land where they herd their animals. At the same time they also get more from the sale of animal and animal products thus improving the household income. This to some extent improved the household financial access to food.

Findings by Nestel, (1989), while working in the same community, found that although the Maasai may have large herds of cattle and may be producing cash crops, the economic benefits are usually visualized when they sell the animals or animal products or the crops. This occurs when they require money or either to pay school fees, or to meet medical bills. These occasions are usually very few thus the income in the household fluctuates and is not constant except for those seriously involved in commercial trade. This consequently goes a long way in influencing the financial access to food. It is then expected that the contribution of such income to the household budget is small.

Although having a boy child is crucial in the families, having more female children in the family was desirable as the girls are valued for their bride price. As reported by Kaikai (1995), early marriages are to ensure that the girl's suitor is able to meet the dowry. This was seen as a potential wealth as the livestock received as dowry would in the long run boost up the wealth of her father.

The purchase of food was done mainly by the men although some women were given money to purchase food-stuffs. The most commonly purchased foods were maize, rice, beans, cooking fat and sugar. Purchase of meat was only when some money was available. This is expected as earlier studies by Nestle (1989) and Wathome, (1990) showed that slaughter of animals was mainly done during



ceremonies whereas slaughter of animals for ordinary consumption in the household had become rare. Purchased quantities were usually small about a kilo or less.

The community as reported by Nestel, (1989), is one which shares together most of their harvest, hence during the survey, it was noticed that a man would only purchase food-stuffs (apart from maize) that would be enough to be shared to other households within the *boma*. This cultural aspect of sharing seemed to limit the amount of food purchased for the household consumption and especially if he had little money to spend and thus would decide not to buy anything at all rather than buy for his household only, as he would be considered selfish.

Money remitted to the mother of the household by her brother was the only money (income) she had control over. The study however, did not determine the reason behind this phenomenon. More often than not, the remittance received was less than the husbands income. Most of it was spent on purchasing food-stuffs. Although the women cash income is generally lower than that of men, they, however, allocate a higher percentage to the household food (Tinker, (1979); Mencher, (1985); Katona-Apt, (1983)). The question to ask is if improving the mother's income could have a substantial contribution towards improving the household access to food, the household food adequacy and the nutritional status of their children.

## CHAPTER 7

### CONCLUSIONS

A third of the households are likely to be at risk of being food insecure, with an energy intake of less than 60 % of their requirement. The diets are adequate in Vitamin A due to the accessibility to adequate quantities of vitamin A rich foods (milk and fortified cooking fat). Dietary adequacy of Iron is low due to low consumption of iron rich food especially the green vegetables. The reliance on animal products as their staple food has decreased while the utilization of cereals and grains has increased. The relief food aid contribution is an important factor in caloric intake though not sustainable.

Crop production is low due to the poor agronomic practises, wildlife and pest destruction, seasonal fluctuations and the lack of money to buy the farm inputs.

The male household heads controlled the household income and make final decisions on its expenditure hence influencing the food available for consumption in the household.

In terms of nutritional status, boys are more prone to being underweight than the girls. Pre-school children are most prone to being underweight between ages 24 -48 months.

The community's wealth indicators are the type and number of the livestock owned, the number of girl children in the household and finally the land size owned.

Most household mother's income is from remittance received from her brother, much of it becomes part of the food budget. Purchase of food is mostly done by the men as they are the ones who have money.

These results therefore cannot be generalized to the whole pastoral populations as the study focused on the pastoralists who at the moment are undergoing sedentarization as well as other changes in their lifestyles. However they indicate the problems of other pastoral communities who currently are changing their lifestyle to a more agro-pastoralism and commercial trade as a result of reduced grazing area due to the land subdivision and increase in the populations.

## CHAPTER 8

### RECOMMENDATIONS

1. The household energy and iron adequacy in the diets were found to be low and a third of the households food insecure. Improvement in the nutrient adequacy can be achieved through advocacy for more participation in agriculture, improved grain storage methods to reduce losses during storage and through more consumption of foods high in micronutrient. Nutrition education and agricultural extension, should be used as tools, to make the men aware of their household food requirements hence influencing them to allocate more of the household resources to the access of food.

2. The relief food aid was distributed for a period of one year and as such some community members tended to rely on it as a source of livelihood. This tends to reduce the ability for the community to be self sufficient in the food. To promote more long lasting survival strategies, the relief food should only be limited to the emergency period only.

3. Poor health and environmental sanitation exists, thus affecting the nutritional status and health being of the people. The group ranches should allow the community members to construct latrines within the homesteads as a means of controlling the disposal of wastes and minimizing contamination of the water

system.

4. Health personnel and the community health workers need to advocate the utilization of the available health facilities in order to improve the health status of the community, especially that of the children.

5. For most women, their income was from remittance and much of it became part of the food budget. Women should be encouraged to participate more in income generating activities in order to ensure more contribution of women towards the access of food and by implication the nutritional status of the children.

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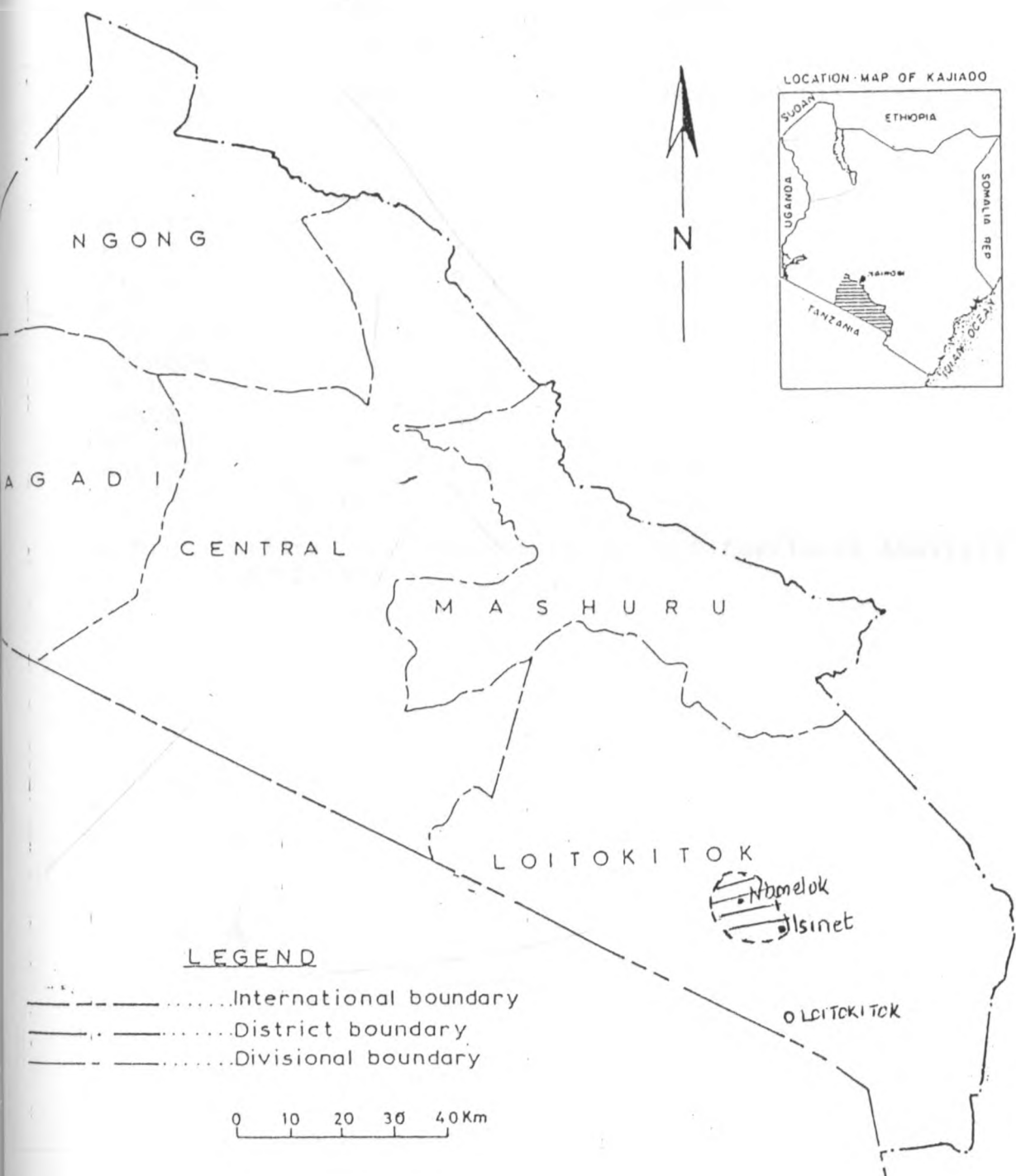
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Map 1 : Map of Kajiado District Showing the Research Site (shaded) Inset , Kenya.



Source: Adapted from Kajiado District Development Plan, 1994-1996 and Kajiado District Atlas (1990)

APPENDIX 2: PREVALENCE OF WASTING AMONG UNDER-FIVES IN SELECTED DISTRICTS IN KENYA

Wasting (%) among under fives in selected Districts in Kenya at two different periods.

DISTRICT	1982	1987
KILIFI	5.1	2.5
KWALE	4.9	1.7
SIAYA	6.3	6.1
KITUI	1.8	3.9
S. NYANZA	1.5	5.4
MURANGA	4.2	4.2
EMBU	2.0	3.6
NAROK	2.5	6.1
KAJIADO	-	6.6 *
BARINGO	6.4	3.6
NATIONAL AVERAGE		2.3

Source: Children and Women in Kenya A Situational Analysis 1992 (GK/UNICEF)

### APPENDIX 3: WEALTH MEASURE AMONG MAASAI OF NAMELOK

Loitokitok Livestock Unit (LLU) is a measure of wealth in terms of the livestock owned by the Maasai of Namelok, Loitokitok District. LLU was calculated using the formula,

$$\text{LLU} = (\text{no. of cows} \times 1) + \frac{(\text{no. of goats/sheep} \times \text{price of goat/sheep})}{\text{price of cow}} \\ + \frac{(\text{no. chicken} \times \text{price of chicken})}{\text{price of cow}}$$

A person is considered poor if he owns less than 10 cows, 5 goats or sheep and 2 chickens. Thus a person with an LLU value of less than 10.99 is considered poor.

The market prices of livestock at the time of the study were:

cow	Ksh. 7,000.00
Goat/sheep	Ksh. 1,300.00
chicken	Ksh. 200.00

APPENDIX 4: DISTRIBUTION OF ENERGY INTAKE ADEQUACY AMONG THE STUDY HOUSEHOLDS

Household nutrient (energy) intake Adequacy

%			n*
Household count	mean	(sd)	
cu/hhd#	6.7	1.8	
<60 % requirement	20	34.4	
60-80 % requirement	19	32.8	
>80 % requirement	19	32.8	

\* Dietary intake sub sample size was 58 households  
#Household consumer units

APPENDIX 5: CLASSIFICATION OF FOODS CONSUMED IN NAMELOK

Food class	Foods
meats/dairy	milk, meat, eggs, beans
cereals	maize, wheat, rice, potatoes
Fat/Oils	animal fat, vegetable oil
green vegetables	kales
fruits	mangoes, avocado, banana



APPENDIX 6: The Pre-school composition by age group\* and sex in Namelok, Kajiado district, 1995.

Age Group	# children	percent	
		Male	Female
12-23	60	46.7	53.3
24-35	61	44.3	55.7
36-47	69	47.8	52.2
48-60	61	54.1	45.9

\*Based on Waterlow et al (1977) Age categorization (for fewer than 100 children per each age group)

APPENDIX 7: Pearson correlation between nutrient (Energy) adequacy, from farm produce, food purchase, dietary intake, and selected variables.

Variable	Nutrient Adequacy		
	Produced	Purchased	Dietary
Household size	0.1526 (0.035)*	-0.0730 (0.316)	0.0599 (0.655)
Child Adult ratio	-0.0215 (0.768)	-0.1303 (0.072)	0.0441 (0.742)
No. of children /hhd	0.1377 (0.058)	-0.0718 (0.323)	0.0433 (0.747)
under-fives /hhd	-0.0870 (0.231)	-0.1123 (0.122)	0.2832* (0.031)
Income	0.1071 (0.140)	0.1454* (0.045)	0.2592* (0.049)
Expenditure on food	0.1921 (0.019)*	0.2336 (0.004)**	0.1942 (0.196)
Income generating activities	0.1727* (0.017)	0.1609* (0.026)	0.2565 (0.052)
Loitokitok livestock unit	0.1948** (0.008)	0.1725* (0.019)	0.2696 (0.041)*

significant at  $p < 0.05$

\*\* significant at  $p < 0.01$

hhd =household.

APPENDIX 8: Pearson correlation Maternal Education and the Household Nutrient Adequacy and Nutritional Status of the pre-school children

Variable	Maternal Education N=191
Own produce	-0.1217 (0.144)
Purchased food	-0.0561 (0.220)
Dietary intake	0.0009 (0.497)
Underweight	-0.0175 (0.405)
Wasting	0.0271 (0.355)
Stunting	-0.0633 (0.192)
Complete immunization	0.0957 (0.097)

## APPENDIX 9: CONSUMER UNITS

For the analysis of survey findings at household level, it is important to standardize household size. The most common way is a straight count of the number of household members, which means each member receives an equal weight. For demographic purposes this is quite appropriate. However, for household consumptions a weighted summation is often needed because the requirements of household members differ from each other. For example the food consumption of a child is less than that of an adult. An approximation of the relative needs is offered by a physiological weighting namely according to the nutritional requirements of the individual household members. This incorporates various biological characteristics: age, sex, physiological status and physical activity level and it offers a fair approximation of overall requirements, also because consumption forms a large part of overall consumption. This weighting is usually termed as "consumer unit".

One consumer unit (cu) is equal to a reference adult male. The reference adult male of 20-29 years of medium activity level is estimated to need 2660 Kcal per day and 60 grams protein per day. Vitamin A and iron requirements for the reference adult male in a household is estimated at 960 micrograms and 40 mg respectively. All the other individuals are expressed as a ratio of this unit (adult male Equivalent) on the basis of their estimated nutritional requirements (Sehmi, 1993). The energy requirements of the various age and sex groups, expressed in terms of consumer units, are as follows.

Adult male	1.0cu
Adult female	0.8cu
Adolescents (12-15)	1.1cu
Children (5-12)	0.8cu
Children (1-5)	0.5cu

NB. 1) The calories are based on a Kenyan man weighing 65 kg. and a Kenyan woman weighing 55 kg.

2) The requirements for calories are also based on the tropical climate prevalent in Kenya.

APPENDIX 10: STANDARDIZATION OF MEASUREMENTS

CONVERSION OF MEASUREMENTS INTO GRAMS

A. GRAINS

Type	Unit				Cup(ml)		
	1/4	1/2	1	2	550	380	220
Maize		700	1200	2000	400	200	90
Beans		500	1200				
Rice		505	1010				
Muthokoi			880				
FLOUR							
Maize	200	455	845				
Wheat	175	417.5	807.5				

B. VEGETABLES

Type	UNITS		
	small	medium	large
Tomato	45	79	85
Potato	25	65	120
Onion	20	68.75	150
Carrot	69	100	128
Cabbage*	950	1300	1775
Sukuma-wiki (leaf)	35		
Green Banana		56	

C. SUGAR /OILS

Type	UNITS	
	tsp	tbsp
Sugar		
Fat		15
Vegetable oil		10

\* cabbages edible portion conversion were :- 323, 442 and 603.5 grams for small, medium and large sizes respectively.

## APPENDIX 11: FOCUS GROUP DISCUSSIONS

### AIM:

1. To build rapport with the members of the community
2. To obtain a general framework of the community lifestyle
3. To learn about the household food security among the community
4. To know the agricultural crops grown and their use.
5. To find out the role of the women and the youth in agriculture.

### QUESTIONS

1. What survival strategies do the maasai have?
  - savings (in money, cows, investments )
  - preparedness
  - in times of stress (drought)
  - seasonal variation
2. What foods are locally grown in this area?
3. What are the foods eaten by people in the area?
4. Is the food grown for household consumption or the market?
5. What is your view on agriculture and its role in household access to food?
6. What is the participation of the youth and elderly women in agriculture?
7. What are the causes of poor harvest?
8. What are you doing to improve agriculture in the area?
9. What is normally used for ploughing?
10. What are the payment terms for 'hired' hands?
11. What do you do with the earnings from sale of harvests?
12. During the dry season when all food reserves have been exhausted, where do you get money from to purchase food?
13. How do you store food from harvest?
14. How do you market your farm produce?
15. What proportion of your harvest do you keep for household consumption?
16. What forms of work do you engage in Food - For -Work?
17. What form of income generating activities do men, women and the youth involve themselves in?
18. How is the income from IGA used?
19. Who purchases food for use in the home?
20. How do you use the relief food received?
21. What household size do you feel is adequate to manage without constraining food reserves?
22. When do you slaughter animals for home use?
23. What type of cooking stoves are usually used in the home?
24. Does the use of a particular cooking stove limit cooking of certain foods? If so which ones.
25. What are *cultural bomas* and what is their use?
26. What participates in the *cultural boma* and what happens to the generated income?
27. What is wealth and how is it ranked?

APPENDIX 12: QUESTIONNAIRES

HOUSEHOLD FOOD ADEQUACY AND NUTRITIONAL STATUS OF PRE-SCHOOL CHILDREN IN A CHILD SURVIVAL PROJECT, NAMELOK. KAJIADO.

GENERAL QUESTIONNAIRE

Date of interview \_\_\_\_/\_\_\_\_/\_\_\_\_ Questionnaire No. \_\_\_\_\_

Name of interviewer \_\_\_\_\_

Cluster \_\_\_\_\_

Location \_\_\_\_\_

Household Number \_\_\_\_\_

Name of household Head \_\_\_\_\_

Name of respondent \_\_\_\_\_

=====

For supervisor

Are all questions filled \_\_\_\_\_

Are the responses reasonable \_\_\_\_\_

Is the questionnaire ready for keying \_\_\_\_\_

Other comments on the questionnaire







What method was used to plough the fields  
last season \_\_\_\_\_

- 1=hand hoe
- 2=Oxen/donkey
- 3=Tractor
- 4=Hand hoe and oxen
- 5=Handhoe and tractor
- 777=No land cultivated

Of the methods used to plough how was it paid for? \_\_\_\_\_

- 1=household own it
- 2=Hired /Rented
- 3=Borrowed
- 777=No land cultivated

Do you use irrigation to grow any of the following? \_\_\_\_\_

- a) cash crops \_\_\_\_\_
- b) food crops \_\_\_\_\_
- c) horticultural crops(vegetables) \_\_\_\_\_

CODES

- 1=Yes
- 2= No
- 777=No land cultivated

Were you able to harvest enough food to feed  
your family (to the next season) last season \_\_\_\_\_

- 1= yes
- 2= No
- 777=no land cultivated

12. Did you purchase the following food items in the period of the last one month?

Food	Freq.	amount	Unit	cost/unit
maize				
Maize flour				
beans				
Rice				
Wheat flour				
Meat products				
Milk				
Fats and oils				
sugar				
Special baby food				
Vegetables				

Frequency	Units of measurements		
01=daily	01=kg	09=bundle	17=Bottle(beer)
02=Weekly	02=counts/#	10=loaf	18=Bottle (soda 500ml)
03=Monthly	03=bunch	11=packet	19=90 kg bag
04=Every 2-4 Months	04=2 kg tin	12=nets	20=50 kg bag
05=Rarely	05=Crates	13=Litres	21=Debe
06=Yearly	06=1kg tin	14=Guard	22=Heap
07=When there is need	07=0.5 kg tin	15=bottle 700 ml	23=carton
08=Never	08=0.25kg tin	16=bottle (soda 300ml)	

NB:GUARD (#OF CUPS CONTAINED &SIZE OF THE CUP)

13. What are the three main sources of food for the household? \_\_\_\_\_

Code

1=Own produce    2=Relief    3=Purchase    4=Donations

14. In the last 6-12 months have you received relief food either from the government or other organization? \_\_\_\_\_

a) Last 6 months \_\_\_\_\_

b) Last 6-12 months \_\_\_\_\_

CODES

1=Yes

2=No

15. If YES, what type(s) of foodstuffs were received

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

16. What is the main source of livelihood for this household?

- 1-Selling animal or animal products
- 2=Food crop production
- 3=Cash crop production
- 4=Employment (salary)
- 5=Self employment
- 6=Casual work
- 7=Borrowing/ begging
- 8=Others (specify ) \_\_\_\_\_

17. What was your last month's total income

\_\_\_\_\_

18. Approximately how much did you spend on food last month? (ksh)

\_\_\_\_\_

19. Do you have any other source of income?

- 1=YES
- 2= NO

\_\_\_\_\_

20. If so, from whom?

- CODES 1=sons/daughters living away from home
- 2=none
- 3=brother

\_\_\_\_\_

21. How much did you receive from them last month

\_\_\_\_\_

### HOUSEHOLD CHARACTERISTICS

23. What is the type of the house?

- 1=permanent
- 2= Semi permanent
- 3= temporary

\_\_\_\_\_

24. Observe the main house and record the building materials.

- a) Floor
- b) Walls
- c) Roof
- d) Toilet

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### CODES

- 1=mud
- 2=tin
- 3=iron sheet
- 4= thatched grass
- 5= stone
- 6=Wood
- 7=cement
- 8=cow dung
- 9=No toilet

25. What are the main sources of drinking /cooking water

- a) in dry season
- b) in wet season

\_\_\_\_\_  
\_\_\_\_\_

### CODES

- 1= Taps
- 2= Bore holes
- 3= River
- 4= Rain harvesting
- 5= Spring

26. What are the main types of cooking fuel used in the house? \_\_\_\_\_

CODES

- 1=Firewood                      2=Charcoal                      3=Kerosine  
4=Gas                              5=Electricity

b) How long does it take to fetch the fuel (minutes of walking) \_\_\_\_\_

CODE 999=BOUGHT FUEL i.e electricity, charcoal or gas

27. Does the household own any of the following? and if so , How Many

	yes/no	Number
a) Bicycles	_____	_____
b) wheel burrows	_____	_____
c) car (moving)	_____	_____
d) tractor	_____	_____
e) television	_____	_____
f) radio	_____	_____

28. Does the household own any of the Following?If so, how many?

	Yes/No	Number
a) cows	_____	_____
b) goats	_____	_____
c) sheep	_____	_____
d) birds (chicken)	_____	_____
e) donkeys	_____	_____

29. Does the household receive any assistance in form of

a) child sponsorship to school? \_\_\_\_\_

1=YES    2= NO

b) a needy farmer \_\_\_\_\_

1= YES    2= NO

30.

## HOUSEHOLD FOOD FREQUENCY

Ask the head female of the household the following questions. During the last week how often did your family eat the following foods?

FOOD ITEM	FREQUENCY/WEEK	SOURCE
Milk whole Fresh		
Milk sour/fermented		
Animal fat		
Vegetable oil		
Maize		
Ugali		
Bread		
Uji		
Meat/chicken		
Beans/other pulses		
Eggs		
Rice		
Potatoes		
Fresh green vegetables		
Bananas (ripe)		
Mangoes		
Pawpaws		
Avacados		

ode

source: 1=purchase 2=own grown 3=donated/gift 4=barter 5=No answer 9=DNK

HEALTH SERVICES AND USE

31. How far (in minutes of Walk) is the nearest health facility \_\_\_\_\_

32. For children of ages 12-59 months, collect the following information.

CHD.NO	DATE OF BIRTH	SEX	GMCARD PRESEN	#GM.Y R 1	BREAST FEEDING	HEALTH C.USED

33. In the last one week has the child been ill? \_\_\_\_\_

1=YES 2= NO

34. If YES what has the child been suffering from?

CHD.NO	ILLNESS	CODE

code:

Sex:1=Male  
2=Female

Card present:1=Yes  
2=No

Breast feeding:1=Yes  
2=No

Disease episode:1=Not sick  
2=Fever  
3=Diarrhoea  
4=Gastrointestinal problems

5=headache  
6=Wounds/scabies  
7=Eye problems  
8=Malnutrition  
9=Others(specify)\_\_\_\_\_

health care:1=None  
2=Purchase medicine from shop  
3=GOK health centre  
4=Private/Religious health facility  
5=Traditional health care  
6=Home remedies

35. Immunization status of children 12-59 months of age

CHD.NO	BCG	1 POLIO	2 POLIO	3 POLIO	4 POLIO	1 DPT	2 DPT	3 DPT	MEASLES VAC	DIS

36. Collect the following anthropometric measurements for each child of age 12-59 months

CHD.No.	AGE MONTHS	WT 1	WT 2	AV.WT	HT 1	HT 2	AV.H T

37. How many Tetanus toxoid injections did the child's mother receive during her last pregnancy? \_\_\_\_\_



HOUSEHOLD FOOD ADEQUACY AND NUTRITIONAL STATUS OF PRE-SCHOOL CHILDREN IN A CHILD SURVIVAL PROJECT, NAMELOK. KAJIADO.

HOUSEHOLD FOOD COMSUMPTION (24 HOUR DIETARY RECALL)

Date of interview \_\_\_/\_\_\_/\_\_\_ Questionnaire No. \_\_\_\_\_  
 Name of interviewer \_\_\_\_\_  
 Cluster \_\_\_\_\_  
 Location \_\_\_\_\_  
 Household Number \_\_\_\_\_  
 Name of household Head \_\_\_\_\_  
 Name of respondent \_\_\_\_\_

=====

Please ask the mother the following questions and fill up the following table.

1. Starting from yesterday morning what did the household eat?
2. What were the ingredients in the dish?
3. Who ate the food?
4. What amount was cooked ?
5. Where did the food come from?
6. Was there any left over? if so what amount?

TIME	COOKED DISH	INGREDIEN T RAW	INGR AMT.	SO UR CE	AMT. COOK ED	CONSUMED BY			LEFTOV I.P
						<5	5- 15	15+	
MORNING									
LUNCH									
SUPPER									

