POST-HARVEST FACTORS AND HOUSEHOLD FOOD SECURITY IN NDEIYA LOCATION, KIAMBU DISTRICT

BY

PAUL KIHUGU KURIA

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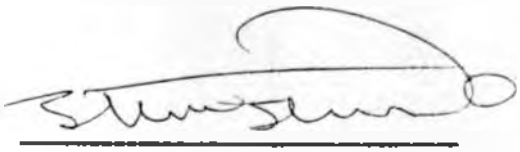
DECLARATION

This thesis is my original work and has not been presented for an award of a degree in any other university

12.10.01

Paul Kihugu Kuria **Date**

This thesis has been submitted with my approval as the University Supervisor



12/10/2001

Dr. Steve M. Nangendo **Date**

Senior Research Fellow

DEDICATION

To my parents Peter Kuria and Monica Waithira for their encouragement and selfless sacrifice in financing my education

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ABSTRACT

This study was designed to examine post-harvest factors and their influence on household food security. The study was carried out in Ndeiya Location, Kiambu District, between November 1999 and January 2000. The study sought to investigate the extent to which post-harvest food technology influences household food security, the effect of food selling on the availability of household food, and the impact communal food sharing has on household food security. This study was guided by entitlement theory propounded by Amartya Sen.

The main method of data collection was structured interviews using a standardized questionnaire administered to a randomly selected study sample of 90 respondents. Data was also gathered through direct observations, key informants, focus group discussions, and reviewing of documentaries. The data were analyzed both quantitatively and qualitatively and the information presented in form of the tables and descriptive accounts, respectively.

The findings reveal that households tend to lose large quantities of grains due to improper post-harvest food handling, including food storage and preservation. Lack of reliable sources of income forced a majority of households to result in food selling in order to fulfil a myriad of subsistence needs. The study also revealed that although food sharing is a culturally defined strategy of subsistence, it hardly insured households against suffering food shortages. In fact, it exposed households to food insecurity.

It is, therefore, recommended that extension services on post-harvest food handling should be directed to the study area. Improved and cost effective methods of food storage and preservation should be introduced in the area. To reduce high dependence on maize as a cash crop, small-scale cash cropping that had been existing should be reactivated. It is also recommended that development agencies should assist in improving on the various off-farm income generating activities in which respondents engaged so as to increase the households incomes.

The study holds that with improved food storage systems and less dependence on food selling to earn supplementary incomes, households are likely to improve their access to adequate stocks of food. Subsequently, food sharing would be reduced and its negative impact largely nullified.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

Food is the first basic need of humanity and is essential for survival, growth and functioning of people. Although access to food is a basic human right (GOK / UNICEF, 1998), more than 830 million people in the world suffer from food insecurity while malnutrition contributes to the death of a child in every eight seconds (World Food Programme, 1998).

Surprisingly, while the global economy produces enough food to feed the world's population, an increasing proportion of Africa's people have a limited access to adequate food to sustain a healthy and productive life (Ndegwa and Green, 1994; Hinrichsen, 1997). The Food and Agriculture Organization (FAO, 1996), for example, has observed that 41 countries in Africa do not have enough food to feed their population or financial resources to pay for food imports.

On the recognition that proper nutrition is more than just sufficient food intakes, UN agencies and many governments have laid emphasis on household food security rather than on national food security (Ingham, 1995). Also, it has now been acknowledged that the household is the basic and appropriate social unit where most people gain access to food (GOK/UNICEF, 1998:143). Food security refers to the access required by all people at all times to safe and nutritious food to maintain a

healthy and active life (FAO, 1996:64; World Bank, 1986; WFP, 1996:7, 1997). Although other authorities differ from this definition, Maxwell (1996) asserts that the key defining concepts of household food security are security, sustainability and vulnerability. Thus, food insecurity refers to the lack of access to sufficient food

Numerous studies on household food security in sub-Saharan Africa have precipitated the emergence of various schools of thought. In addressing the various factors influencing food security, for example, some authorities have underscored natural factors such as adverse climate, shortages of arable land, calamities such as flooding and drought, and invasion of crops by pests. Others, especially in the last few decades, have focused on human-made factors that include loss of agricultural land to urbanization, high population growth rates, unstable political systems and civil wars, deteriorating infrastructure, and cultural beliefs and practices.

Noting that household food security focuses on the needs of the poor, Ingham (1995) suggests that, as a policy, household food security should emphasize production for own consumption and for sale as well as improving post-harvest practices. This study is partly based on Ingham's suggestions.

1.1 Problem Statement

This study examined some of the post-harvest factors influencing household food security. Despite the Kenya government's recognition of the paramount importance of ensuring food security for its people (GOK/ UNICEF, 1998), there is no doubt that

a considerable proportion of households is food insecure. Concerns regarding household food security in Kenya have been intensified in the last decade due to the decline in food production since the late 1980s (GOK / UNICEF, 1998). Specifically, the decline in the production of maize in the last five years is a clear indicator of food insecurity (FAO, 1999a, 1999b; GOK, 1998). This observation points to the continental food crisis, for instance, it is now reported that Africa is producing nearly 30 percent less food per person than in 1967 (Hinrichsen, 1997:4).

In the recent past, food security in Kenya has been a topical issue among non-governmental organizations, the government and local communities. The reported rampant food shortages occurring in the arid regions such as Turkana, Wajir, and Garissa Districts as well as in some arable regions of Central Province (*Daily Nation, 22 November, 1999; 5 March, 2000)* points to the extent to which food insecurity has a devastating effect on development. This is because food insecurity has both socio-cultural and economic implications, for instance, it is the most visible manifestation of poverty in Kenya

Households in Kenya are expected to meet their food requirements basically through food cultivation, purchases from the market, and through social systems of food acquisition, for example, begging, as well as intra- and inter-household food sharing (Omosa, 1998). Being an agrarian country, a majority of the households do produce their own food through cultivation. However, food sharing and purchasing is common among both farming and non- farming communities alike.

Many studies on household food security in Kenya have concentrated on the pastoral communities, drought stricken arid and semi-arid communities, the urban poor and cash crop growing communities. The assumption has been that food producers are food self-sufficient. However, several authorities concur that female-headed households, inhabitants of semi-arid areas, as well as households growing dual staple foods are also vulnerable to food insecurity (Horenstein, 1989; Mbatia, 1990; Njiro, 1994; Shaw, 1986; Sutherland et al. 1998; World Bank, 1986). A more recent study in southwestern Kenya reveals that some households in very high potential food producing zones of Kisii District are equally vulnerable (Omosa, 1998). This is attributed to the incorporation of the subsistence production system into the market economy. Omosa further observes that the weakening of cultivation as a source of food compounded by uneconomical land fragmentation, and the subsequent shortage of arable land as well as the challenges that surround the market as an emerging alternative, have all resulted in the declining food position of Kisii District.

Attempts to study household food security in semi-arid areas have been guided by a general assumption that crop failure and subsequent food shortages persistently characterize these areas. There is a need, however, to underscore the fact that some semi-arid zones, especially those emerging into wetter high agricultural potential areas, produce food even for the market. For example, pockets of Machakos District, some semi-arid areas of Tharaka–Nithi, Embu and Narok Districts, are just but a few of the high agricultural potential semi-arid areas (Campbell and Migot-Adholla, 1981; Sutherland, et al. 1998; Waema, 1995). Ndeiya Location, where this study was

carried out, is a hardship area that harbours a relatively high agricultural potential (Bullock, 1975; GOK, 1997a) which has been reasonably exploited through subsistence farming. Nevertheless, like other similar areas, Ndeiya occasionally depends on relief food even after producing sufficient quantities of basic food crops.

Quantitative studies, for example, as documented in government papers, provide statistical data of the volume of food harvested, as a major indicator to extrapolate and predict the situation of food security in a particular area at a given time (GOK, 1998). This picture pleasing as it is, however, conceals a much more complicated situation, including the social, technological and economic factors following food harvesting and how these influence food security.

This study sought to generate qualitative insights into household food security in a semi- arid food producing community. A general guiding question to this study was what socio-cultural and economic factors following food harvesting have a bearing on household food security? In an endeavour to answer this question, this study examined some post-harvest factors and their influence on food security. Specifically, the study sought to address the following questions:

1. To what extent does post-harvest food technology influence household food security?
2. What is the effect of food selling on household food security?
3. What is the impact of communal food sharing on household food security?

1.2 Objectives of the Study

1.2.1 Main Objective

To establish and discuss post-harvest factors influencing household food security.

1.2.2 Specific Objectives

1. To investigate the extent to which post-harvest food technology influence household food security.
2. To investigate the effect of food selling on household food security.
3. To determine the impact of communal food sharing on household food security.

1.3 Rationale of the Study

Food security is a subject of global concern. In 1996, FAO generated a new attention to achieving food security, which was skewed towards improving yields on marginal lands. This attention proposed the introduction of more efficient farming techniques to help subsistence farmers in marginal lands (Hinrichsen, 1997: 16-19). In line with FAO's proposal, the Kenya government intended to achieve national food security mainly through the implementation of advanced agricultural production programmes in arid and semi-arid areas which cover about 80 percent of the total land surface (GOK, 1997b). Campbell and Migot-Adholla (1981) have observed that Kenya's semi-arid areas are characterised by heterogeneity in ecological conditions and production systems. This study sought to generate insights into food security in a semi- arid area of moderately high agricultural potential. Consequently, the findings

should be of interest to development agencies in designing area-specific intervention programmes on household food security.

Semi-arid areas emerging into high agricultural potential zones are characterized by population pressure resulting from natural increase and in-migration by cultivators from high potential land areas (Campbell and Migot-Adholla, 1981; Odingo, 1972). To meet the food requirements of such an increasing population, proper post-harvest food handling is imperative. Moreover, it should be noted that reduction in post-harvest losses could increase food supply without increased production. This study addresses this issue which has largely been ignored by researchers and administrators (International Development Research Centre, 1980).

Apart from broadening the existing knowledge on food security in semi-arid areas, the findings should contribute to the government's efforts of implementing the already proposed projects in Ndeiya Location, including the construction of grain stores at farm level, training farmers in modern improved food storage and preservation methods and the introduction of dry crop farming (GOK, 1997a). Moreover, the findings may help improve food security intervention programmes designed by church organizations and other non-governmental organizations working in the area. In response to food insecurities currently affecting most parts of Kenya, some findings of this study and the recommendations drawn thereof should form a major input for development agencies seeking for a package of solutions to the problem.

1.4 Scope and Limitations of the Study

This study focused mainly on the post-harvest factors influencing food supply in the households. The study, therefore, concentrated more on the farm food production option as a strategy of enhancing household food security. This is because nearly all subsistence farming rural households depend on farm produce to achieve food security. However, availability of adequate staple food to the households is an indicator of food security, thus, justifying the focus of this study on the main foods. The study did not focus on the field management practices that to some extent influence post-harvest food handling.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter is broadly divided into three sections, namely, literature review, theoretical framework, and assumptions.

2.1 Literature Review

The literature review is divided into four themes, namely, agricultural sector and food security, food storage, preservation and security, food production and income generation, and social networks and food security.

2.1.1 Agricultural Sector and Food Security

In developing countries, agriculture is the major source of food and livelihood. In fact, 60 to 80 percent of the people in these countries engage in farming (Achebe et al. 1990; Scrimshaw, 1968). However, their agricultural productivity does not keep pace with the rising demand for food. Contrary to this, Rempel (1985) observes that although sub-Saharan Africa has an escalating food deficit problem, it is a net exporter of food.

GOK (1997b) acknowledges that about 80 percent of Kenya's population live in rural areas where agriculture is the basic means of livelihood. Since over 75 percent of the

total land surface in Kenya is arid and semi-arid, the high potential agricultural zones are over-exploited, thus resulting in uneconomical land fragmentation. A forecast by Kliest (1985) reveals that by the year 2000, a majority of Kenya's districts will have high population depending on too small a productive land, to enable every family to live at a minimum subsistence level. High population pressure and shortage of land have precipitated the in-migration of cultivators to the marginal lands on which farm production is dependent on rainfall patterns (Dietz, 1981; GOK/UNICEF, 1998).

Most of the farms in Kenya are small parcels, but produce a major proportion of the domestically produced foodstuff, cash crops, and livestock. This accounts for 75 percent of the total production and 50 percent of the marketed surplus (GOK, 1997b; GOK/UNICEF, 1998) which ensures the availability of adequate food on the market. In general, the performance of Kenya's agricultural sector does not compare unfavourably with that of the majority of other African states (Kliest, 1985). However, as a result of population pressure on land resources, adverse climatic conditions, and the impact of worldwide economic recession, the performance of the agricultural sector in Kenya has in the last few decades deteriorated (Kliest, 1985; Ochoro and Omoro, 1988).

As cities continue to expand in developing countries, people are growing more and more food in urban areas. In Accra, Ghana, for example, urban gardens supply the city with 90 percent of the vegetables (Hinrichsen, 1997). In her study on urban farming in Nairobi, Mwangi (1995) documents the significance of urban agriculture

on food security among the low-income groups. On the other hand, Nimez (1985) observes that the food crisis in Africa may be partly reduced by encouraging urban agriculture. The poor planing of urban centres and the high demand for construction land have hindered the success of urban farming in many cities of Africa. The rapid growing of slums in the immediate outskirts of the cities have generated a relatively proportional food problem marked with recurrent food shortages and hunger plague. Although urban agriculture in Kenya is not legalised, Mwangi (1995) asserts that various non-governmental organisations continue to finance programmes designed to facilitate urban agriculture. She further observes that households from slum areas engaging in urban farming are generally food secure. Moreover, urban farming is an additional income generating activity for the urban poor.

Some authorities assert that improvement in the agricultural sector does not necessarily translate into improved food security. At one extreme are scholars such as Bodley (1985), Cohen (1987) and Dando (1980), who strongly believe that food insecurity is a product of agriculture and, hence, more prevalent in modern societies than among early hunters and gatherers. In his contribution, Hogg (1987) has observed that development projects in Kenya aimed at encouraging pastoral communities to practise farming have led to escalated food problems and desertification. In many parts of western Kenya, commercial agricultural production, including sugarcane and tobacco farming was introduced with an outstanding theme of increasing food accessibility. However, Egesah (1994) and Wandere (1991) lament that these programmes have turned most parts of Western Kenya into home-grown

food deficit areas. Wandere has, therefore, attributed the problem of low nutritional status of children, for instance, in South Marama to the poor performance of both subsistence and commercial agriculture.

The contribution of women in agricultural production is greater in Africa than anywhere else in the world. The gender division of labour for export and food crops is well defined. In sub-Saharan Africa, women are the primary food producers (Downs et al 1991). In Kenya, women are increasingly undertaking small holder agricultural production. Horenstein (1989) observes that approximately 96 percent of the rural women work on the family farm. A paradox arises when some authority points out that women are victims of food insecurity irrespective of their tireless contribution in food production. In her discussion of the 1949 Nyasaland famine, Vaughan (1992) documents the entitlement changes among women, which rendered some of them more vulnerable to food insecurity. She also vividly discusses a myriad of strategies employed by women in coping with food shortages. However, both men and women are equally important in different phases of the food production cycle.

2.1.2 Food Storage, Preservation and Security

> *Nobody knows how much food man labours every year to produce.*
> *only to see it taken off by rats and insects or spoiled in a hundred*
> *different ways (FAO, 1969:v)*

Appropriate food storage facilities are an essential aspect for ensuring food security at all levels of human organization, namely, national, community, and household. Good

storage facilities and food preservation measures increase the household command over the staple food grain (Subbo, 1996).

At the national level, the success of food reserve policies greatly depends on adequate and secure facilities to store the locally produced or imported grains. While food losses can occur before and during harvests, the greater losses are realized during storage. Scrimshaw (1968), for instance, notes that the largest post-harvest loss of food to insects and rodents occurs in low-income food–deficit countries. Arguing along the same lines, IDRC (1980), as well as Saito and McCarney (1990) estimate that one-fourth of all the food produced in African countries is lost due to spoilage, insects and rodents. IDRC laments that those farmers who lose their harvests this way must increase production by 50 percent simply to replace their losses. Lema (1981) and Shamalla (1982) assert that post-harvest food loss has a direct bearing on entrenched food crisis in sub-Saharan Africa. Lema laments that most developing countries lack even the most rudimentary facilities for drying, preserving and proper handling of food after harvest. Mass grain loss is, therefore, common when harvesting and rain seasons coincide.

Among the farming communities of Kenya, much of the harvested food is stored in the farmer's stores. The United Nations Environmental Programme (1983) notes that for many subsistence farmers their stored food is an asset and any food loss is an indicator of serious economic loss. Likewise, the on-farm storage system is an important asset to the farmer in providing space to keep the family's food as well as

the necessary farm inputs (World Bank, 1980, cited in Shamalla, 1982). At this level, Ndegwa and Fenwick (1986) contend that pests and inappropriate storage facilities largely cause food losses. In 1985, a review of storage policies in Kenya revealed that 80 percent of the maize producers had inadequate storage facilities that would store maize for more than two months (Maritim, 1985, cited in Horenstein, 1989).

Over time, farmers have devised ways and means of storing food. Food grains, for example, may be stored in or out doors, under or above ground in bulk or in bags and containers, and in indigenous or modern types of structures (Abdel-Aziz, 1975; Bodholt and Diop, 1987; UNEP 1983). The United Nations Development Fund for Women (UNIFEM, 1993) has established that farmers store staple grains because of some of the following reasons: For home consumption, as seeds for the next crop, for marketing later in time when prices improve, as well as for socio-cultural reasons, such as gift giving, offerings and sharing with kinfolk.

Food storage is more than just an economic aspect. Gender issues, for instance, are essential in analyzing food-storing processes in developing countries. In Central America, Asia and Africa, it is usually women who store and handle food (Dey, 1984; UNIFEM, 1993). Among the Agikuyu, after the harvest, women were expected to store sufficient grains to last their family until the next harvest. The stored grain was dished out carefully by the wife, with the view neither to be wasteful nor starve the family (Kenyatta, 1961:63). Among the pre-industrial Babukusu of Western Kenya, Nangendo (1994) observes that every wife stored food harvested from her plot in her

own granary. Men were prohibited from interfering with such a stock. For the Abagusii, food stocks belonging to the head of the household (man) were hardly accessible to the wife (wives) except in cases of severe shortages (Omosa, 1998:86). Noteworthy, however, is that in many pre-literate food growing societies in Kenya, the length of time a harvest lasted depended on the organizing skills of the wife.

2.1.3 Food Production and Income Generation

As argued by Sen (1981) and Sutherland et al (1998), household food security is not simply a function of household food production. Perhaps, Heisey (cited in Sutherland et al., 1998) is more precise in contending that household food security is more closely related to income levels than production levels.

Throughout Africa, almost all food crops are also cash crops and rarely the reverse is true (Sen, 1995; Shipton, 1990; Watts, 1991). The dichotomy between cash and food crops is artificial in most parts of sub-Saharan Africa. Communities growing food crops both for own consumption and sale are vulnerable to food insecurity. Mwape and Russell (1992), for instance, observe that farming households in Zambia growing hybrid maize as a dual staple food and cash crop are among the least food secure. Food crops provide most of the cash income for the majority of sub-Saharan African rural households (Shaw, 1986), where the ability to produce is associated with the need to sell.

The traditional African economy was geared towards self-sufficiency. Among the

Agikuyu, food would be sold only when the family had a genuine and immediate need to satisfy, and when scarcity of that particular food occurred in the market (Kenyatta, 1961). However, in the modern economy, food production is geared towards the market demand. The 'surplus' food is sold, irrespective of the supply situation in the market. However, Shamalla (1982) and Shipton (1990) observe that the foods which subsistence farmers sell are not necessarily 'surpluses'.

In areas with a high proportion of food-poor households and where subsistence farming is the primary source of livelihood, the selling of produce immediately after the harvest when the prices are low is necessary (GOK/UNICEF, 1998). In such poor households, food is the only commodity for exchange as well as collateral for winning social favours. Persistent dishing out of food from the stores for sale hightens vulnerability to food insecurity.

Other scholars have argued that the rush to dispose of produce after the harvest in most rural farming households is a reflection of lack of appropriate storage facilities. The fear for eventual loss of the harvested yields causes the farmers to rush to sell what they consider 'surplus' (Shamalla, 1982). More often than not, this practice result in a situation where households buy the staples they sold against higher prices. Such a perverse supply response sets into motion a vicious circle of poverty (Shipton, 1990: Sutherland et al. 1998).

In analysing the impact of structural adjustment programmes on household food

security, many authors agree that the reduction of subsidies in health and education sectors has forced poor households to sell food to raise the cash required to meet health and education needs. Noting that households in semi-arid areas place a particularly high value on education, Sutherland et al (1998) lament that many households sell family food stocks to pay for school fees for their children, thus reducing the amount of food available for own consumption. Ndegwa et al (1985) admit that there is a direct cost of education to rural based cultivators in terms of cash for building funds, uniforms and school fees. On the other hand, IDRC (1980) observes that an increase in food production in arid and semi-arid areas would greatly improve the health and economic well being of the rural poor.

The change in food preferences towards the consumption of 'tasty' or 'civilized foods', such as wheat and rice, has influenced food selling among the low-income earners. Farmers may opt to sell staple grain (maize) at lower prices to purchase the processed foods and additives at exorbitant prices (Seebohm, 1984; Waema, 1995).

The collapse of government parastatals supporting various cash crop productions has an influence on food selling. Many households that practised food and cash crop cultivation now have to depend on food crops to generate cash. Also, in most communities cash crops were controlled by men and, by virtue of the decline in cash crop production, both men and women depend on the same food crop to generate income. At some point, cash crops are essential in providing income required by the household to meet school and health fees. However, there exists some evidence that

an increase in the availability of cash in households does not proportionally correspond to an increase in food availability. This is partly because, some of the money is diverted to other activities that do not directly address matters pertaining to food availability and accessibility (Corbett, 1988:1099).

Related to their role as farmers is women's involvement in marketing agricultural produce. Due to escalating poverty in many agricultural communities, Pala (1976) observes that the need to purchase household basic items constraints women to sell off portions of the food supply even against their own best judgment.

2.1.4 Social Networks and Food Security

Among human societies, the acquisition of food is in part at least a corporate responsibility. Human beings are, therefore, organized into various social units of differing magnitudes to enhance survival through actual food production, distribution and consumption (Isaac, 1978; Scupin, 1995). Family and kin groups in many food producing societies are essential in the organization of agricultural production resources, such as labour. The strong social forces of reciprocity induce the individuals' relationships in social networks. Basically, reciprocity is the exchange of goods and services among people (Sahlins, 1972).

Sahlins has identified three types of reciprocity, namely, generalized, balanced and negative. All, however, are guided by the principle of sharing and the social distance between the persons. General reciprocity may be mandatory for the family and close

kin members while balanced reciprocity is practised among 'equals'.

Safety networks are communal institutions in all aspects of the economy. In Laikipia, Opondo (1995) observes that social networks enhance labour availability during the peak seasons, and latently improve food production. Generally, households living in conditions, which put their entitlement to food at recurrent risks, will plan strategically to minimise these risks. The particular response adopted by a household varies with, among other issues, the perceived causes of food insecurity (Corbett, 1988). Corbett orders coping strategies into three distinct stages, that is, insurance mechanisms, disposal of productive assets, and distress migration. The author elaborates that when households are faced by rapidly declining entitlements to food, they first respond by employing insurance mechanisms characterised by, reduction of current consumption levels, labour migrations, disposal of personal possessions, collection of wild fruits, and increased petty commodity production. Insurance mechanisms are very common at times of transitory food shortages common in most parts of Kenya. Initial responses to food crises are generally coping mechanisms with smallest commitment of domestic resources.

With increased severity of food crises, households results to disposing of key productive assets that involve the selling of large animals and agricultural tools, mortgaging of land, and acquisition of credit from merchants. Disposing of productive assets by households signifies the exhaustion of possible actions available for gaining access to food at a smaller opportunity cost (Corbett, 1998). The writer observes that the terminal coping strategy occurs sequentially when households are

virtually assetless after employing the first two stages unsuccessfully. Persisting food crises motivate households to migrate in search of relief. Corbett cautions that when a large number of households reach destitution stage without any external intervention, mortality is registered.

In her study among the Abagusii of southwestern Kenya, Omosa (1998) established that social safety networks are an essential strategy of securing food in a household. The scholar observes that by mapping out the social networks of a household, it is possible to deduce its food security situation. Shipton (1990) has observed that social investments that include giving, sharing or lending to others with an expectation of direct or indirect return, has been a major coping strategy against famine in East Africa. Exogamy, as practised by Luo clans, creates a network of alliances useful in emergencies.

Among African societies, food was, and still is, shared freely especially during visits and feasts. The intra- and inter-household networks are aimed at availing food in the face of shortfalls, or when a given social occasion is too demanding for a single household to handle. Omosa (1998) remarks that unlike in the traditional economy where social networks functioned as insurance, seeking food assistance in the modern economy has become a successful food earning strategy for some households.

Among the Akamba, Akong'a (1988) observes that through reciprocal networks, the deleterious effects of famine are reduced and food security of the households

involved in the networks is improved. Mwangi (1995:6) argues that food gifts are largely common in the rural areas. In the urban setting, exchange of food gifts is less popular partly because people are socially organised into more transitory and segmentary relationships exemplified in neighbourhoods. Other scholars, however, have asserted that entrenched social relations are equally efficient in promoting food insecurity. Omosa (1998), for instance, assents that 'food social safety nets' does not always guarantee catering for the most needy. Watson (cited in Subbo, 1996) avers that extended families in small farms of Swaziland inhibit food security at the household level because whatever food is produced is shared by so many people.

In their contribution to studies on African famine, Funk (1991) and Vaughan (1992) reveal the significance of social networks in reducing the impact of food crisis. Funk, for instance, observes that strong social ties between the urban and rural households in Guinea-Bissau enhance food availability. During moments of acute food crisis, the incomeless urban dwellers go to stay with their rural kin. Conspicuous consumption and cultural activities, such as a chain of ceremonies commencing after harvests have an impact on food production as well as food security (Mbatia, 1990). Among the Bejaa of Guinea-Bissau, however, Funk (1991) observes that following bad harvest social ceremonies that require large amounts of food are postponed to seasons of bumper harvest. Nevertheless, he maintains that this form of life is a threat to granary reserves.

2.2 Theoretical Framework

This study was informed and guided by the entitlement theory. Amartya Sen advanced this theory in an attempt to analyze the problem of food security. According to Sen (1981:46), entitlement refers to the set of alternative commodity bundles that a person can command. It directs attention to the assembly of economic, political, social and cultural relations determining the acquisition of food by individuals (Sen 1995:3). These relations may be market exchange and the terms of trade, those within the family or a community, and those between the government and citizens. However, Sen suggests that entitlement may be taken largely to depend on income.

According to Sen (1981:2), entitlements are basically divided into the following categories:

(i) Trade-based entitlement: This involves ownership through commodity exchange, for example, one is entitled to own whatever one gains through trading with a willing party.

(ii) Production-based entitlement: Individuals or households have the right to own what they grow on the farm.

(iii) Own-labour entitlement: An individual is entitled to sell labour power for the purposes of earning an income so as to purchase food.

(iv) Inheritance and transfer entitlement: Individuals have the right to own what is given to them by others.

In a market economy, a person can exchange what he or she owns for another set of commodities. This exchange can be done either through trading, production or through a combination of the two (Sen, 1981:3). An entitlement set for a person in a given society consists of a set of alternative commodity bundles, anyone of which a person can decide to have. This is basically characterized as depending on endowments of the person (the ownership bundles) and the exchange entitlement mapping.

Sen (1981, 1995) acknowledges that endowments in themselves do not bring adequate food until appropriate 'exchange mappings' commence. Exchange mappings refer to a network of relations that govern how much food one is able to obtain through cultivation, or purchasing, or through seeking and receiving assistance. In other words, the exchange entitlement mapping (E-mapping) defines a range of possibilities open to individuals, corresponding to each ownership situation. Households would be food insecure, if their ownership, the exchange entitlement set, does not contain feasible bundles, enough food inclusive. Building on Sen's ideas, Omosa (1998) reiterates that for households seeking food through cultivation, their food security is determined at the point of harvesting.

In addressing food security, the entitlement theory holds that a collapse or erosion of the categories of entitlement depletes the individual's command over food. Households are, therefore, plunged into food crisis if their endowment collapses either through a fall of endowment bundles, or through unfavourable shift in the

exchange entitlement mapping. More precisely, households suffering from food shortages are primarily those that have no or insufficient land for own production of food (erosion of direct endowment), those whose labour is unemployed (erosion of own-labour entitlement), and those dependent on shallow and volatile social networks (inefficient transfer entitlement).

Comparing food producing peasants and wage labourers, Sen (1981) argues that the former are less exposed to food insecurity even when their typical standard of living is no higher than that of the latter. Important, however, is Sen's observation that the household's ability to avoid food insecurity depends both on its ownership (endowments) and on the exchange entitlement mapping that it faces.

Entitlement theory is relevant to this study in that it presented a useful dimension to the study of food security. The theory provided a large framework encompassing social and economic processes useful in understanding food security. Since the study targeted a food producing community, it partly utilized the production-based and inheritance/transfer entitlements suggested by the theory.

This theory also generated some variables necessary for formulating assumptions for the study. As enumerated by Maxwell (1996), these variables include income, storage and household social contracts. Entitlement theory's assertion that food insecurity can exist without any decline in the supply of food (Omosa, 1998) was used as a guiding tenet of this study.

2.3 Assumptions

1. The post-harvest food technology has a positive influence on household food security.
2. Post-harvest food selling has a negative effect on household food security.
3. Communal food sharing is detrimental to household food security.

2.4 Definition of Terms

Food: This is what human being ingest in order to sustain life. In this study food refers to the staple grain, primarily maize (Omosa, 1998).

Household: Refers to a person or group of persons, who eat, live and cultivate a piece of land together. Though modified this definition was adapted from Ahawo and Mukras (1990).

Communal Food Sharing: Refers to the frequent sharing out of food products with kinfolk, friends, and non-resident children. Sharing also includes food donations to various groups, food contributions to ceremonies and *harambee* and offerings made by the household for rituals in church or otherwise.

Household Food Security: This refers to the ability of a household to withstand seasonal variations in staple food (maize) availability through cultivation and storage

of harvests. This also entails household experiences in food shortage and coping strategies during times of food crisis (Mwangi, 1995).

Food Selling: This refers to trading in household farm food in exchange for money or service, in order to meet other needs, subsistence or otherwise.

Post-Harvest: If harvest is the single deliberate action to separate foodstuff from its growth medium, then all succeeding actions are defined as post-harvest actions. The post- harvest period, therefore, begins at harvest and ends when food enters the process of preparation for consumption (National Research Council, 1978:12).

Post- Harvest Food Technology: This refers to the methods of food storage and preservation which include the physical facilities of storing food as well as the handling and treatment of food after the harvest that ensures absolute low food loss.

2.5 Dependent Variable

Household food security.

2.6 Independent Variables

Food selling, communal food sharing, and post- harvest food technology.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter describes the research site, sampling techniques, and methods of data collection and analysis. The problems encountered in the field and their solutions are also presented.

3.1 Ndeiya in Retrospect

Ndeiya Location of Limuru Division and Karai Location of Kikuyu Division are vast semi-arid zones of Kiambu District. Before 1900, Ndeiya formed the pastures of the Maasai community. As a sign of compensation for the alienated lands of Agikuyu territory (Kiambu District), the colonial government in 1911 decided to integrate the dry plains of Ndeiya into the district to increase Agikuyu grazing fields. Named later as 'Ndeiya Grazing Ground. Cultivation was only practised under permission from the District Commissioner (Bullock, 1975).

By the 1930s, a few portions of Ndeiya were temporarily settled by the landless. In the early and mid-1950s villages in Ndeiya Location were converted into emergency or concentration camps as part of the government attempts to discourage the Mau Mau Movement as well as to ease the burden of administration (Bullock, 1975; Robins, 1985).

In the early 1960s the African District Council allocated some of the landless and home guard loyalists 4.8- hectare plots of land in Ndeiya under lease provisions. The terms of land lease required the tenants to pay an annual rent fee of 60 shillings for a lease period of 33 years in addition to a commitment of exploiting the environment sustainably. A majority of the poor remained in the emergency villages, which were later demarcated into 0.1- hectare pieces of land. This generated a rigid social, economic and political dichotomy between 'people of the village' (andu-a-icagi) and 'people of the farms' (andu -a - migunda) (Robins, 1985).

The foregoing historical account shows that a portion of the inhabitants of Ndeiya is endowed with land, while another portion is near landless. Surprisingly, Robins (1985:29) observes that the former forms the majority of the beneficiaries of relief food.

3.1.1 Site Description

This study was conducted in Ndeiya Location of Limuru Division in Kiambu District. Ndeiya Location is the driest (semi-arid) zone of the three locations, namely, Ngecha, Limuru, and Ndeiya, which make up Limuru Division (Map 3.2). Limuru Division is one of the five divisions forming Kiambu District in Central Province. The other four are, Githunguri, Kiambaa, Kikuyu, and Lari (Map 3.1).

Ndeiya is located southwest of the lower part of Kiambu District. Administratively, the location is divided into four sub-locations, namely, Ndioni, Tiekunu, Nderu and Thigio (Map 3.3). It occupies a total area of 125.2 square kilometres (GOK, 2001).

Map 3-1

(Source: Kiambu District Development Plan 1997).

Map 3.2

LIMURU DIVISION
Administrative Boundaries

(Source: Electoral Commission of Kenya 1997)

Map 3-3
NDEIYA LOCATION
Administrative Boundaries

(Source: Electoral Commission of Kenya 1997)

3.1.2 Topography and Climate

Kiambu District is divided into four broad topographical regions: Upper highlands, upper midlands, lower highlands, and lower midlands. The lower midlands are found in Ndeiya and Karai Locations. The area comprises dry plains. Since the distribution of rainfall in Kiambu is influenced by altitude, the leeward side of the Rift Valley escarpment where Ndeiya is located receives less rainfall. The rainfall regime is bimodal, with the long rains occurring between mid to end of March and May, while the short rains fall from November to December (GOK, 1997a; Jaetzold and Schmidt, 1983). The hottest months are January through March while the cool months are July and early August.

3.1.3 Soils

Kiambu District has three broad categories of soils, namely, soils on the high level uplands, soils on volcanic foot ridges, and soils on plateaus. Ndeiya Location is characterized by the last category. These soils are of varying fertility and are either sandy or clay loam which are poorly drained (GOK, 1997a).

3.1.4 Agricultural Activities

Ndeiya Location occupies Agro-Ecological Zone UM4 (Jaetzold and Schmidt, 1983) that supports subsistence farming and livestock keeping. According to a survey by Robins (1985), the following food crops are grown in this decreasing order: Hybrid maize, beans, potatoes, vegetables, peas and tomatoes, millet and sorghum, while pyrethrum is the only pure cash crop grown. In her findings, 95 percent of the

households grew hybrid maize while only 2 percent grew millet and sorghum (drought-resistant crops).

3.1.5 Food Availability and Nutrition

The Kiambu District Development Plan (GOK, 1997a) acknowledges that although a majority of the people in the district are well fed, there exists some cases of poor nutritional standards in marginal areas such as Ndeiya Location. The author observes that the existing cases of malnutrition are a result of poverty and ignorance on the part of residents and not because of food shortages. It further reveals that potatoes and bananas are the only crops in the District playing the dual role of food and cash crops. Chapters four and five of this thesis, however, point to the fact that maize (staple food), is also grown as a food as well as a cash crop.

3.1.6 Economic Infrastructure and Development Problems

The informal sector in Ndeiya Location is poor because of the low levels of economic development. The road networks are poor while most parts of the location lack telecommunication facilities. Many of the market centres of Ndeiya Location are not connected with electricity. The location is served with one health centre that is over-utilized. The water facilities are inadequate, inaccessible and over-utilized (GOK, 1997a; Robins, 1985).

3.1.7 Population

According to the Kenya population census of 1999, Ndeiya Location had a total population of 23,704 of whom 12,534 and 11,174 were women and men, respectively (GOK, 2001). This location has a population density of 189 persons per square kilometre. The density, however, is increasing rapidly due to high immigration of people from the other surrounding densely populated areas of Kiambu District (GOK, 1997a).

3.2 Population Universe

The Kenya population Census of 1989 shows that there are 3,886 households in Ndeiya Location (GOK, 1989). For the purposes of this study, only the households within the farming zone were sampled and these were 1520.

3.3 Population Sample

The household was the unit of sampling and analysis because it is the unit of production, consumption and decision making. It is in the household that most people gain access to food (GOK/UNICEF, 1998:143). In an effort to overcome time and financial constraints, a sample of 90 households was selected and studied.

3.4 Sample Selection

A three-stage sampling technique was used to select the study sample. In the first stage, simple random sampling was used to select three sub-locations (Nderu,Thigio, and Tiekunu) from the list of four sub-locations. The four sub-locations were

assigned numbers written on separate pieces of paper. The papers were folded and tossed on a table. A folded piece of paper was then picked at random and the sub-location it represented recorded down. Tossing and picking was repeated until the three sub-locations were chosen. This method was preferred because it is accurate (Bailey, 1988) and it ensures a degree of representativeness by providing the elements with an equal chances of being selected (Babbie, 1994: 211).

The Assistant Chiefs from the selected sub-locations were requested to prepare lists of households living on the farms from which the study sample was selected. The selection of the farming zones of Ndeiya Location was done through the non-random, purposive sampling technique in order to establish a study sample with characteristics required to meet the needs of the study (Baker, 1994). The households in the farming zone are actively involved in subsistence food production on household land. While households in the study area are engaged in most of the farming projects, they are largely affected by food insecurity (Robins 1985). It is on the basis of these assertions that purposive sampling was found useful. In this study, sampling of households living on the farms and largely dependent on subsistence farming formed an appropriate study sample.

Prepared lists of households formed the sampling frames. On every frame, simple random sampling was employed to select 30 households to generate a study sample of 90 households.

3.5 Methods of Data Collection

3.5.1 Secondary Sources

Published and unpublished documentary materials such as journals, theses, seminar papers and books were reviewed.

3.5.2 Primary Sources

These formed the core of the study and involved the use of structured interviews, direct observation, key informants, and focus group discussions.

3.5.2.1 Structured Interviews

The basic tool of data collection was a questionnaire. A standard questionnaire containing both closed- and open-ended questions was designed to elicit information relevant to the study. To minimise misunderstanding and misinterpretations of the questions, direct interviews were employed.

The closed-ended questions were useful in helping the researcher to code and compare responses. However, closed-ended questions limited the respondents' expressions and, therefore, open-ended questions were used to motivate the respondents by allowing them to answer questions in a relatively unconstrained way. The questionnaire was used to collect background information of the respondents and some information on the influence of food storage, selling and sharing on household food security.

3.5.2.2 Direct (Non-Participant) Observation

This method was used alongside the survey interview. Direct observation was used to confirm some of the verbatim responses of the respondents. This method was used to collect some data on food production, storage and preservation. Direct observation was limited by the fact that it is difficult to observe all the traits relevant to the study. There was always the danger of making errors of misperception.

3.5.2.3 Key Informants

Formal interviews and informal conversations were held with opinion leaders with the aim of learning the insider's view on various post-harvest factors influencing household food security. This technique provided additional information to that obtained through the interview schedule, especially on food selling and pest control measures. The method was also used to ascertain some issues such as the relationships between production of surplus and food selling as well as the influence of food sharing on household food availability. Key informants were purposely drawn from farmers, women group leaders, Agricultural Extension Officers, teachers, church leaders, and the aged.

3.5.2.4 Focus Group Discussions

These were organized in the form of mini-symposiums to discuss various issues arising in the course of survey research. Such issues included the importance of cash crop farming in the study area, traditional and modern methods of pest control,

factors influencing the selling of meagre stocks of food, and the role of social safety networks in the procurement of food.

Two focus group discussions were held, each comprising 10 members of the same age category and socio-economic status. The participants were, therefore, relatively homogeneous. Although in a homogenous group, discussants are likely to participate more freely it lacks representativeness. Also, the similarity of the participants sometimes influences their individual contribution during the discussion. The first focus group discussion was held at Tiekunu Primary School, in Tiekunu Sub-Location. The participants whom the researcher had booked appointments with gathered in the school play ground after an adjournment of a community meeting convened by the area Assistant Chief. The discussion began with a brief 'warm up' introductory conversation. The researcher moderated the discussion while a secretary to one of the women groups in the area assisted in note taking. The second focus group took place in Thigio Sub-Location after several postponements due to a series of burial ceremonies that occurred in this area at the time of study. The participants convened under a tree shade in Thigio shopping centre, commonly used by the local administrators in holding public meetings. Focus group discussions facilitated the collection of data within a relatively short time.

3.6 Methods of Data Analysis

Qualitative and quantitative methods of data analysis were employed. Qualitative methods involved describing the responses from the informants, establishing patterns

in responses and showing how they relate to the variables stated in the assumptions. Quantitative methods involved the use of simple descriptive statistics whereby percentages and frequency distributions of various responses were calculated and presented in the form of the tables.

3.7 Problems Encountered in the Field

Although efforts were made to ensure that the study realized its objectives, a number of obstacles were faced. First, a few respondents were reluctant to participate in the research. They lamented that in the past some NGOs had conducted several researches without implementing any projects. They associated the researcher with such NGOs. The researcher had to explain in detail the nature and purpose of the study and that he was not in anyway aligned to any NGO that had ever worked in the study area.

Second, some respondents declined from answering some questions, for example, those pertaining to food selling. Some respondents, particularly married women, feared that this could lead to domestic conflicts between them and their spouses. The researcher had to encourage the respondents by promising them confidentiality to all the responses made.

Another problem encountered was that while interviewing an informant, some visitors or family members sometimes wanted to contribute to the on-going interviews, by assisting in answering some questions. In some cases, visitors would

take over as informants, thereby, overshadowing the real informant. The information from 'intruders' was treated as important for qualitative analysis but not analysed as part of the pre-determined sample.

3.8 Ethical Issues

Being an anthropologist, the researcher handled the respondents as per the requirements of their customs. As a member of the study community it was not difficult upholding the expected customs. The researcher, for example, administered the questionnaire to the respondents at places they felt most convenient. Some respondents found in the gardens insisted to have the questionnaire administered to them while seated in the main house. This is in accordance with the Agikuyu culture defining the etiquette of handling a visitor such as a researcher.

The researcher also informed the respondents on the nature of the research and obtained their verbal consent. The researcher treated the information acquired from the respondents with confidentiality, especially the information regarding food selling provided by some women who never desired to discuss the issue in the presence of their spouses.

CHAPTER FOUR

POST-HARVEST FACTORS AND HOUSEHOLD FOOD SECURITY

4.0 Introduction

This chapter presents the research findings on various post-harvest factors and their influence on household food security in the area of study. The chapter begins by presenting the socio-demographic characteristics of the study sample. The subsequent sections and sub-sections present the findings of the study on the following: food production, storage, preservation, selling, and gender issues in post-harvest food handling. Information obtained from non-participant observation, key informants, focus group discussions, and secondary sources has been used to validate some of the responses to the questions in the questionnaire.

4.1 Socio-Demographic Characteristics of the Respondents

Out of the 90 respondents sampled, 80% of them were women while the remaining 20% were men. The large gender disparity, though expected, arose because the field study commenced when some development projects were underway that attracted much male labour. For example, the rural electrification project in Ndioni sub-Location and the installation of communication cables by Telkom Kenya Limited along the Nairobi - Naivasha Road enrolled most of the men as hole diggers, post carriers and trench diggers. Most men left their households at dawn and returned at dusk and were, therefore, not available to respond to the questionnaire. For those men who were available at the time of research, some refrained from responding to

the questionnaire. Their argument was that issues related to food are more confined to women. In response to the main objective of the study, a majority of men felt that once the food is harvested it becomes wholly a woman's domain. However, to a greater extent, this study revealed that men equally participated in the food production cycle as discussed later in this chapter. Moreover, the observed gender disparity correctly confirms reports made by GOK/UNICEF (1998) that more than 75% of the rural farming populations are women. Ironically, together with children, women are the first victims of a food crisis (WFP, 1998).

The distribution of respondents by age reveals that more than a half of the farmers (59%) were aged between 20 and 39 years. In this study, this category is referred to as young farmers. Nearly a third (31%) of the respondents were middle aged (40-59 years) while only a tenth (10%) were aged between 60 and 79 years. The presence of an overwhelming majority of young and middle-aged farmers in the sample was essential to the study because these are the groups of people, which are actively involved in farming. They are also most depended upon by a majority of the food consuming groups such as children and the aged. Moreover, the said farmers are faced by the realities of food security both as active producers and consumers and studies targeting them, therefore, are of great value.

Almost all the respondents (99%) were Christians. The remaining one respondent was affiliated to Agikuyu traditional religion. An overwhelming majority (90%) were married, out of whom, 5.6% were in polygynous unions. This points to the declining value of the polygynous form of marriage which was rampant and bore some cultural

significance among the traditional Agikuyu community (Kenyatta, 1961). Another 5.6% were single and only 3.3% had either separated from, or divorced, their spouses.

Besides farming, nearly a half (45.6%) of the respondents stated that they derive income from remittances which included all monies received by respondents from spouse(s), children and relatives. Some 38.9% of the respondents earned income from off-farm petty activities including cutting and selling grass to livestock keepers, cutting and selling firewood to business persons, quarrying, charcoal burning, transporting bags of charcoal and bundles of posts from the forest to convenient sites, selling fruits along the highway as well as providing casual labour to other farmers. A few respondents, 6.7% and 8.9%, cited salaried employment and formal business operations, respectively, as their alternative sources of income. The distribution of respondents by sources of income points to the concentration of rural people to peasantry and subsistence forms of occupation. Masindano (1996) and Opondo (1995) observed similar situations in their respective studies among small-scale subsistence farmers in Laikipia District.

Information gathered from focus group discussions revealed that the number of farmers involved in off-farm petty activities is highly dependent on the performance of the farms. Discussants reported that when a majority of the farmers have bounteous harvests, the number of people involved in off-farm petty activities shrinks. Similarly, during times of food crises, the number swells.

An inquiry about the length of time the respondents had been into the farming business revealed that 61% of them had been farming for a period of less than two decades. This figure is nearly equal to the number of young farmers involved in the study. The prevalent lack of employment partly justifies the increased number of young people venturing into farming. Slightly more than one third (39%) of the respondents ventured into farming before the 1980s.

Table 4.1: When Respondents Began Farming

Time	Frequency	Percentage
1990s	37	41.1
1980s	18	20.0
1970s	26	28.9
Before independence	09	10.0
Total	**90**	**100**

4.2 Food Production and Security

An entry point to the collection of data pertaining to the specific objectives of this study was sought by examining crop production in the area and its contribution to food security. A summary of the common food crops grown by the respondents and their major uses are presented in Table 4.2.

Table 4.2: Common Food Crops Grown and their Uses

Type of crop	Household consumption		Both household Consumption and sale	
	Frequency	Percentage	Frequency	Percentage
Maize	90	100	87	96.7
Potatoes	90	100	79	87.8
Beans	90	100	75	83.3
Cabbages	87	96.7	62	68.9
Peas	80	88.9	26	28.9
Kales	72	80.0	23	25.6
Carrots/tomatoes	18	20	05	5.6
Sweet potatoes	21	23.3	01	1.1
Onions	56	62.2	06	6.7

N = 90

According to Table 4.2, a majority of respondents grow maize, potatoes, beans and cabbages for household consumption as well as for sale. In fact, maize, beans and potatoes were grown by the entire sample. However, some respondents admitted that they grew food crops purely for household consumption. For instance, 12.2% and 16.7% of the respondents reported that they grew potatoes and beans, respectively, solely for household consumption. Only a small fraction of the respondents grew horticultural crops, except cabbages for the market.

An overwhelming majority (95.6%) pointed to maize as the staple and the main crop determining the food security of the residents of Ndeiya Location. A negligible minority (4.4%) reported otherwise, out of whom 2.2% cited beans while a similar

proportion mentioned potatoes. On probing further, it was revealed that these respondents (4.4%) were all young farmers with children to care for. To them, food security is achieved when the most vulnerable, in this case children, have access to appropriate adequate food. They, however, ultimately confessed that maize was necessary, though not sufficient food, for all residents of the area. One of the respondents remarked thus:

> *Onakuri ouguori, mbembe nocio irio cia andu oothe, tondu no uciendie, ugurire ciana irio ingi kana umathiire mutu.* Nevertheless, maize is the main food for all because you can sell to purchase for your children other foods or mill (to prepare more convenient meal).

A key informant observed that there has been an increase in the number of farmers growing cabbages especially for the market since the mid-1990s. He revealed that the 1997 *El Nino* rains motivated farmers to invest into vegetable farming, an enterprise that has been dominant in the neighbouring highlands of Limuru and Lari regions. As the heavy rains rendered most parts of Lari Division impassable, many traders turned to Ndeiya Location and established 'satellite markets' along the Nairobi-Naivasha Road, where farmers would deliver their cabbages for sale. As a result, farmers allocated more land to the cultivation of vegetables. The informant lamented that, with the decreasing amounts of rainfall experienced during the subsequent years, the performance of vegetables deteriorated as the traders moved back to the highlands. Consequently, some remarkable transitory food shortages were realized during the 1998/1999 farming year.

A majority of households (71%) do not grow non-food cash crops. Surprisingly, all young farmers were represented in these households. A sizeable minority (28%) grew pyrethrum while only one respondent grew castor oil. A further analysis shows that all pyrethrum growers were aged above 40 years. A middle-aged secretary to a woman's group stated that prior to the mid-1980s pyrethrum was a very significant cash crop to the farmers. She informed the researcher that the regular income earned from pyrethrum sales catered for the farmers' myriad needs such as payment of school fees, purchases of farm inputs, and clothing. These very needs compel farmers today to sell their meagre food stocks. She remarked, thus: "that is why young subsistence farmers suffer from persistent food crisis. They all look up to the selling of maize. I wish pyrethrum still existed."

The importance of pyrethrum to the farmers of Ndeiya Location was also pointed out in focus group discussions. Discussants placed some blame on the Pyrethrum Board of Kenya which, they argued, had demotivated farmers. The board was accused of failing to remit payments on time and withdrawal of extension services. It is because of these reasons, among others that, probably, the hectarcage under pyrethrum in Ndeiya Location has become insignificant.

Having maize declared unanimously by respondents as the main food determining their food security, then collection of more information on maize growing in Ndeiya was proved important. The data on the yields of maize for the last three consecutive

years were collected and computed. These data were, however, suspect because only a few respondents kept production records. Estimations were, therefore, inevitable.

Table 4.3: Yield of Maize for 1997- 1999

	1997		1988		1999	
No. of bags (90kg-bag)	**F**	**%**	**F**	**%**	**F**	**%**
Below 4	14	15.6	16	17.8	14	15.6
5 – 9	35	38.9	41	45.6	52	57.8
10 – 14	24	26.7	19	21.1	16	17.8
15 – 19	11	12.2	14	15.6	6	6.7
20+	6	6.7	0	0	2	2.2
Total	**90**	**100**	**90**	**100**	**90**	**100**

As illustrated in the table above, a majority of respondents harvested less than 10 bags of maize throughout the years. Informants, however, declared the yields of maize over the computed years as being poor and far below expectation thus, concurring with the report in the *Daily Nation* of 16 February, 2000 and FAO (1999b). The two documents observe that there has been a decline in the yields of maize harvested in most parts of Central Province. No wonder a participant in a focus group discussion made the following remark: "tell him! When we have been blessed with a bumper harvest, many of us are assured of 15 bags and above."

Slightly more than two thirds (67.8%) of the respondents reported that they produced surplus food only in very few seasons. A minority (24.4%) had surplus food during most of the seasons. However, about 17% hardly harvested more food than their

household would require. Nearly all respondents (95.6%) informed the researcher that they experienced some food shortages even after plentiful harvests. Exactly half of the respondents asserted that the amount of food they harvested was relatively adequate for subsistence. Some 57.8% pointed out that food availability in their households was not often adequate. However, some 42.2% of the respondents had enough food in their households irrespective of the source.

These findings conflicting as they seem, conceal a more qualitative picture of the post-harvest factors influencing household food security. The researcher, therefore, examined the specific post-harvest factors and the findings are outlined in the sections that follow.

4.3. Food Storage, Preservation and Security

In order to examine the influence of post-harvest food technology on household food security, the following were taken into account: Food storing facilities, storage pests and their control, store maintenance practices, and sources of food loss. An inquiry into these variables was deemed necessary because nearly all respondents (95.6%) reported affirmatively that they harvested their maize when dry.

4.3.1 Food Storage

About two thirds (61%) of the respondents store dry maize in the main house while the rest (39%) use the crib. Nevertheless, a majority of the respondents (84.4%) felt that mass grain loss is more common in the main house than in crib-storage systems.

Observation of the cribs pointed to their shanty nature. The walls are made from pieces of wood while the roofing is done using pieces of iron sheets. Only a few of the cribs observed may be described as well built. These observations confirm the descriptions offered by Bencini (1991) in discussing food storage facilities common in Africa. Bencini writes that cribs in the developing world are small shanties, although they meet some of the prescribed standards of food storage systems. In the study area, cribs were observed having floors raised above the surface. In some homesteads, the space beneath the crib's floor is fitted with wire mesh or thin stems of sisal, thus, forming a cage for rearing poultry. The responses of a majority of informants depicted the low dignity accorded the cribs as compared to other structures, especially the main house. Cribs are described by respondents as small houses perhaps most important when housing some harvests. Out of 27 (30%) of the respondents suffering from food loss due to dumpness, 15 (17.8%) of them stored maize in the cribs. This finding is supported by the observed semi-permanent nature of the cribs. Although all the cribs observed were positioned close to the main house, their shanty nature partly encourages food theft. A fifth of the 35 (38.9%) respondents storing maize in the cribs, for example, cited theft as contributing to food loss. Other physical characteristics of the crib worthy mentioning include the shape. All cribs were either cube or cuboid shaped. UNIFEM (1993) observes that the shape of the crib allows drying to proceed during storage due to natural ventilation. UNIFEM specifies that cuboid and cube shaped stores are better than the round ones. Apart from storing maize, some farmers used the crib to store other foods, mostly

pulses and potatoes. As observed by Shamalla (1982), some farmers house farm inputs, tools and equipment in the same crib the food is stored in.

Cribs are used to store unthreshed maize. A farmer cautioned that before maize is spread on the floor, adequate drying, sorting and grading is done. In one of the households, the researcher observed a few cobs of maize hanging from the roof of the crib. The respondent explained that such maize possessed some desirable traits and was, therefore, reserved as seed.

In the main house, there are variations on where the food is stored. For instance, in some households bags of maize were packed conspicuously in the living room. Other respondents admitted storing food in the children's bedroom, while those with spacious houses constructed a pseudo-crib known as *kibaca*. This structure resembles the crib except that it assumes the roof of the main house and the door is hardly fixed. All farmers storing food in the main house used gunny bags singly or in addition to other food storing containers. The bags were mainly used to store threshed grains. The bags of grains are then stacked on a raised floor made of low wood benches. Where the space is limited, bags of maize were observed heaped high.

Interestingly, farmers rated whether the yields are poor or good depending on the space of the storing facility the yields have taken. The same scale informs on the food situation of the household as reported by one of the respondents: 'When this crib

is full of maize, I am assured of surplus to sell as well as absolute food security for my family."

To this effect, the size of food storing facilities is equally important to the farmers.

Table 4.4: Household Food Storage Capacity

Storage capacity	Frequency	Percentage
Very adequate	20	22.2
Somehow adequate	22	24.4
Inadequate	48	53.3
Total	**90**	**100**

According to Table 4.4 above, almost a half (53%) of the respondents had inadequate food storing capacities. Only 22% of the respondents have very adequate storage facilities, a figure equivalent to the number of respondents producing surplus during most of the seasons. It is more likely that farmers producing surplus in nearly all seasons would have set in place adequate storage facilities to accommodate the same. Apart from the gunny bags, about 21% of the respondents use plastic buckets, tins and paper bags for storing small quantities of food. Some 5.6% of the respondents continue to use pots, gourds and baskets. This group of respondents is composed of some of the aged farmers who have advanced the use of some of the pre-industrial Agikuyu material culture to the modern society. Pots, gourds and baskets are used to store grains that are harvested in small quantities such as peas as well as seeds (Kapule, 1986). Most of the modern containers made of synthetic materials have assumed the utility value of the traditional food storing containers.

Putting food into containers and packing them into the store is one of the steps towards ensuring food availability.

4.3.2. Food Preservation, Pests and Pest Control

An overwhelming majority (92%) rated the loss of grains to pests during storage as a very serious problem calling for immediate redress. Only one respondent felt that pests are not a problem to the farmers of Ndeiya Location.

Insect pests and rats, as cited by 98% of the respondents, specifically cause mass damage to food while the remaining 2% felt strongly that only insect pests destroy stored foods. The maize weevil (*Sitophilus zeamais*), Angoumis grain moth (*Sitotroga cerealella)* and white ants are the common insect pests in the study area. However, only a few respondents cited ants as potentially damaging pests as compared to other insect pests. Ants destroy gunny bags and reach the stored maize in the cribs through the posts. Some respondents thought of moths as a stage in the metamorphosis of the weevil. Hardly were moths and weevils cited as independent pests. Grains of maize attacked by moths or weevils and used to make some meals are unpalatable, sometimes bitter and promote surfeit. Damaged grains are also a loss to the farmer because they cannot be preserved as seeds. A key informant revealed that when pests attack the stored food, farmers are left with a single option of selling most of the yields more probably in the glut.

As earlier reported, theft and dumpness were cited as other possible causes of grain damage. Respondents revealed that dump-storing facilities enhanced the rotting of grains. Also, when grains are stored with a high moisture content, especially in gunny bags, the rotting is inevitable. This points to the improper drying of the harvested grains. Leaking roofs of the storage facilities were also reported as resulting in dumpness and, subsequently, the rotting of grains. These findings are in line with assertions made by Lema (1981). Lema laments that mass grain loss common in sub-Saharan Africa is mainly due to the lack of even the most rudimentary facilities for drying and, subsequent, proper handling of grains after harvesting.

Table 4.5: Duration Food can be Stored Free of Pests

Time in months	Frequency	Percentage
3 –6	58	64.4
6 – 12	20	22.2
12+	12	13.3
Total	**90**	**100**

The data in Table 4.5 above, indicate that almost two thirds (64%) of the respondents have food storage facilities that would store maize for a minimum of three months and a maximum of six months. Only 13% of the respondents are able to preserve their maize for more than a year before pests attack it. Martim (cited in Horenstein. 1989) observes that 80% of the maize producers in Kenya have inadequate storing facilities that would store maize for more than two months. The present study. therefore, pinpoints to some improvements in the on-farm storage systems.

Both traditional and modern methods of pest control are practised in Ndeiya Location. Table 4.6 below is a summary of the distribution of respondents by the methods of insect pest control.

Table 4.6: Insect Pest Control Methods

Method	Frequency	Percentage
Wood ash	7	7.8
Certified pesticides	53	58.9
Wood ash / certified pesticides	17	18.9
Wood ash/herbs/ certified pesticides	5	5.6
None	8	8.9
Total	**90**	**100**

A majority of respondents use certified pesticides either singly or in addition to other forms of pesticides. Almost a third (32.3%) of the respondents, all the elderly farmers included, use wood ash singly or in addition to other methods. Noteworthy, also is the fact that a sizeable minority (24.5%) combines traditional and modern methods of controlling insect pests. A further analysis reveals that these respondents are distributed, though unevenly, across all the age categories of farmers. This gives some evidence of the value accorded to the traditional methods of food preservation whose relic has spilled over to the post-modern Agikuyu culture.

Discussants in the focus groups highlighted the fact that not only is the traditional pesticides effective but also readily available, cheap and easy to apply. However, some participants reported that some 'breeds of pests' are sometimes tolerant to traditional pesticides, hence, the need to reinforce them using modern pesticides.

Modern pesticides were also declared less effective by some respondents unless they are used together with ash, herbs, or both. Such respondents lamented that even after fumigation using modern pesticides, the grains are still damaged by pests. Moreover, certified pesticides were perceived as expensive as well as demanding technical know how whose lack may lead to poisoning.

When 75 respondents who claimed to be using certified pesticides were requested to cite examples of the brands of pesticides they used, 78% did not know the pesticides by their names. These respondents reported that when purchasing the pesticides, they either requested the shopkeeper to sell them pesticides of a certain price, or described the physical characteristics of the pesticides. One respondent remarked, thus: "I request the dealer to give me a weevil controlling pesticide whose price does not exceed a hundred shillings." Some women farmers informed the researcher that their husbands buy the chemicals and, therefore, they hardly knew the brands.

Similar information was collected from a local shopkeeper in Thigio Shopping Centre of Thigio sub-Location. He admitted that farmers are not sensitized about appropriate storage pesticides to use. This dealer had stocked up acetelic super, a pesticide he said was preferred by many farmers. In many homesteads, respondents showed the researcher containers of acetelic they were using or had used before. This pesticide is popularly referred to as *dawa ya mutu ya mboca* literally translated to (powdery weevil – pesticide). A farmer observed preparing her maize for storage remarked

thus: "here is the packet (of pesticide). You extension officer, read aloud to me the instructions on the packet...."

Some herbs were reported to be equally effective in killing pests. *Mubangi* (*Tagetus minuta*) and murubaine (*Azadarienta indica*) were cited as weevil repelling plants. A layer of *mubangi* or *murubaine* is either spread on the floor of the store or on the stored cobs of maize. Other respondents preferred sweeping the stores using *mubangi*. These results support part of the findings documented by Kapule (1986) after studying food preservation methods among the inhabitants of Murang'a District. A negligible minority (9%) revealed that they do not control insect pests. Nearly all (88.9%) of these respondents were affiliated to independent churches. The remaining respondent was affiliated to the Agikuyu traditional religion. They backed their assertion by referring to religious-oriented reasons. All respondents, for instance, alleged that attempts to control pests especially by killing them reflect human negligence in appreciating God's perfect creation. Moreover, it's against God s teaching 'thou shall you not kill'. Households obtained modern pesticides from various sources as shown in Table 4.7.

Table 4.7: Sources of Modern Pesticides

Source	Frequency	Percentage
Local Duka	5	5.6
Market	4	4.4
Agro-chemical Shop	63	70
Agro-chemical Shop/Duka	3	3.3
Not Applicable	15	16.7
Total	**90**	**100**

It is evident from Table 4.7 that more than 70% of the respondents obtain pesticides from agro-chemical shops, 5.6% and 4.4% from local shops and open air markets, respectively. Paradoxically, while a majority of the respondents obtained storage pesticides from agro-chemical shops, the problem of grain damage by pests is rampant in the area.

Another common pest in Ndeiya Location is the rat. During the 1998-farming year, fields of maize were destroyed by rats leading to relatively poor harvests (*Daily Nation* of 8 June 1998). An inquiry into the rat-controlling measures employed by the respondents revealed that a sizeable number (73%) of them use rat-traps and poisoning, while a negligible minority (3.3%) did not bother getting rid of the rats. Some 20% use rat-traps and cats. Further probing revealed that these respondents feared that the poison in the pesticides could jeopardise the lives of other animals in the household or even contaminate drinking water and food in storage.

Although an insignificant number (2.2%) cited general cleanliness as a compulsory strategy of eradicating rats, a vast majority had referred to the same when responding to the issue of storage maintenance practices employed by farmers. Almost all respondents (94.4%) reported that they repaired, washed or swept clean the storage facilities. Only 5.6% oiled the stacks or posts of the storing facilities to repel white ants.

4.4. Food Selling and Household Food Security

While all respondents grew maize for home consumption, nearly all (96.7%) sold maize to meet a myriad of needs. Surprisingly, only 25.5% of the respondents produced surplus food during all or most of the seasons.

Nearly two thirds (67.8%) produce surplus only in very few seasons while less than 10% hardly harvest surplus food. On the other hand, about 83.3% of the respondents admitted selling maize that was not necessarily surplus.

A sizeable minority, (16.6%) of the respondents believed that all maize they sold was exclusively surplus. However, a proportion of these respondents were among the overwhelming majority (95.6%) who confessed having experienced some food shortages even after bountiful harvests. This finding prompted the researcher to investigate why farmers sold meagre stocks of maize even after nearly all (95.6%) of the respondents admitted that maize determined the household food security.

Table 4.8: Reasons behind Selling of Maize

Reason	Frequency	Percentage
School fees	71	78.9
Water/medical bills	35	38.9
Buy other food stuffs/processed food additives	30	33.3
Buy farm inputs	46	51.1
Purchase households goods, e.g., salt, kerosene	38	42.2
Clothing	29	32.2
Livestock	4	4.4
Construction, e.g., house	8	8.9
Furniture	5	5.6
Kitchen ware, e.g., utensils	4	4.4
Women group/loan servicing	2	2.2

N=90

Table 4.8 clearly shows that a majority of the respondents (79%) sell maize to cater for school fees, including stationery and uniforms, while almost a half (51%) are compelled by the need to purchase farm inputs such as seeds and pesticides. The need to buy household goods, such as salt and paraffin, accounted for (42%), water and medical bills (39%), purchases of convenient foods or otherwise (33.3%), clothing (32.2%), livestock and kitchen ware (4.4%) each. Other reasons cited include: the need to accomplish some construction (8.9 %), purchase of furniture (5.6%), and raising funds for servicing loans or women groups (2.2%). Dependence on monies derived from food selling is a common phenomenon among farming communities living in marginal areas such as Ndeiya Location because a considerable

proportion of the population earn income from subsistence agriculture and/or from unreliable sources. In this study, for example, 78% derive their meagre income from off-farm petty activities and remittances. Food selling is practised to supplement the little available income. The practice is aggravated by the fact that a majority of farmers are women whose economic status is low. One female respondent remarked, thus: "Month end to women reaches soon after harvests. It is at this time that I am in a position to buy a pair of shoes and a few plates."

The above quotation points to the times when most farmers sell their harvests. A sizeable number (62.2%) sell their grains immediately after the harvesting and any other time the need arises. This number is as high as the number of informants deriving income from unstable sources. Harvesting of maize commences a month or two before the festive season in December. During December, children are clothed and tasty foods are normally bought. At the same time, some farmers need to save money to meet school fees as well as buy farm inputs for the major farming season commencing between January and March. Information gathered from focus group discussions revealed that food selling begins once the green maize is ripe. The ready market that is provided by Limuru, Kanyua, Gitaru, Kangemi and Kawangware markets, and the young men roasting maize along a section of the Nairobi-Naivasha Road neighbouring the location, perpetuate this practise.

A fifth of the respondents sold maize when prices are perceived as being reasonable. It is more probable than not that, the prices would soar some time after harvesting. Since a majority of farmers hardly preserve maize for long, only a few of them

succeed to market maize at the perceived 'reasonable prices'. This is because the attack of grains by pests, which is reported as occurring a few months after food is stored, compels the farmers to dispose of stock, in order to minimize losses. Only 17.8% of the respondents reported selling maize after budgeting enough stock for the household. A further analysis shows that this category of respondents was composed of all informants who declared that all food they sold was exclusively surplus.

The use of food, especially maize, beans and potatoes for a compensation of labour services is evident in Ndeiya Location. A sizeable proportion of the respondents (76%) hired farm labour. Only about 9% of the respondents afforded paying for hired labour in cash. About 3% of the respondents all aged above 60 years, preferred using food to pay for hired labour. Almost two thirds of the respondents (63.3%) combined cash money and food in paying for the labour. A minority (24%) depended exclusively on family labour. A key informant revealed that the use of food singly or in addition to cash, as a form of payment or remuneration, has been advocated for by labourers mostly from the villages. Apart from lacking access to land, the villagers derive much of their income by engaging in a myriad of petty activities, including provision of cheap labour.

Hiring of labour has been rendered necessary due to the existence of inadequate family labour largely aggravated by the mass enrolment of children in schools. The migration of male labour in search of employment leaves behind women to handle some roles that are labour intensive. Due to the low economic status of women, they

are likely to find food as an acceptable commodity that can be exchanged for labour. Hiring of labour is more common during the peak seasons of planting and weeding. Meagre food stocks are rapidly depleted, putting the households in potentially risky situations, especially when subsequent seasons are unsuccessful. It is no wonder that an overwhelming majority of respondents (95.6%) reported they were aware that food selling deteriorates household food security. A negligible minority (4.4 %) argued otherwise.

4.5. Food Sharing and Household Food Security

A majority of the respondents (84.4%) reported that they regularly paid visits to their relatives living either within or without the boundaries of Ndeiya Location, while the remaining 15.6% visited their kinsfolk occasionally. The presence of social ties, as exemplified by the frequent or occasionally visits between and among the kinsfolk, is a remarkable coping and survival strategy as partly supported by a range of reasons cited by respondents for visiting their relatives presented in Table 4.9.

Table 4.9: Why Respondents Visit Relatives

Reason	Frequency	Percentage
Attend family meetings	74	82.2
Assist in agricultural activities	30	33.3
Take the food	37	41.1
Ask for some food	5	5.6

N=90

Table 4.9 shows that a majority (82.2%) of the respondents visited their relatives when attending family meetings. About a third cited the need to assist in agricultural

activities, namely, weeding and planting, while almost 40% visited their relatives with the aim of taking to them some food. A small minority (5.6%) of the respondents searched for food aid from their relatives, thus, visiting them during times of food shortages. On probing further, a majority of respondents reported that they hardly visited their relatives with the objective of requesting for food. This is either because the relatives reside far from Ndeiya Location, for instance, in the Rift Valley, and transporting food is thus uneconomical, or the relatives resided in regions where land is small and hardly produces adequate food to be shared. Respondents further explained that the reasons cited above instilled in them some endurance and urge for striving hard to alleviate dependency and subsequently cultivate for self-reliance. These findings, however, point to the importance of social networks in times of joy or hardship.

Participants in focus group discussions emphasized that although individualism is creeping into households, social nets have remained and often get intensified during times of hardship. Discussants added that according to Agikuyu culture, it is rather mandatory that when paying visits to a relative and vice versa, one should take gifts in the form of food. However, gift giving is practised more by women as one discussant remarked: "Every woman paying her relative a visit must take with her something small, like sugar in a basket."

A key informant revealed that although sharing of food is common among the residents of Ndeiya Location, it does not at all alleviate food shortages for the

victims. This informant exclaimed "*ciathuguri itiyuraga ikumbi!* Bought things do not fill the granary!" This is a proverb meaning that one should not hope of becoming rich without cultivating one's field. Borrowed or donated food is assumed to be a short-term remedy for food insecurity.

All respondents unanimously admitted that they are paid visits by their relatives. When asked to point out times during the farming calendar when relatives frequent most, slightly more than half (54.4%) of the respondents reported that the visits are evenly distributed against time, while 7.8% revealed that relatives frequent most during the peak seasons of labour, namely, ploughing, planting and weeding. Further probing revealed that during such times, the demand of labour is higher and farmers are in dire need of assistance. Child labour is equally scarce as the schools are normally in session almost during such times. Slightly more than a third (37.8%) of the respondents reported of experiencing many visits from their relatives during harvesting. These respondents informed the researcher that although harvesting is less labour demanding some relatives come to assist in the exercise hoping to earn food in return.

Table 4.10: Living with and Obligation to Feed Relatives

	Obligation to Feed Relatives					
	Yes		No		**Total**	
Living with Relatives	F	%	F	%	F	%
Yes	15	16.7	9	10	24	26.7
No	11	12.2	5.5	61.1	66	73.3
Total	**26**	**28.9**	**64**	**71.1**	**90**	**100**

The results in Table 4.10 indicate that about 27% of the respondents house some relatives, out of whom, more than a half (17%) are under obligation to provide the relatives with food. On the other hand, nearly a third (29%) of the respondents have the obligations of feeding relatives out of whom less than a half (12%) provide food to relatives living outside households. It is, therefore, evident that farmers in Ndeiya Location have responsibilities of feeding their kinsfolk whether they are living within or without the respondent's households. Many of the respondents (61%), however, neither live together with their kinsfolk nor bear the obligation of feeding them. This number is almost equivalent to the number of young farmers (58.9%) in the study sample. If this occurrence is not by chance, then it may be explained that young farmers are in the process of establishing themselves and have sometimes children to look after. Most of the relatives are, therefore, more likely to have discontinued their dependence from the young farmers.

While 23% of the respondents had some children who were non-resident and bore no obligation of feeding these children at all, 16% had the responsibility of sharing food with them. Almost 61 % of the respondents had either all children residing with them or never had offspring Apart from relatives and children, farmers also share a portion of their food with social institutions, a practice that influences food security. Nearly all respondents (95.6%) admitted that there were social ceremonies conducted during and immediately after harvesting. Such social functions include marriage ceremonies and family meetings. Information gathered from group discussions revealed that most of the social ceremonies coincide with the harvesting seasons to enable their

success. During this time, the ceremonies are more convenient to the participants. The same time is also, conventionally, defined as a feasting season. After harvesting, every household is assumed to be in a position to contribute some food towards the ceremonies. If the function demands some money, the households are expected to raise the funds that normally involve selling a portion of the food. A key informant to this study remarked:

> *Andu mathondekaga maruga hindi ya magetha tondu, ni maramenya gutiri mundu ungiaga kurehe kanyamu.* People prepare feasts [ceremonial occasions] during harvesting because they are assured that participants will have something to contribute.

The informant revealed further that during harvesting, the attendance at the ceremonies is higher. One would be despised by others for failing to attend social functions taking place during such times.

Farmers have also established social networks through the church, women groups and self-help organizations. Nearly all respondents (98.9%) reported that they donated food in terms of offerings, or otherwise, to the church. Among the Catholics, for example, food donations were made at least once in a month, to feed the priests and other people housed by the church. To the Protestants, offerings in the form of food accounted for the tithe. Irrespective of the denomination, church projects are designed to commence during harvesting. In unanimity, respondents reported that the church had established annual ceremonies involving congregations surrendering a portion of their harvest to God under the auspices of the ministers of the church. Consequently the annual religious–harvest ceremonies commenced during harvesting. Respondents

emphasised that only those who honoured the sacred 'harvest ceremony' by offering some food items are endowed with blessings, thereby, succeeding in most of their endeavours. Respondents, however, noted that their social obligations in church are not only confined during harvesting. They are expected to participate in other church functions throughout the year, a majority of which require them to raise funds in the form of money or food items. The latter is later converted into cash. To some extent, therefore, household food stocks are used by farmers to meet some obligations in religious circles.

About two thirds (67.8%) of the respondents had made donations to *harambee* functions. The donated food is either prepared for consumption during the function or it is auctioned to raise some money, which accounts for the 'donor's' participation in the *harambee*. Respondents reported that maize and beans are more preferred in the *harambee* functions because they hold a higher price tag. Part of these reports was confirmed when the researcher observed a community school–building function in Kiandutu, Nderu sub- Location. People from this area had gathered at a site to construct a school. Some of the people had brought with them baskets full of maize to be sold and the proceeds used in the purchasing of the required building materials.

Three fifths (60%) of the respondents made food donations to women groups popularly known as *mungiki* which come to the aid of a member faced with a solemn or felt need. The members are obliged to generously contribute material goods or money to the candidate. One of the most readily available and acceptable

commodities is food, which accounts for a high proportion of the contributions made. A negligible minority reported donating food to schools, which were, however, located outside the research site. A key informant pointed out that some social and moral commitments compelled farmers to share out food, irrespective of the available stock. She exclaimed that 'Blessed are those who giveth.' On the same issue, Abdel-Aziz (1975), observes that food sharing fulfils socio-cultural and religious needs.

Table 4.11: Food Sharing and Depletion of Available Stocks

Response	Frequency	Percentage
Strongly Agree	44	48.9
Agree	21	23.3
Disagree	5	5.6
Strongly Disagree	20	22.2
Total	**90**	**100**

When respondents were requested to give their opinions on the argument that food sharing depletes the available stocks, 72% of them answered affirmatively that it does (Table 4.11). They emphasized that their argument was vital now that the agricultural sector was performing relatively poorly. The 'giving' household exposes their endowments, food included, to potential risks, especially when subsequent harvests turn out to be inadequate. Noteworthy, however, is the fact that the 'receiving' households are latently rescued from sufferings of absolute food shortages through the social networks. Omosa (1998), however, observes that food security attained through safety networks is unsustainable as compared to that earned through production based entitlement.

A sizeable minority (29%) of the respondents stated otherwise. They felt that food sharing has a negligible impact on the available stocks and, subsequently, on the general food security of the household. A probe launched to elicit more information pertaining to this argument revealed that the assertions made by these respondents were largely based on religious grounds. Some of these respondents warned that entrenched food sharing without adequate and precise budgeting could also jeopardize the household food security. It is worthy noting that respondents hardly accounted for the amounts of food given out to other households and social institutions.

4.6 Gender Issues in Post-Harvest Food Handling

When collecting information pertinent to the objectives of this study, it was evident that gender issues, especially in decision making on post-harvest food handling, were recurring. Details are presented in Table 4.12.

Table 4.12: Decision Making on Food Harvesting, Storage, Sharing, and Selling

	Harvesting		Storing		Selling		Sharing	
Gender	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Men	6	6.7	22	24.4	26	28.9	11	12.2
Women	71	78.9	49	54.4	47	52.2	61	67.8
Both	13	14.4	19	21.1	17	18.9	18	20.0
Total	**90**	**100**	**90**	**100**	**90**	**100**	**90**	**100**

It is conspicuous in Table 4.12, that the number of respondents reporting that both men and women are involved in household decision making on post-harvest food

handling activities, namely, harvesting (14.4%), food storing (21.1%), amount of food to be sold and at what times (18.9%), as well as quantities of food to be shared out and with whom (20%), is almost evenly distributed in the sample. Evident also, is that women are the main decision-makers on post-harvest food handling. This is, however, in line with Agikuyu culture. Kenyatta (1961:55), for instance, observes that harvesting time is the busiest period for a majority of women because they are the 'managing directors' of the food supply in their respective households. Kenyatta adds that it is considered right and proper for the women to handle the grain and store it according to the immediate and future needs of the household.

Further analysis reveals that fewer women are key decision-makers in food selling than in all other food handling processes. This points to the strong influence of men in the disposition of assets at the household level.

4.7 Conclusion

The findings presented in this chapter reveal that maize farming contributes directly towards the food security of the study area.

The chapter has revealed that lack of proper on-farm food storing systems characterized by inadequate storage facilities and improper food preservation processes contributed remarkably towards grain loss in Ndeiya Location.

The research findings point to the negative influence of food selling on household food security. Food selling depletes the food stocks available to the household and, thus, exposes the household members to risks of food insecurity.

The research findings presented in this chapter also reveal the influence of food sharing on household food security. Respondents informed the researcher that sizeable proportions of their harvests were not consumed by the immediate household members.

Finally, it is evident from the chapter that gender issues are important in post-harvest food handling process that, subsequently, influence food security.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter contains a discussion of the research findings in regard to the objectives of the study. Inferences drawn from the study are also presented in line with the objectives discussed and these are then used to make recommendations.

5.1 Household Food Production and Security

The study findings point out to the fact that subsistence farming is the main pursuit among the inhabitants of the farming zones of Ndeiya Location. Interviews conducted and direct observations made revealed that maize, beans and potatoes are the dominant food crops grown in the study area. Maize was regarded as the staple food, largely determining the household food security of nearly all the respondents. GOK/UNICEF (1998) observe that a decline in the production of maize among subsistence farmers is an indicator of food insecurity. Information gathered from opinion leaders indicated that maize was a major food to virtually all households in the study area because of the following reasons:

(a) Sustenance: Opinion leaders observed that the major dish *(irio)* made partly of maize, has a higher ability of sustaining household members from hunger as well as enabling them to endure hard work.

(b) Processing: Maize can be processed into various forms to prepare a wide range of dishes palatable to all categories of household members, including children and the aged.

(c) Storage: Storage of dry maize is perceived as being cheap and easy to do. Moreover, maize can be preserved for several years without going bad.

(d) Production: Production of maize is less labour intensive and the crop can be inter-planted with a wide range of other crops. The growing of maize is, therefore, economical to small landholders practising intensive farming.

In essence, therefore, the preference for maize by the respondents is rational. Similar findings were more or less reached by Ndombi (1992) in her study among smallholder sugar outgrowers contracted by Nzoia Sugar Company in Bungoma District, Western Kenya.

While all the food crops grown in the study area were consumed in the households, a portion of the produce was also sold at the market. Much of the marketed food hardly formed part of the surplus, thus, directly jeopardising the household food security. This finding, however, partly supports Ontita's (1996) observation that among communities strongly dependent on subsistence agriculture, farm produce more often than not finds its way to market. In confirming the foregoing assertion, entitlement theory advances that households are entitled to exchange their endowments to acquire other sets of desired commodities. In this study, much of the exchange was achieved through trading using food materials.

Evident, also, in the study findings, is the emergence of horticultural farming for both home consumption and the market. The loss incurred in vegetable farming by the farmers due to failure of rains and unreliable markets, as cited by the respondents, is worthy mentioning. The poor performance of horticultural farming in the study area could be attributed to lack of ample or proper agricultural information to the farmers.

Sutherland et al. (1998) observe that although horticultural farming in marginal areas is a viable intervention strategy of alleviating food insecurity, the choice of suitable dry-land horticultural enterprises is absolutely necessary and should be accompanied by a package of well-strategised agricultural extension services. The near non-existence of small-scale cash crop farming in Ndeiya Location points to the deteriorating agricultural performance of the medium potential marginal regions in Kenya. A few pyrethrum growers, comprising 28% of the total sample, observed that during the early 1980s pyrethrum farming covered a sizeable portion of the cultivated land. Some key informants pointed out that when a majority of farmers in the study area were growing pyrethrum, food shortages hardly existed. There existed a clear-cut distinction between food and cash crops and, therefore, food crops, especially maize, were highly preserved for household consumption and at minimal levels for the market. Sutherland et al. (1998) made similar observations in Tharaka–Nithi and Embu Districts. The decline of cotton production in these districts affected household food security at two major levels. Firstly, crop rotation was altered and this deteriorated the soil fertility which, subsequently, led to poor

yields of food crops. Secondly, the main food crops, such as pearl millet, maize, and sorghum, were converted into cash crops, thus, rendering households more vulnerable to food shortages.

While the decline in pyrethrum growing could be attributed to the increasing land shortages and sparing of more land to food crop growing and dairy farming, the research findings suggest otherwise. A retired Community Development Officer and a farmer in Tiekunu sub-location stated that food security had deteriorated with the withdrawal of pyrethrum farming. A similar response was recorded from elderly pyrethrum growing farmers who associated the escalating incidences of food shortages among the young farmers to lack of engagement in small-scale cash crop growing.

According to the findings of this study, there has been a decline in the yields of the maize produced since 1997. Inferences drawn from Table 4.3 show that the average yields of maize harvested by the respondents decreased from 9.8 bags in 1997 to 8.7 bags in 1998 and further to 8.1 bags in 1999. This finding supports reports appearing in the *Daily Nation* of 5 March 2000 to the effect that maize production in Kiambu District has dropped tremendously. An improvement in the maize staple food production in Kiambu District and particularly in the drier zones is, therefore, necessary. UNEP (1983) has proposed various strategies of achieving increased food availability including increasing the land size under food production and increasing the yields per unit land area. Since the entitlement theory advances that a decline in

food production is not necessarily sufficient in the promotion of food crisis, this study focused on post-harvest factors as an additional and an alternative strategy of promoting household food security.

5.2 Food Storage and Preservation

5.2.1 Food Storage

According to UNIFEM (1993), without proper food preservation, processing and storage policies, any increase in agricultural production is often accompanied by food shortages. The findings of this study revealed that the use of appropriate storage technologies is vital in the process of improving food security and lowering the risks of suffering from transitory food shortages in the months preceding the harvest. In order to understand the grain storage system in the research site, the study adopted a set of hints prescribed by Abdel-Aziz (1975), that include examining the kinds of food grains grown, harvesting seasons, average quantities of grains stored, period of storage, indigenous method of storage, and source, extent and times of grain damage.

The fact that 95.6% of the respondents harvested maize only when dry supported an observation made by National Research Council (1978) that maize is consumed more in the dough than in the milk stages. Storing of maize in sacks and stacking them in the main house was observed as the commonest food storage system. Bencini (1991) observes that the storing of grains in sacks is one of the improved systems of storage in the developing world. However, such a storage system is more common among commercial farmers. Bencini further writes that with proper handling, sacks offer

maximum protection to grains against insects, fungi and rodents. A similar form of maize storage system was observed by Egesah (1994) among small-scale farmers in North Bunyala, Kakamega. The prevalent use of sacks in Ndeiya Location could be attributed to the availability of jute bags after emptying poultry and dairy feeds as well as the need to minimise the space taken by stored food in the main house. Lack of external storage facilities such as cribs, due to the monetary costs incurred in erecting one, offers an alternative explanation. Grains stored in the main house were reported to be more secure than those stored in the cribs especially among the households neighbouring the 'concentration villages.' The near-landless residents of these villages were accused of breaking into the stores and parting with food during times of food shortages.

Although storing of grains in sacks is highly recommended by specialists of post-harvest technology, this study revealed that the sack-grain storage method demands a lot of inputs from the farmers, including regular inspection, building of stacks, adequate drying of grains before bagging up as well as protection against rodents. Respondents lamented that food stored in sacks and stacked in the main house required the farmer to maintain the floor absolutely dry or else the dumpness would damage the grains. The rate of the spread of the pest infection in grains stored in sacks is much higher compared to other forms of storage. Sacks are easily destroyed by rats, which results in grain spillage. It is not unsurprising, therefore, that a majority of respondents (84.4%) reported that the main house storage system leads to

mass grain loss. Storing of grains in sacks is, however, commendable because inspection can be done with much ease. Sacks are also portable.

External food storage systems are predominant throughout the food producing societies in developing countries. Cribs are one of the advanced simple food storing systems common in sub-Saharan Africa (National Research Council, 1978). This study found that although respondents preferred the crib to main house storage system, a majority of them stored maize in the main house. A few of the respondents had fixed pseudo-cribs in their main houses. Bencini (1991) observes that cribs are generally well ventilated and aerated. Bencini, however, laments that in most parts of the world, cribs are generally poorly built structures. The findings of this study revealed that the shanty nature of cribs in the research site contributes to grain loss due to leaking roofs. The over-exposed walls with large crevices often displayed unthreshed stored maize, thus, attracting domestic animals such as goats and poultry to spoil the grains, an observation also made by UNIFEM (1993).

Cribs were observed to be accorded low dignity in relation to the main house. At the same time, cribs were noted to be important assets to the farmers. It was evident in the study area that some of the farm tools and equipment were stored in the cribs. Virtually all the respondents referred to the cribs as the maize storing house. A sizeable number of them, however, used the same facility to store other foods but mainly cereals. An emic view revealed that the size of the crib is equally important and meaningful to the household. Formal and informal interviews revealed that

household members felt more food secure when their cribs were optimally filled with grains. Nevertheless, some 53.3% of the respondents lamented that their storage capacities were inadequate. While these assertions were made when harvests were poor, further probing revealed that during successful years farmers realised bumper yields.

Production of surplus food in the study area is not a common phenomenon. About three-quarters (74.5%) of the respondents reported that they either harvested surplus maize in very few seasons or none at all. It is, therefore, logical to concur with a key informant who reported that a crib full of grains does not necessarily mean the presence of surplus food. The informant's assertion also pointed to the fact that one could not assess the quantity of maize harvested by merely observing the size of the stores.

The use of smaller containers, either traditional, such as pots and gourds, or modern, such as buckets and tins, is evident in the research findings. Abdel-Aziz (1975), Kapule (1986) and UNIFEM (1993) observe that small containers are used to store small quantities of grains, mostly seeds. It was noted in this study that most of the grains stored in the small containers, except seeds, were hardly mixed with insecticide substances. This is partly because such foods were believed to be pest-free, either because of the nature of the material making the container or because of the fact that the containers had cover lids.

5.2.2 Pests and Pest Control

An overwhelming majority (92.2%) of the respondents felt that grain loss to pests in the study area was rampant. Two insect pests, namely, the maize weevil and grain moth, were cited as the major ones destroying stored food. Latham (1997) and UNIFEM (1993) note that attack of grains by pests contribute to either loss in quantity, quality or both. Consequently, these losses have both economic and nutritional implications. Information gathered from focus group discussions indicated that the amount of stored grains reduced whenever rats invade the stores. Grains attacked by weevils are also reported to be lighter in weight due to the larger portion of the grain consumed by the pest. Grains infected with pests are sold at a lower price than the pest free grains. The farmer, therefore, loses some income he/she could otherwise have gained. The research findings further revealed that farmers are compelled to sell their grains once they have noted the attack of pests to avoid losses. Whatever the selling price, food selling affects directly the quantity of food available o the household. On the same issue, the National Research Council (1978) asserts that when subsistence farmer is forced to buy extra food to replace the lost supplies to pest, the cost of hat food is a tangible loss.

ests such as the maize weevil that selectively feed on a part of the foodstuff, for instance, ne nutritious germ of grains, reduce the nutritious value of the foodstuff. The research nding reveals that grains attacked by moths are generally unpalatable and cause surfeit. hen pest-infected grains are ground into flour, the respondents lamented, the flour is lump' while the dish made from it is bitter. This could be attributed to the contamination of

the grains with aflatoxins. The presence of rat hairs, excreta and urine on the grains, equally reduces the quality of grains.

The study findings suggest that a majority of respondents (91%) are quite aware of some pesticides that could eliminate the common pests. However, only 13.3% of the respondents could store grains free from pests for durations of twelve months or more, thereby, being able to preserve maize till the next harvest. The continued grain loss to pests even after applying some pesticides could be attributed to either one or more of the following reasons. Firstly, the farmer could be lacking ample or proper information pertaining to the use of pesticides. Secondly, the local dealers could be supplying farmers with uncertified pesticides, as was also noted by the *Daily Nation*, of 5 March 2000. The paper reported that Kiambu District harbours unscrupulous stockists who supply farmers with uncertified pests and seeds. Waema (1995) made more or less similar observations in his study in Kilauni Location, of Machakos District, where farmers were using fake pesticides supplied by some agro-chemical dealers. Thirdly, the use of some indigenous methods of pest control, for instance, 'religious faith pest control method', could be ineffective though relied upon by some of the respondents, either singly or in addition to modern pesticides.

The study identified a sizeable number of respondents who hardly knew the brands of storage pesticides that they used. This could be attributed to the fact that a majority of respondents were women and some of them were bought pesticides by their spouses. When such farmers are less literate then their little knowledge on pesticides is doubtless. Other respondents barely knew the formula of applying the pesticides. To a few households this could be

attributed to illiteracy and to a majority, lack of agricultural information from the extension officers.

The persistent use of indigenous pesticides such as wood ash and herbs by the households in the study area need to be underscored. On the one hand, scholars such as Bencini (1991), Latham (1997) and UNIFEM (1993), observe that some traditional pesticides are effective in controlling pests. On the other hand, Giles (1965) argues that the extent to which some herbs such as *Tagetus minuta* and *Azadarienta indica* are insecticidal when mixed with stored grains is rather uncertain. Nevertheless, the use of traditional pesticides continues to prevail among the small-scale farmers because of their relative advantages, namely, they are readily available, cheap and are perceived as effective.

The control of rats by the use of rat-traps and poisons, though used by a majority of respondents (73.3%), is rather unfriendly to the ecosystem (personal communication with Entomologist, National Museums of Kenya). As much as rats are harmful to the stored food, they are at the same time important to the ecosystem. A more environmental-sustaining pest control method such as biological control methods involving the use of predators, for instance, cats and the use of rat buffles fixed on the stacks or cribs have been advocated for. None of the households studied used rat buffles for controlling rats in the storage facilities.

5.3 Commoditization of Household Food

Kliest (1985) observes that even after harvesting, a large segment of the farm population are usually not able to maintain sufficient food stocks due to the financial obligations compelling

them to sell large quantities of their harvest. Kliest further adds that, on average, small holders seem to sell maize and beans despite the fact that the remaining amounts are insufficient to meet their own requirements and that they must buy back considerable quantities of those foods later. Small holders, therefore, engage in perverse supply responses that fuel poverty (Shipton, 1990). The study findings supported the foregoing discussions in that a majority of the respondents (83.3%) admitted selling maize that was not necessarily surplus. In fact, only one respondent produced surplus food throughout the seasons. Similar observations made by Wandere (1991) suggest that accessibility to the food produced within the household may encounter disturbing influences when food is delocalized for market value. The situation is aggravated by high dependence on household food as a source of income. However, because a majority of the respondents were largely dependent on subsistence agriculture and poorly paying sources of income, their dependence on farm produce as a source of finance besides being a means of subsistence is thus justified. Surprisingly, even the very few respondents engaged in salaried employment sold portions of their household food to supplement incomes.

The study also observed that a majority of respondents were women generally documented as people of low economic status. Farmers of low economic status resort to translating part of their food sector into cash, in order to manage as well as meet other subsistence requirements. In support of this observation, the entitlement theory asserts that the probability of food insecurity increases whenever a large segment of the population has access to minimal endowments.

A majority of households sold food because of economic reasons, mainly the need to cater for school levies. Ndegwa et al. (1985) and Sutherland et al. (1998) observe that farming households in marginal areas place a particularly high value on education because farming to them seems to offer low and risky returns in comparison to regular urban employment. They, therefore, invest in education even to the point of selling household food stocks to pay for school fees for their children. The purchase of farm inputs such as seeds and pesticides saw a sizeable number of respondents selling portions of their harvests. Paradoxically, some of the seeds and pesticides that farmers buy are uncertified *(Daily Nation,* 5 March, 2000).

Sutherland et al. (1998) note that the increasing cost of health care has a direct influence on household food security. In this study, more than one third of the respondents cited medical bills as a reason compelling them to sell off their food. Pala's (1976) remarks that the need to purchase household basic items constrained women farmers to sell part of their food supply were supported by the findings of this study. About 42% of the respondents reported that the costs of salt, kerosene, cooking fat, among other household items, forced them to market household food bit by bit whenever such a need rose. Interestingly, the study revealed that much of the proceeds earned from the sale of food were in most cases used to purchase additives such as sugar, salt, and relishes and not necessarily main food stuffs. This does not mean, however, that food is never sold due to selfless reasons.

According to Shamalla (1982), there is a tendency of farmers to rush to dispose of the harvest for fear of eventual loss to pests or due to lack of adequate storage. Part of these observations were confirmed by the study findings. Of importance here, however, is the fact

that households market their meagre stocks of food in response to some cash requirements. In Ndeiya Location, food selling immediately after harvesting was common, partly because the harvesting season nearly coincides with pre-determined money demanding occasions, including the December festive season, land preparation activities, and commencement of a new academic year. Information gathered from key informants revealed that the farmers' attempts of storing and preserving grains for sale later in time when the prices were perceived fair were thwarted by pest attack. Consequently, a majority of households preferred selling their produce immediately after harvesting. GOK/UNICEF (1998) has made similar observations by reporting that selling of farm produce soon after the harvest even in famine prone zones of Eastern and Coast Provinces is known.

The study findings also revealed that harvesting of maize is closely followed by a labour intensive season involving land preparation. During this period, the availability of family labour is relatively low due to the absence of school going children during a better part of the day, in addition to the absence of male labour often employed off the farms. A majority of the households, therefore, depend on hired labour paid for by food, either singly or in addition to cash. Ontita (1996) avers that when a section of the community is observed working for food on their neighbours farms, it is a demonstration of the extent of food insecurity in the area. An equally important finding of this study is that virtually all the households felt strongly that food selling depletes the available stock and is, therefore, detrimental to household food security, especially when the subsequent farming seasons prove unsuccessful. In this context, small-scale farming in the study area can be termed as a near-subsistence activity because not all the food produced is used to feed the household

members. This is contrary to the policy suggested by the World Bank (1986) that the priority of agriculture in semi-arid areas should be on food for subsistence rather than as a source of income.

5.4 Food Sharing and Household Food Security

The last objective of this study was to examine the influence of food sharing on household food security. Food sharing is a social activity involving exchange of food materials among kindreds, friends as well as food donations made to social institutions. On one hand, Kliest (1985) observes that the changing social structures, especially in urban areas, have hampered food sharing. On the other hand, Ontita (1996), notes that the escalating needs such as clothing, school fees, better housing and fuel that requires money for them to be satisfied have rendered increasing food selling with limited food sharing.

Informal interviews revealed that all households strove to achieve their food security mainly through cultivation. Similar findings were made by Omosa (1998) in her study among rural food producers in Kisii District where nearly all (99.6%) of the respondents pursued food security mainly through cultivation. However, sometimes households engage in social safety networks to build up their food security. According to Sen, (1981), social safety networks are part of the 'transfer entitlements' whose efficacy is dependent on the nature of social relationships and availability of other forms of entitlements to the households. The occasional or frequent visits made by a majority of respondents to their kindreds points to a transfer of some social favours among the households. The existence of social cohesion is

exemplified by the attendance of family meetings reported by 82.2% of the respondents (Table 4.9).

The findings of this study reveal that only a small fraction (5.6%) of the respondents reported visiting their kindreds with the objective of seeking for some food aid. This points to high incidences of lack of expectation for food assistance and could be attributed to the struggle of respondents in achieving independence and self-reliance. Alleviation of dependency and cultivation of sustainability are some of the noble virtues called for by development agencies. Moreover, discussants in focus groups correctly observed that food sharing in modern communities is a culturally defined short-term solution to food insecurity.

While a sizeable number (41%) of the respondents affirmed that they took some food to their relatives particularly on learning that their kindreds were hungry, an almost equal number (37.8%) reported receiving many visitors in need of food during the harvesting season. The study revealed that kindred in need of food assistance would send some of their members, especially children, to relatives farming in Ndeiya Location to assist in harvesting, in return for some food. Only a few (7.8%) of the respondents reported receiving visitors to assist with labour during the peak seasons. It is no wonder that households depend on hired labour during labour intensive seasons.

Over two thirds (71%) of the respondents were not under obligations to feed their relatives. Also, about 27% of the respondents had housed some of their relatives. These findings could be attributed to the changing of some social structures, including households and family

nits. A sense of individualism is emerging in most human organizations. This is partly fuelled by economic hardship as well as social and physical mobility characterising post-modern societies. Neighbourhood and peer fabrics are rapidly replacing the traditional social fabrics such as kinship that were vital in binding people together. The absence of optimum extension of assistance to the kindreds by the respondents finds a further explanation in the socio-demographic characteristics. The young married people dominant in the study sample formed the newly established households whose efforts are geared towards establishing self-sustaining units. This category of farmers are parents of the food consuming age groups. Also, young farmers focus their attention on their children whom they owe direct responsibilities of providing with basic needs.

The findings of this study indicate that 15.6% of the respondents shared food with non-resident children. This finding could be attributed to the argument that due to economic constraints facing the young population, children remain dependent on their parents, especially in the provision of food conventionally assumed to be abundant in the rural farms. The economy of affection could also offer an alternative explanation. Nearly a half (45.6%) of the respondents derived additional income from remittances. The practice of extending assistance to households by spouse, children or relatives is induced by the obligation of reciprocity. The socio-cultural obligation of children to support their parents and vice versa, enables the household members who are in hard situations to subsist. Mutual assistance is, moreover, hereby emphasized as one of the packages by which family members are bound. It could be timely here to add that there are some limitations beyond which the practice of

reciprocity is made impracticable. This is common when there are insufficient subsistence food supplies in the entire community.

An unquantified amount of food find its way to various institutions that households identify themselves with. During the December festive season, for instance, a myriad of social ceremonies including marriage, family meetings and some anniversaries normally take place. This time is perceived to be convenient partly because there is at least some food and the local participants would have some material contributions to make. Hosts of the ceremonies often call upon friends and neighbours to help in the preparation of the feast by sending some food. Where the ceremony demands some contributions in the form of money, farmers sometimes resort to food selling to meet the fee.

Other food donations made by the households are channelled through the church and church-based organisations. The tithe and offerings made by the households to church stem mostly from the farm produce. Informal interviews revealed that many of the church projects are sustained through the contributions made by the congregation. The congregations in the study area derive much of their income from the sale of food items. It is, therefore, worthy noting that the forms of offerings made to churches in either material goods or money basically originate from the locally available resources. Among semi-arid food producers harvests are a key resource and any attempt geared towards the exchange of food for other entitlements exposes the population to risks of food insecurity. While remittance of offerings by the households are generally annual events commencing immediately after harvesting, some church functions emerging between the harvests and demanding some material

contributions from the congregation, compel farmers to sell part of their stored food to fulfil such an obligation. The study further revealed that even the very mini-offerings made nearly on all Sabbaths by respondents stemmed from the farm produce. Important also is the argument that most of the church projects financed by the congregation are designed to coincide with the harvesting seasons. During these times, optimum contributions from the congregation are expected.

Portions of food donated to the church are often redistributed to the less advantaged members of society within and without Ndeiya Location. To some extent, however, the food-donating households get their food stocks depleted but the prevalent religious convictions and justifications are used to normalise this practice. The finding supports Abdel-Aziz's (1975) observation that food is a vital commodity in meeting religious needs.

Harambee functions were reported to happen soon after harvesting. The local participants are encouraged to contribute their share in the form of food or otherwise. A local administrator informed the researcher that in order to harness optimum participation of the farming community, organizers of the *harambee* request farmers to make their contributions in the form of food. This points to the extent to which food has been commoditized. This observation could, however, be justified because locally available resources are utilized to initiate development. The impact of food usage in the day to day transactions on household food security requires thorough assessment in future research on food security.

The observed organization of women into groups with the main objective of pulling their resources together and, more specifically, improving their economic status as well as enhancing their abilities to meet a range of social obligations pointed indirectly to the roles of women in the enhancement of household food security. The findings of this study revealed that women, organized into groups, engaged in supplying food to the needy members. The study also noted the high degree of awareness held by households pertaining to the detrimental effect of persistent food sharing on food stocks available to the household. Since the sharing of food is a socially accepted and culturally justified custom its negative influence on households' food security is sometimes blurred.

5.5 Gender and Post-harvest Food Handling

Gender issues in food harvesting, storing, selling and sharing were evident in the study findings. Apart from women being a majority of farmers, they are also more involved in post-harvest food handling than men are. These findings support Horeinstein's (1989) view that in most subsistence food producing communities, women perform much of what pertains to food production on the farms. While women are mainly involved in food harvesting and storing, they are less involved in construction and repairing of food stores (Kenyatta, 1961). Among the pre-industrial Agikuyu, men were responsible for the construction of granaries, a tradition that has spilled over into the present society. Therefore, men are equally important in the cycle of food handling. The study findings further revealed the prevalence of low decision making capacities among some women farmers pertaining to the disposal of harvests. Some of them confessed that they had to inform their spouses before selling some food otherwise any failure in seeking consent would sometimes fuel unrest in the household.

A majority of the women farmers argued that since they had little authority of disposing major assets such as livestock, it was more convenient to meet their needs by selling a portion of their own asset, in this case food.

Secondary data reveal that women form a majority of members of most of the community-based social organisations, including church and women groups. Consequently, women contribute a larger proportion of the capital required to run these social institutions. The study findings revealed that women farmers depended largely on the locally available resources, mainly food, to assist them in fulfilling their social obligations, such as, supporting the social institutions they identify themselves with. Kenyatta (1961:62-63) observes that women are 'managing directors' of the food supply and, therefore, they are endowed with the responsibility of handling and storing food according to the immediate and future needs of the household. Some of the responsibilities accorded to women farmers include managing food sharing with resident, non-resident relatives and children, and budgeting of food to be marketed or donated to institutions.

5.6 Conclusions

Post-harvest factors influencing household food security in a semi-arid food producing community were the main subject of this study. The conclusions drawn from the study are presented according to the themes investigated and are as follows.

1. The small-scale farming in the study area is a subsistence activity because nearly all the farm produce is grown both for home consumption and the market. Maize is the determinant crop to household food security. However, with the rapidly

declining pyrethrum farming, the staple maize food has been converted into a cash crop. The lack of alternative non-food cash crop in the study area to compliment food crops contributes significantly to food insecurity.

2. On-farm storage systems, specifically the main house and crib food storage are commonly used in the study area. A majority of the households store food in the main house using gunny bags. While this method is highly supported by secondary data it contributes to grain loss in the study area. This observation is supported by the fact that pests and dumpness are the major contributing factors of grain loss when food is stored in the main house. When bags of grains are heaped together over a small space, aeration is inhibited, thus generating a conducive environment for the rapid breeding of insect pests. Also, the rate of the spread of pest infection is high for threshed grains stored in bags especially, where farmers apply pesticides after the pest attack is observed. Storing of food in gunny bags, however, allows optimum inspection. The bags of food are also portable. It is, therefore, recommended to commercial dealers handling large volumes of grains that are sometimes required to be transported from one area to another. Storing of grains whose moisture content is below 12% (Bencini, 1991) contributes to rotting especially when grains are stored in gunny bags. Also attack of bags by rats results into spillage. Nevertheless, it was evident in the study area that food stored in the main house was more secure against theft. The availability of jute bags in the study area prompted the utilization of main house storage systems. A majority of the respondents preferred the crib food storage system, although only slightly more than a third (39%) of the households have

managed to construct cribs. Either one or more of the following reasons justified the preference of cribs to other forms of food storage. Firstly, cribs do not require the grains to be threshed before storage. Secondly, the drying of grains is prompted even after storing. This is enhanced by the adequate aeration and ventilation, however, sometimes harmful when drying reduces the grain moisture content to below average. Cribs were also preferred because of their secondary functions, for instance, they are used for storing farm tools and equipment. Cribs had some demerits, for instance, food stored in cribs are more prone to theft. Their shanty nature contributes significantly to food damage, for instance, food is less protected against rain. A monetary cost is also incurred in the construction of cribs. Abdel-Aziz (1975), Bencini (1991), and UNIFEM (1993) observe that on-farm simple storage systems are essential to small-scale subsistence farmers in that they promote their food security. Important also is the fact that the available on-farm storage capacities in the study area are inadequate as reported by more than a half (53.3%) of the respondents.

3. Food loss to pests is a known problem in the study area. Most of the households, however, are highly aware of some remedy to grain pest attack, including the use of modern and traditional pesticides. Key informants revealed that farmers are endowed with inadequate information pertaining to pest control. Interestingly, while a majority of households use pesticides bought from the agro-chemical shops, escalating grain loss to pests is reported. This partly points to the supply of uncertified pesticides to farmers by some pesticide-dealers. Also applying of

pesticides by farmers after the attack has actually occurred offers an alternative explanation to the increasing grain loss.

4. While only a few households produced surplus maize, nearly all households reported selling maize, sometimes to the extent of threatening the meagre stocks in order to meet other subsistence demands. A myriad of economic reasons, among others, the need to raise school levies, medical and water bills, purchasing of farm inputs as well as basic home requirements, compelled farmers to market their food. The poor economic performance among a big cross-section of households (GOK, 1997a) is definitely instrumental in the participation of households in the injurious business of selling food. Food selling is further aggravated by the dependence of households on poorly paying occupations besides subsistence farming as sources of income. Also, due to their low economic status, women who are the majority of farmers use food as the only valuable resource that they can dispose of easily. This has a direct impact on the quantities of food available to the household. The ready market for food provided by consumers living in less farming regions neighbouring the farming zones of Ndeiya Location encourages food selling.
5. The movement of food from the farming households is higher than is the inflow of the same. While only a few households seek for food aid from their kindred, a sizeable number of farmers received pleas from relatives to provide some food assistance. A majority of households confessed giving out some food to social institutions. Since much of the donations made to a majority of institutions are often monetarized, the donated food has to rhyme with the set levy. Due to the

relatively low prices of maize, the donating households find themselves contributing large quantities of food. This obviously depletes the available household food. Nevertheless, it was revealed that much of the food given out by the households is rarely quantified with precision. Also, religious beliefs are often used to justify the practice of contributing food to social circles. The use of food by the households to meet nearly all their social obligations is prevalent because of lack of sustainable sources of income, especially among women farmers.

6. In Ndeiya Location, as is the case with other agricultural communities, women are active participants in the management of the harvested food.

5.7 Recommendations

On the basis of the discussed findings and the conclusions drawn thereafter the following recommendations are proposed.

1. Ndeiya Location is much wanting in terms of extension services in the farming zones. Apart from the extension officers advising farmers on strategies of improving maize production in the farms, they would be of great assistance in encouraging farmers to invest in small-scale pyrethrum growing. This recommendation is timely suggested since the demand for pyrethrum is increasing at local, national and international levels. The study points to the emergence of horticultural farming in Ndeiya Location. Extension services should be deployed in the area to help farmers in establishing dry land horticultural enterprises.

2. The study revealed that farmers engage in off-farm activities to supplement incomes earned from the main occupations. Development agencies and non-governmental organizations working in the study area, in conjunction with the government, should assist farmers to improve on the already established income generating initiatives as well as develop other environmentally sustaining initiatives. Such input is composite in nature for it would enable the farmers to achieve self-sustaining growth, reduce poverty and improve household food security.
3. Food storage has been identified by this study as a central component in the enhancement of household food security. The on-farm food storage systems call for immediate improvement. All parties interested in development should assist farmers in improving the food storage systems already existing in the study area. Extension officers should train farmers on the modern improved storage systems.
4. Research designed to assess the effectiveness of traditional methods of pest control should be commissioned and the findings communicated to the subsistence farmers. This would provide a scientific basis of either crediting or discrediting these methods. Government authorities should ensure that only legally registered and approved agro-chemical dealers are supplying farmers with pesticides. Agricultural extension officers should provide farmers with necessary training on the application of suitable storage pesticides.
5. Women should be the main target group for many intervention programmes and change policies geared towards post-harvest food handling because they directly influence household food security.

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APPENDIX 1

QUESTIONNAIRE

Please check as advised in each case. Your response will be held in strict confidence

A. Background information

Name (optional) ---------- Sub-location ----------

Sex 1. Male 2. Female

Age_____ Years

Marital status

1. Single 2. widowed 3.polygamist 4.monogamist 5.Divorcee/separated.

Religion

1. Christianity 2.Traditionalist 3. Muslim 4. Other (specify)----------

Since when did you start farming business?

1. 1990s 2. 1980s 3.1970s 4.Before Independence

B. Food Production and Security

1. Which food crops do you grow and for what purpose.

Crop	Home consumption	Sale	Both
1. Maize			
2. Beans			
3. Potatoes			
4. Cabbages			
5. Peas			
6. Kales			
7. Other(Specify)			

2. Which one food crop more likely determines the food security of your household?_____

3. Which non-food cash crop do you grow? _____

4. When do you harvest maize? When: 1. Green (go to Q.5) 2. Dry

5. Suggest reasons_____

6 For the following years, how many bags of maize did you harvest?

Year	1997	1998	1999
No. of bags			
Land size under maize(hectare)			

7.Do you think the amount of food you harvest each year is enough for your household needs? 1. Adequate 2.Inadequate

8.Have you ever suffered from food shortages after bumper harvests?

1. Yes 2.No

9.How would you rate food availability in your household?

1. There is always enough to eat
2. Occasionally, there is enough to eat
3. There is never enough to eat

C. Food storage and preservation

1. Where do you store your maize?

   1.Traditional granary 2. Main house 3. cribs 4. Other(specify)

2. What maintenance practices do you carry out on your store before storing food? (check as many as apply)

   1. Washing 2. Repairing walls, roof etc 3. Fumigation
   4. Oiling/greasing posts 5. Other (specify)

3. What types of containers do you store food in? (check all that apply)

   1. Grass bins 2.Gunny bags 3.Gourds 4.Pots 5. Paper bags 6.Tins
   7.Other (specify)

4. In your opinion which form of storage lead to large quantities of grain loss?

   _____ Explain _____

5. For how long can your food remain in the store without getting damaged?

   1.Less than 3 months 2. 3 – 6 months 3.6 – 12 months 4. 1 year +

6. Is the capacity of your storage facilities adequate to hold all your harvest?

   1.Very adequate 2. Somehow adequate 3. Inadequate (to Q. 7)

7. What do you do with the remaining unstored food? (check all that apply)

   1.give out to relative, friends 2.sell 3. use as animal feed 4.other (specify)

8. Which insect pests commonly attack your stored food? (check all that apply)

   1.Weevils 2.Moths 3.Ants 4.Other (specify)_____

9. How do you get rid these of pests

   1. Use of traditional 'pesticides' (namely _____
   2. Modern pesticides (namely _____
   3. Both
   4. I don't bother (to Q.10)
   5. Other (specify)_____

10. Why not? _____

11. Where do you obtain modern pesticides?

    1.Local duka 2.Local market 3.Agro-chemical shops 4.Co-operative society

    5.Friends/relatives 6.Other (specify)_____

12. Do rats damage your stored food? 1.yes 2. no

13. If yes, how do you control them? (check all that apply)

    1. Using rat guards Trapping 2.Use of predator 3.Poisoning 4.I don't bother

    5.Other(specify) _____

14. A part from insect pests and rats, what else contribute to loss/damage of your stored food.

1.Dumpness 2.Theft 3.Domestic animals 4.Other (specify) _____

15. How would you rate the problem of loss/damage stored grains in your household?

    1.Very serious 2.Somehow serious 3.Not a big problem 4.Not a problem at all.

D. <u>Food selling</u>

1. What are your sources of income? (check all that apply)

   1.Salaried employment 2. Business operation 3.Remittances 4.Off-farm petty activities 5.Other (specify) _____

2. For what purpose is the harvest sold? (check all that apply)

   1.Raise schools fees 2.Pay water or medical bills 3.Purchase valuables 4.Buy convenient foods 5.Maintain the farm 6.Buy household essential goods (sugar, salt etc) 7.Others (specify)

3. How often do you produce "surplus' food?

1.In all season 2.Most of the seasons 3.In very few seasons 4.Never

4. All food you sell is surplus. Do you agree with this view?

1. Strongly agree 2. Agree 3.Disagree 4.Strongly disagree

5. When do you sell your grain? (check as many as apply)

1. Immediately after harvesting
2. When the forth coming harvest seems good
3. As long as I notice attacks by pests
4. When prices are perceived good
5. As long as the family has enough
6. Any time
7. Other (specify) _____

6. Do you hire labour in your farm?

1.Yes (go to Q. 7) 2.No

7. How do you pay for it

1.Cash 2.Food 3.Both 4.Other (specify) _____

8. Does food selling affect your household's food sufficiency? 1. Yes 2.No

E. Food sharing

1. Do you visit your relative and /or friends? 1.Yes 2.No (to Q. 4)
2. How often do you visit them? 1.Very often 2.Often 3.Occasionally
3. Why do you visit them (check all that apply)
    1. Attend clan meetings and other ceremonies
    2. Assist in some agriculture activities
    3. Take them food
    4. Ask for food
    5. Other (specify) _____
4. Why not?----------
5. Check. when relatives visit you most.

1.Ploughing and planting 2.Weeding 3.Harvesting 4.Other(specify)

6. Do some of your relatives live with you? 1. Yes 2. No
7. Are you under any obligation to provide food to

(i)Relatives? 1.Yes 2.No

(ii) Non-resident children? 1.yes 2.No

8.Are there times you are expected to donate food to any of the following

	Yes(explain)	No
Church		
School		
Harambee functions		
Women groups		
Other (specify)		

9.Are you aware of ceremonies that take place mainly after harvests 1.Yes 2.No

10. If yes, which are they? _____

11. In respect to the amount of food you give out and receive, do you agree that post-harvest food sharing depletes your food stock?

    1.Strongly agree 2.Agree 3.Disagree 4.Strongly disagree

12. Who make decisions on?

    a. When to sell food
    b. Amount of food to be stored
    c. Amount of food to be shared and with whom
    d. Amount of food to be sold
    e. When harvesting should begin

APPENDIX II

INTERVIEW GUIDE FOR KEY INFORMANTS

1. How do you rate food security of this area? Give reasons for your answer.

2. Even after bumper harvests, many households in this area suffer from food shortages. What is your opinion towards this view?

3. Describe on-farm storage facilities common in this area? If any, what are their weakness and advantages?

4. Describe the food preservation practices commonly used by residents of this area. In your opinion what is their efficiency in reducing food loss?

5. Why do households embark on selling their meagre food reserves? How does this influence food security?

6. What communal social functions normally take place in this area? Do you think they have any influence on food security?

7. What forms of communal food sharing are common in Ndeiya? What impact do they have on household food security?

8. What recommendations would you suggest that would enhance improvement of food security in Ndeiya Location?

APPENDIX III

FOCUS GROUP DISCUSSIONS GUIDE

1. Many households do not grow non-food cash crops. Does this have any impact on household food security?
2. While a majority of households store food in the main house, they highly prefer crib storage system. What explanations would you offer to this observation?
3. Farmers are known of using pesticides yet they persistently lament against mass grain loss to pests. Discuss.
4. Does the present economic development status of this area have an influence on food selling?
5. What strategies should be employed to reduce the reported increasing instances of food selling?
6. Does food sharing have some detrimental effects on household food security?
7. What are the gender roles in post-harvest food handling practices?