DETERMINANTS OF FOOD SECURITY AMONG WAGE WORKERS IN THE FLORI-HORTICULTURE INDUSTRY IN KENYA: A CASE STUDY OF NORTHWEST MT. KENYA REGION

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DECLARATION

I declare that this paper is my original work and has not been submitted for award of a degree in any other university or institution.

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This paper has been submitted for the award of the degree of Master of Arts in Economics with my approval as the University Supervisor.

SUPERVISOR

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DR. MERCY MUGO

DEDICATION

To my family; my wife Brenda Kamboga, my children Adrian, Angela and Anna; and in loving memory of my late parents John Amboga, Benter Auma, and uncle Maurice Otieno.

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LIST OF ABBREVIATIONS

AOF   Augmented Objective Function

ASDSP   Agricultural Sector Development Support Programme

EU   European Union

FAO   Food and Agricultural Organization

GDP   Gross Domestic Product

HCDA   Horticulture Crop Development Authority

HFIAS   Household Food Insecurity Access Scale

IFAD   International Fund for Agricultural Development

KNBS   Kenya National Bureau of Statistics

SDG   Sustainable Development Goals

UK   United Kingdom

UN   United Nations

WFP   World Food Programme

ABSTRACT

Understanding the determinants of household food security is critical in designing relevant and appropriate policy interventions aimed at improving the livelihoods of flori-horticulture wage workers in Kenya. The study set out to investigate the major determinants of food security among flori-horticulture wage workers within the Northwest Mount Kenya region, and whether their wage incomes were sufficient to cushion them from food insecurity. Additionally, this study needed to establish coping strategies for households that experienced food insecurity.

Multi-stage sampling technique was employed where in the first stage, purposive sampling was used to sample 5 farms out of the total 35 farms in the region. In the second stage, simple random sampling was used to pick 24 wage workers per farm. This resulted into a sample size of 120 wage workers, who were later interviewed at household level. In order to model the problem of food security, the Logistic regression model was used to estimate the predictor variable coefficients, and marginal effects were further computed to interpret the regression results.

The results indicated that nearly 71.2 per cent of households within the study area were food insecure. Education of the household head, ownership of livestock such as poultry, and income from wage work were found to be significant determinants of food security at 5% level of significance. However, household size and age of the household head were insignificant determinants. In terms of household coping strategies, the study found out that 16.1 per cent of households borrowed food in order to bridge food gaps, while 28.2 per cent reduced the quantity and quality of their food intakes while a majority, 56.4 per cent took food from local shops on credit.

CHAPTER ONE: INTRODUCTION

1.1   Background of the Study

The horticulture sub sector in Kenya continues to record one of the fastest growth rates in the recent past, ranking third only after Tourism and Tea in terms of export foreign exchange earnings. In 2018, the sub sector grew by 6.1 per cent in terms of production, closing the year at 322.6 thousand tons which translated to a 33.3 per cent increase in market value to KShs. 153.7 billion. This was on the backdrop of increased production and better international prices. (Economic Survey, 2019). The sub sector also continues to be one of the leading employers, creating direct employment to approximately 6 million people, while a further 3.5 million people are estimated to benefit indirectly through trade and other related activities. Notably, there is a high concentration of women and youthful labour force throughout the various stages of production due to the delicate and perishable nature of the produces involved, especially in flori-culture (Kabiru, Mbatia & Mburugu, 2018).

Figure 1. 1: Fresh Horticultural Exports by Market Value – (2000 – 2018)
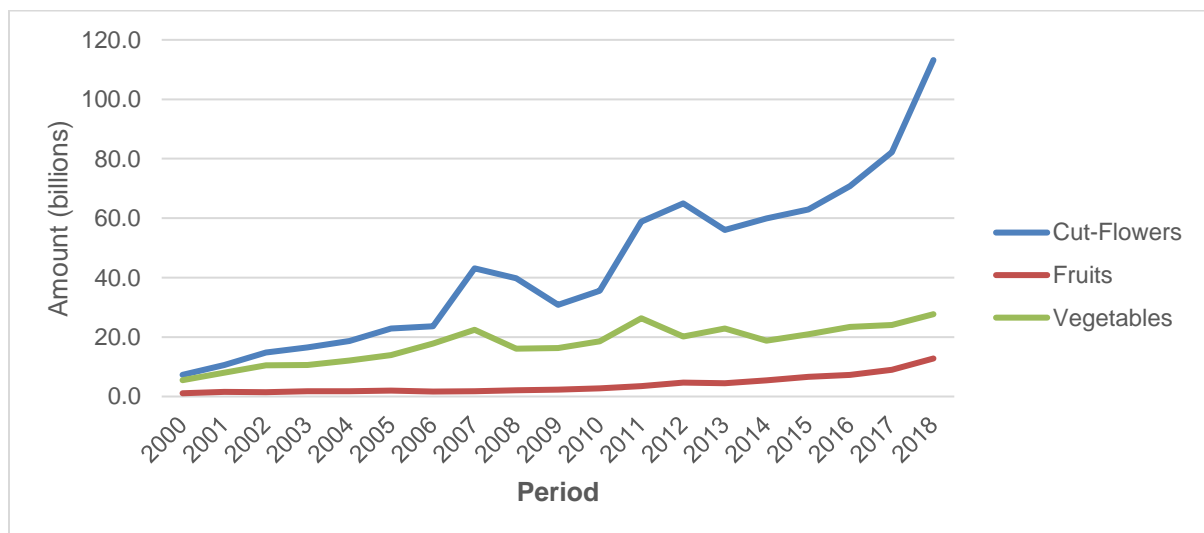
Source: KNBS (Economic Surveys and Statistical Abstracts)

Figure 1.1 above provides a summary of the contribution of each of the three components of horticultural produces in terms of market value. Cut flower has registered steady growth over the years, contributing on average, 63.5 per cent of total earnings, while the market value for fruits has remained relatively steady. The Kenyan government, having recognized the potential of horticulture, put in place policies to promote and grow the sub sector. One such policy resulted into the establishment of the Horticultural Crops Development Authority (HCDA), whose key mandate is to develop, promote and coordinate the production and marketing of export horticultural produce.

Hence the remarkable growth in the sub sector can be attributable to such policy interventions as well as the expansion of destination markets and favorable international prices. In terms of volumes, vegetables continue to be the largest contributor to overall horticultural production, averaging at 38.8 per cent of total output, which is equivalent to 70.4 thousand tons on average as shown in Figure 1.2 below. However, international market prices for vegetables remains lower compared to that of cut flowers, thereby lowering foreign exchange earnings.

Overall, horticultural production in volumes has registered steady growth mainly due to the growth in number of producers within the sub sector. The use of modern production techniques and reliance on scientific research have also been key in enhancing output.

Figure 1. 2: Fresh Horticultural Exports by Volume – (2000 – 2018)
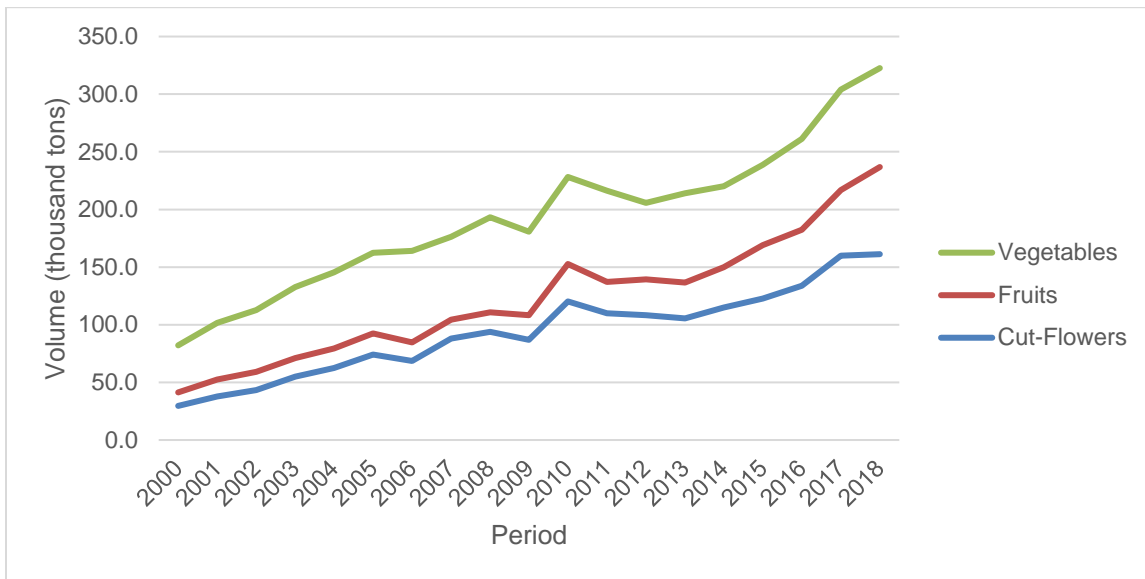
Source: KNBS (Economic Surveys and Statistical Abstracts)

* Data for the period preceding the year 2000 was noted to be incomplete and inconsistent hence was omitted.

Given the importance of the flori-horticulture sub sector towards the achievement of Vision 2030, and its contribution to the agricultural GDP, the Kenyan government drafted a national horticulture policy aimed at enhancing the growth prospects of this subsector, with an objective of ensuring that it remains on a growth path towards enhancing food security. With such growth prospects, the horticulture sub sector is anticipated to positively contribute to Kenya's achievement of the Sustainable Development Goal (SDG) number one and two that aim at ending poverty, hunger and achieving food security by the year 2030.

According to a report by the Embassy of the Kingdom of the Netherlands (2017), Kenya's success in the flori-horticulture business can be attributed to its right climatic conditions, competitive labour force and good access to export markets in terms of regular flights. The sub sector is dominated by large agro-industrial farms based within the Rift Valley town of Naivasha, and the slopes of Mt Kenya within the towns of Naro Moru, Nanyuki and Timau.

Horticulture farming thrives under cool, hot and wet climates. Kenya naturally offers these conditions by being on the equator thereby ensuring production throughout the year (McCulloch & Ota, 2002), although the availability of sufficient water for irrigation in most cases is a challenge. The large agro-industrial farms exclusively produce for exports with the largest market destination being the European Union (EU). In addition, a number of medium-sized farms have signed out-grower contracts with the large farms. These smallholder outgrower farms supply their produce to the large farms who ultimately package and brand for export. This group of small and medium-sized outgrowers account for about 80% of the total producers while the remaining 20% is made up of the large privately-owned farms (Mehra & Rojas, 2008).

In terms of export volumes, Kenya's success can only be compared to that of South Africa who are currently ranked first within the Sub-Saharan Africa region, and Egypt to the north. Kenya is a leading exporter of high value horticultural crops and notably, our green beans is one of the highest quality in the world. Exports are predominantly to the EU market including the UK, Netherlands, France and Germany, although newer markets include the Middle East and Japan for vegetables and herbs, (Barno, Ngwiri & Ondanje, 2011).

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1.1.1 Food Security

A country is said to have achieved food security when its citizens are able to attain both physical and economic access to safe, nutritious, and sufficient food for their daily dietary needs at all times, for a healthy and active life (Food and Agricultural Organization [FAO], 2010). This definition highlights four dimensions of food security namely; physical and economic access to food, physical availability of food, utilization and the stability of the other three dimensions. These four dimensions are critical in analyzing food security both at a household and national level. Thus, a food secure nation is seen to be a healthy economy, which is directly interrelated with low poverty levels and higher economic levels of development.

The World Development Report (2008) highlights that agriculture has the ability to generate an overall gross domestic product (GDP) growth and has comparative advantage in reducing poverty in a given country. This can be achieved through the enhancement of subsistence farming within rural set-ups where a majority of the global population lives, thereby ensuring that the rural dwellers are food secure with lower poverty indices (Lopez & Valdés, 2000).

The global population who are chronically hungry or undernourished is estimated at about 795 million, compounded by the ever-rising world food prices (FAO/IFAD/WFP, 2015). This has necessitated concerted and renewed efforts to reassess the role of agricultural growth and development in averting the incidence of food insecurity and poverty.

1.1.2 Food Security in Northwest Mt. Kenya Region

The Northwest Mt. Kenya region is predominantly an agricultural area with 60 per cent of the residents involved in agricultural activities from which they derive their livelihoods. As a result, agriculture accounts for up to 75 per cent of household incomes within this region (Agricultural Sector Development Support Programme [ASDSP], 2014). Agriculture is majorly at a subsistence level with the main crops grown being maize, beans, wheat, Irish potato, cabbage and tomato. Households also keep livestock such as goats, cows, sheep, donkeys, camel, poultry and pigs, which also contribute immensely towards their livelihoods. However, since agriculture is mainly rain-fed, production levels dwindle during periods of drought.

According to the report by ASDSP (2014), 80 per cent of households in Laikipia face food insecurity. In particular, the report outlines that 89 per cent, 94 per cent and 78 per cent of male, female and youth-headed households respectively, were food insecure. This report also highlighted that a majority of the households (93 per cent) had only one source of income, with on-farm activities being the major income source for households.

1.2   Statement of the Research Problem

Production of horticultural products for export has increased the competition for land and labour resources between the production of vegetables, cut-flowers and fruits for exports, and food crops, thereby increasing chances of food insecurity. As such, the "food first" approach for smallholder farmers has been promoted as a solution to the problem of malnutrition, since growing cash crops exposes them to unpredictable market fluctuations, which has compromised their food security.

While flori-horticulture farms contribute immensely towards the growth of the economy through foreign exchange earnings and employment creation, there has been a debate regarding their contribution towards improving the living standards and food security of their work force. A study carried out by (Chege, Mburu, Nyikal & Muriithi, 2013) on the food security status of smallholder farmers in Kirinyaga and Mbooni Counties in Kenya, revealed that in Mbooni in particular, food security was negatively impacted. The farms offer employment in three main forms; casual, seasonal or permanent. The first two forms offer little and unstable income while the permanent form, which is mostly offered by flower farms, pays relatively well (Lanari, Liniger & Kiteme, 2016).

Whereas the farms create employment for the wage workers who have to forego food production in their own farms, wage earnings are low and do not guarantee a decent standard of living since much of the labour is unskilled. Skilled employment opportunities such as spray technicians are mostly preserved for men.

Working conditions are deplorable and include long working hours, physically demanding tasks, and health risks arising from exposure to chemical usage without the requisite protective gear (Lanari et al., 2016). This was confirmed by (Anker & Anker, 2014) who also highlighted exploitation of wage workers.

Therefore, the current study seeks to assess whether the flori-horticulture farms contribute in any way, through creation of employment and therefore wage income, to the food security status of the wage workers and their households. The study explores how wage workers allocate their scarce financial resources towards achieving food

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security and a decent standard of living. Food security will be evaluated in terms of physical access to and the financial ability to purchase food, availability of food as well as utilization. In doing this, the paper also seeks to establish some of the coping strategies that food insecure wage workers and their households employ to bridge food gaps if any.

The broad objective of this paper is to establish the major determinants of food security among wage workers in Northwest of Mt. Kenya region.

The specific objectives are:

1. To establish the food security status of wage workers in Northwest Mt Kenya region.
2. To determine income levels of wage workers by source and test its effect on food security status at household level.
3. To determine household coping strategies in relation to food security status within Northwest Mt. Kenya region.
4. To suggest policy recommendations concerning food security within the Northwest Mt. Kenya region.

1.3   Justification of the study

The horticulture sub sector continues to be a growth sub sector within agriculture and is expected to grow even further in terms of output production and market value. The sub sector continues to employ millions of wage workers directly, who earn a livelihood from such employment. Majority of wage workers live in urban settings including small town centers and markets, where the cost of living is relatively higher compared to their rural dweller counterparts (Anker & Anker, 2016).

As a large agro-industrial food system, the sub sector's impact on food security is varied depending on which cash cops are grown and how they are marketed (Chege, et al., 2013). Studies on the subject matter have also yielded dissimilar results with (McCulloch & Ota, 2002) confirming that households involved in the horticulture sub sector either as producers or as workers, are better off than households that are not. On the contrary, (Lanari et al., 2016) argue that while wage workers within the horticulture sub sector stand a better chance of earning decent incomes by offering their labour, it is at the expense of working in their farms to produce food for subsistence consumption, and this may impact their food security status.

This study therefore aims at contributing to the existing studies on this debate, by specifically determining the causes of food insecurity among wage workers and their households, in the flori-horticulture sub sector in Kenya and in particular, North West of Mount Kenya region.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

In this chapter, both theoretical and empirical literature studies that have been done on the subject of household food security and its correlates are reviewed. We begin by reviewing the theoretical literature then finally proceed to review the empirical literature.

2.2 Theoretical Literature Review

Food security is an important area of study for economists for a number of reasons. Other than offering human health benefits, food security serves as a basis for achieving sustained economic growth. Since wage workers have to devote most of their time to work and not to produce food, they are faced with a trade-off between working and food production. It is therefore important to understand these trade-offs. This section reviews some theories that have attempted to explain food security. By reviewing such theories, this study then makes an informed decision on which empirical model clearly explains the topic. Several theories relating to food security have been advanced;

2.2.1 Malthusian Theory of Food Availability

The Malthusian theory of food availability is anchored on the equilibrium and the disequilibrium between population growth rate and food production. Malthus argued that food production should be far greater than the rate of population growth, if a food insecurity crisis is to be eliminated. This theory has been tested in Pakistan by (Ahmad & Ali, 2016) and their results confirmed that indeed there exists a linkage between rising population and food insecurity.

(Scanlan, 2001) also noted that the neo-malthusian perspective of food security is about having a society that can meet the needs of its current human population without jeopardizing that of future generations. Therefore, ecological concerns of population pressure affect food security.

His analysis was particularly concerned with food availability at the household unit level, an area in which the present study will pay particular attention. He brought in the idea of food supply, explaining that famine normally occurs because food supply has been hampered in one way or another. He states further that whenever the demand for food on account of bulging food population grows, while food supply decreases due to decreasing yields, famine and hence food insecurity will indeed happen.

This theory guides the present study in terms of understanding the role of population growth, which creates demand, and food production which is the supply side. It is consistent with the assumption that a majority of households in Kenya rely primarily on their agricultural production for food. This is the same relationship investigated by (Kirimi, Gitau, & Olunga, 2013), in which their study sought to establish the impact of smallholder commercialization as a pathway towards households achieving food security. Their analysis evaluated food security as a two-sided phenomenon with both a supply and demand side, and their results indicated that household commercialization, through provision of farm inputs reduced the risk of food insecurity.

2.2.2 Food Entitlement Theory

This theory by (Sen, 1981) argued that food security can best be explained by supply failure. According to him, famine occurs due to physical inaccessibility of food. Sen argues that the problem of food insecurity is then but an access problem at the household level and that people who suffer from hunger and famine are not and should not be entitled to food but instead be "entitled to starve".

(Sen, 1984) defines entitlements as a set of choices that an individual can acquire based on the rights and opportunities that the society accords him/her. A person's set of commodity choices refers to all the attainable goods and services that an individual can obtain by trading in their resource endowments. With regards to poverty, the entitlement theory aims to explain all the rightful sources of food which (Sen, 1981) has categorized into four: "production-based entitlement" (food production), "trade-based entitlement" (food purchase), "own-labour entitlement" (working for food) and "inheritance and transfer entitlement" (food given by others). When an individual's commodity choices do not provide them with the necessary amounts of food for subsistence, such individual are likely to starve. This then leads to famine especially if groups of people that are occupationally and geographically related are affected simultaneously resulting into drastic declines in their entitlement levels.

Trade based entitlement occurs when individuals get food due to transitionary buying and selling of food. Production entitlement accrue to people when they can grow and produce food by themselves or produce items which when they sell, will enable them to be at a vantage point to buy food. Own labour entitlement occurs when individual members of a household sell their own skill and or labour to either produce or

purchase food. Entitlement due to inheritance and transfer is when food is granted through an action by the government or society's action (Sen, 1984).

The entitlement theory provides a valuable understanding on famine within societies by shifting the focus away from food supply related issues to the inability of households to obtain or access food. People who cannot access sufficient amounts of food due to low purchasing power even when food is available are therefore considered to be food insecure. Sen emphasizes that markets do not need to meet the subsistence requirements of the population and therefore have no moral or legal reason to.

This theory is useful in informing the present study especially on the drivers of food insecurity with access as the main determinant. Other determinants of household poverty include natural disasters, low purchasing power compounded by high food prices and falling nominal and real wages in the labour market (Sen, 1984).

2.2.3 Household Livelihood Security Theory

This theory was advanced by (Frankenberger & McCaston, 1998; Chambers & Conway, 1989). The theory explains food security as a situation where food is available and there is steady accessibility of income devoted towards meeting the basic needs of a household, including food.

This theory argues that livelihoods consist of both non-farm-based and farm-based activities through which households can earn incomes used for buying food. Thus, a household can have multiple sources of entitlement from which their livelihood is ensured. The theory posits that entitlements are determined from a household's economic power and the social standing in the legal, social and political spheres. The

approach also argues that nutritional security in addition to food security, are crucial components of household livelihood security.

However, according to the theory, food is but one among a myriad of factors in the malnutrition problem, with the other factors here being; health and disease, maternal and child care and dietary intake. Therefore, the household in their livelihood basket have to balance among various competing interests both in the short run and in the long run.

The theory also notes that for households to achieve food, nutrition and income security, these three intervention measures need to be considered: livelihood promotion, livelihood protection and livelihood provisioning. Livelihood promotion involves ensuring households are able to provide food and other basic requirements throughout their lifetime. Livelihood protection is when households have been capacitated to prevent disruption of their productive ventures and ensuring recovery of such ventures if they had gone under. Finally, livelihood provisioning involves ensuring nutritional levels and lives are saved through provision of food and other essential needs to the households. These three approaches are to go hand in hand and not separately if at all they are to ensure and sustain meaningful household food security.

The theory is therefore useful in informing the present study, especially on the role of purchasing power on food security, as one of the major determinants under investigation in this study is the income from wage work. Moreover, it is assumed that

the wage worker has a number of competing set of needs that they seek to satisfy, subject to their income constraints.

From the theories explained above, a number of factors explain food security and its four dimensions. In summary, they can be categorized as both physical and socio-economic factors. Thus, any physical or socio-economic factor that explains poverty such as purchasing power, ability to access food, or high population growth may explain food insecurity. This is the focus of the study and these factors are modeled in the conceptual framework highlighted below as well as in the analytical model.

2.2.4 Conceptual Framework

The four main components of food security include availability, access, utilization and stability. The conceptual framework shown in Figure 2.1 below highlights the explanatory variables of food security as investigated in this study, and their linkage with the four dimensions listed above. This study focusses on the physical and socio-economic determinants of food security. As a result, eight (8) independent variables have been chosen such as; age of household head, household size, gender of household head, education level of the household head, land ownership, livestock ownership and income from wage work. These are the factors examined in the present study as explanatory variables while the dependent variable is food security.

Figure 2. 1: Conceptual Framework for Food Security
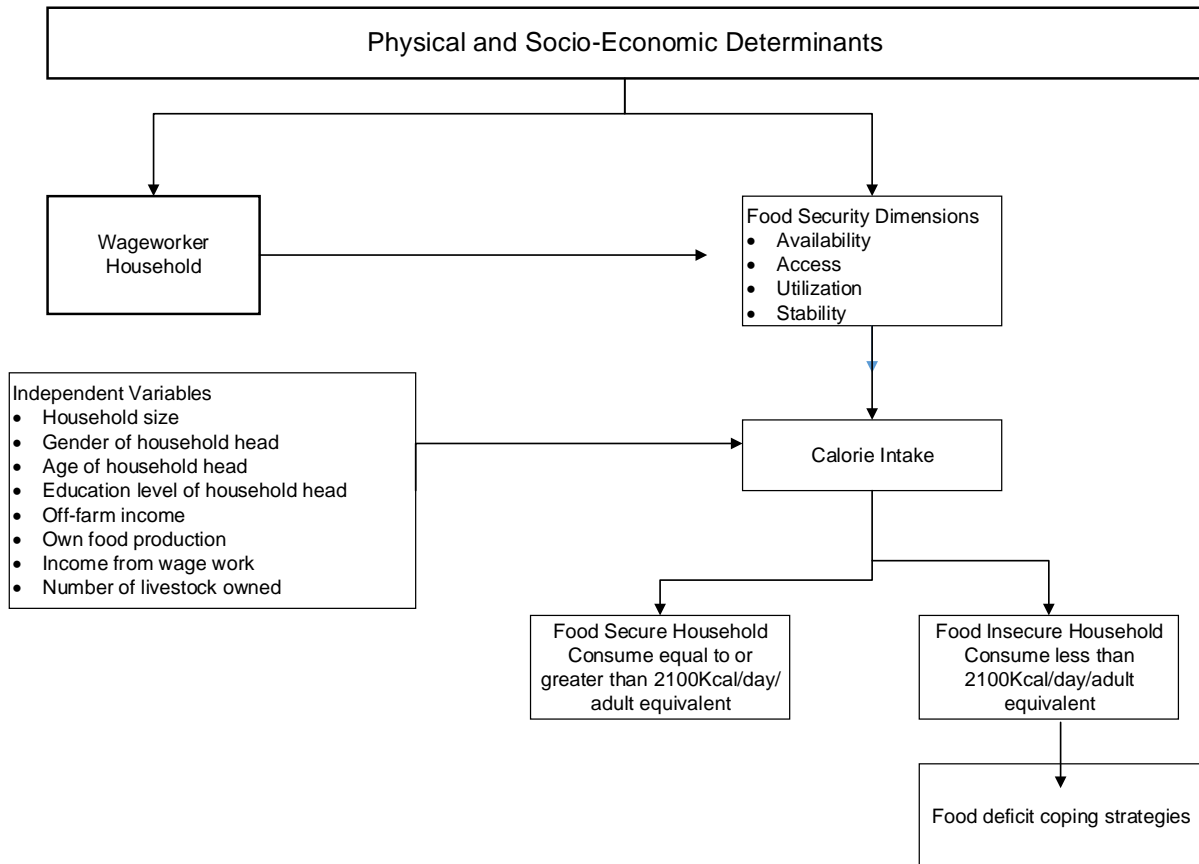
2.3   Empirical Literature

Assessment of household food security is as important to a nation as it is at a global scale. This is what necessitated the development of the Sustainable Development Goal (SDG) number two (2) by the United Nations (U.N), which seeks to "end hunger, achieve food security and improved nutrition, and promote sustainable agriculture". As a result, numerous studies have been done in an attempt to generate and encourage the debate on what really are the causes of food insecurity and how can policy interventions be designed to address food insecurity across various socio-economic and cultural structures of our population. Herein, the current study reviews

existing empirical literature on the subject matter, with a view of gaining a better understanding of the multi-faceted problem of household food insecurity, and how the four dimensions inter-play, both on the demand and supply sides of food production.

2.3.1 Assessment of Household Food Security

Food security has been assessed differently in various studies. (Tefera & Tefera, 2014) investigated the determinants of household food security and coping strategies for food gaps in Southern Ethiopia. In their study, as is in the present study, they used a two-stage sampling approach where in the first stage they randomly selected five (5) *kebeles* from which a total of one hundred and thirty (130) representative households were further selected. Their study further employed the binary logistic regression technique to estimate household calorie intakes. Their study found out that 62 per cent of households sampled suffered food insecurity.

Neo-Malthusian researchers such as (Ahmad & Ali, 2016) also sought to test the population growth theory and its effect on food security in Pakistan. As already highlighted in the Malthusian Theory of Food Availability, Malthus had predicted in 1798 that the ever-rising global population will at one point outstrip food production and supply. The study in Pakistan examined the long run relationship between variables, using the Johanson cointegration technique and found out that Malthus was right. They confirmed that high population growth rates increased chances of food insecurity both in the short and long term.

In Southern Mali, (Diallo & Toah, 2019) investigated the determinants of food insecurity among maize farming households. Their study used the Household Food Insecurity Access Scale (HFIAS) to determine the prevalence of food insecurity among maize farmers. They used a mixed method design to collect both qualitative and quantitative data. In their analysis, they used the probit regression model as opposed to the logit regression model used in the present study. Using the HFIAS, their study found out that 60 per cent of the households suffered from food insecurity, with 7 per cent being severely food insecure.

In another study by (Chege, et al., 2013) the impact of flori-horticulture on food security was assessed, specifically targeting small holder farmers in Mbooni and Kirinyaga counties in Kenya. In order to assess this impact, their study measured food security using per capita calorie intake, a seven-day recall and propensity score matching techniques were used. Their study however, generated mixed results with the outcome from Kirinyaga county indicating that the impact of horticulture farming on food security was positive while in Mbooni county, horticulture farming negatively affected food security.

A similar study by (Muktar, 2011) sought to evaluate the likelihood of food insecurity at household level in Kano State, Nigeria using the binary choice modelling. Specifically, the study used the logit regression model as is the case in the current study too. His results showed that the major determinants of food insecurity included household income, education qualifications, gender, size of household, asset

ownership by households as well as access to credit. The findings of his study were also consistent with those of (Omotesho, Adewunmi, & Muhammed, 2005) who found out that nearly 33 per cent of rural households in Nigeria from their study area, were food insecure and that annual gross farm incomes, household size, annual non-farm income and total farm size in hectares were the major determinants of household food insecurity.

Household food security influencing factors in the Bardera district of Somalia were also examined by (Oloo, 2014). His study set out to answer the research question as to why food insecurity was still prevalent in Somalia despite millions of dollars donated to the Eastern African nation in humanitarian aid. He sampled a total of 246 respondents cutting across various socio-demographic characteristics. Using logistic regression model, his findings were that the education level of the household head and the size of the household were both significant factors influencing food insecurity. His results indicated that 63 per cent of households in the Bulawayn village were food secure compared to 37 per cent which were not.

2.3.2 Household Wage Income and Food Security

As stated in the subsequent sections, the household livelihood security theory forms the basis of the present study as it posits that households allocate their incomes among competing needs including food and non-food items. Income therefore is a major consideration in evaluating the household financial access to food. This income opportunity for the wage workers presents an alternative to working on their own farms for food production. This relationship was also assessed by (McCulloch & Ota, 2002)

in which the impact of export horticulture on poverty alleviation in Kenya was examined. They compared incomes of households involved in horticulture and those which were not. Their findings indicated that households that were involved in horticulture had better incomes and hence were less vulnerable to food insecurity.

(Kabiru et al., 2018) while assessing the conditions of wage workers in the flori-horticulture industry in Kenya, pointed out that levels of education, working conditions and employment terms of flower farm workers have improved over time. The workers also earn slightly better wages than the minimum government approved wages. However, their study found out that this wage was not adequate for a decent standard of living, including guaranteeing food security.

There findings are consistent with those of (Ulrich, 2014) who assessed the implications of horticultural production on the livelihoods of rural households in Laikipia and found out that whereas the horticulture industry contributed immensely to the growth of the region, lower wages hampered the economic wellbeing of their employees. In a study by (Barrientos, Dolan & Tollantire, 2003), workers in the Kenya flori-horticulture industry have also been highlighted as being vulnerable. The study found out that workers who were food insecure were also very vulnerable to poverty. This was more prevalent among temporary female wage workers who accounted for over 65 per cent and who often had to take on both productive and reproductive roles.

2.3.3   The Trade-Off between Food Production and Wage Work

The argument put forward by the present study is based on the hypothesis that there exists a trade-off between households working on own farms to produce food crops for their consumption needs, and choosing to seek employment in the flori-horticulture farms as a source of livelihood. This trade-off is underlined by certain socio-demographic as well as socio-economic factors such as whether a household owns land that is arable, and the nature and availability of employment opportunities. As noted by (Ngutu, et al., 2018) most wage workers in the northwest Mt. Kenya region are inhabitants and therefore do not own land. This could therefore potentially impact their food security status due to overreliance on wage income.

Whereas the opportunity to work in the horticulture farms increases the amount of time spent working, the income earned from it is vital in meeting and providing basic needs for the household. The extent to which this income reduces poverty and improves food security however, is based on the amount of wage received and whether alternative employment opportunities are available (McCulloch & Ota, 2002). In rural and peri-urban set ups such as the area of study, job opportunities are not many and workers do not have many choices in addition to being land poor. Therefore, it is important for households to have other income sources.

In another study by (Ahungwa, Umeh & Muktar, 2013) on the farming households in Benue State, food security status of households within the "food basket" of Nigeria was analyzed. They randomly sampled 180 of such households and used the Food Security Index to determine food security status. Their findings were that only 36.67 per cent of the households were food secure. In addition, their study found out that

out of the food secure group, 50 per cent had between 2.1 and 4 ha of land for own food production, compared to 54.4 per cent of the food insecure group who had 0.5 to 2 ha of farmland. Therefore, their study concluded that little land ownership is likely to predispose any household or region to food insecurity (Babatunde & Omotesho, 2007). These findings are consistent with the hypothesis of the current study that when wage workers forego own food production in search for employment within the flori-horticulture farms, food production suffers and this predisposes them to food insecurity and poverty, compounded by inadequate incomes from wage work.

Further studies by (Ndambiri et al., 2012) on horticulture farming households in Nyeri district in Kenya, found out that horticulture farming was mainly carried out by two groups of people; land owners who also provide capital and labour, and labourers who only provide labour resources and are thus paid wages for it. Using the Gini Coefficient estimation technique, their study revealed that income from farm activities had a lower Gini coefficient meaning it was more consistent and capable of explaining household livelihood strategies as opposed to non-farm income.

2.3.4 Determinants of Household Food Security

From the empirical literature reviewed, (Oloo, 2014) identified age of household head, gender of household head, size of the household, education level of household head, size of land owned, number of livestock owned by the household and household income levels as potential determinants of household food security. (Diallo & Toah, 2019) also used the age of the household head, size of household, gender of the household head, education level of the farmer, plot ownership, size of the plot as well as asset ownership as some key determinants of household food security. On the

other hand, employment status of the household head, gender of the household head, size of the household, education level of household head, were highlighted as major determinants of food security by (McCulloch & Ota, 2002). Finally, (Tefera & Tefera, 2014) chose age of the household head, family size, level of dependency, size of land cultivated, livestock (oxen) kept, amount of credit taken, total farm and non-farm income as factors influencing household food security.

This study has borrowed from these past empirical studies and in particular in the choice of determinants of food security to be tested. Characteristics of the household such as education level of household head, gender, age, household size, off-farm employment income, number of livestock owned, own food production as evident from land ownership and income from wage work have all been considered for investigation as further highlighted in the model specification in Chapter 3.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter presents an outline of the approaches used in this study to ascertain the determinants of food security among flori-horticultural wage workers within the Northwest Mt. Kenya Region. Specific areas addressed are; study area, sampling and sampling techniques, theoretical framework, econometric model, model specification, definition of variables and their expected respective signs, data source and data analysis.

3.2 Area of Study

The area of study covers the Northwest part of Mt. Kenya region which is made up of three administrative counties; Laikipia, Nyeri and Meru. The three counties are a host to over 35 flori-horticulture farms within the region (Lanari et al., 2016). The main economic centres include the towns of Naro Moru, Nanyuki and Timau, alongside other small trading centres where a larger population of the wage workers live. The main economic activity of the population here is trade. Off the main economic centers, the population of the rural areas are small scale farmers who own less than one (1) ha of land per household, where they carry out mixed farming (Zaehringer, Wambugu, Kiteme & Eckert, 2018).

According to the Kenyan Government National Census of 2009, the study area is made up of about 3,000 households, both urban and rural, although it is expected that this number has substantially grown through migration as people come to the region to seek employment. The population is cosmopolitan and draws from other regions of the nation who move here in search of employment (Ngutu, et al., 2018).

Majority of wage workers live in rental houses within the urban and peri-urban centres, and solely rely on wage income for their livelihood.

The study area is located along the equator and therefore provides a conducive agro-climatic condition that is ideal for horticulture production all year round. This is seen as a natural advantage for flori-horticulture farming by (McCulloch & Ota, 2002). The Mt. Kenya serves as a water tower and a source of perennial rivers that flow from it, serving the region. The horticulture sub sector is a major water consumer and these rivers provide the much-needed water supply for the farms, even though producers have shifted from this overreliance on river water supply, to having storage dams.

Figure 3. 1: Location of the study area, Northwest Mt. Kenya Region
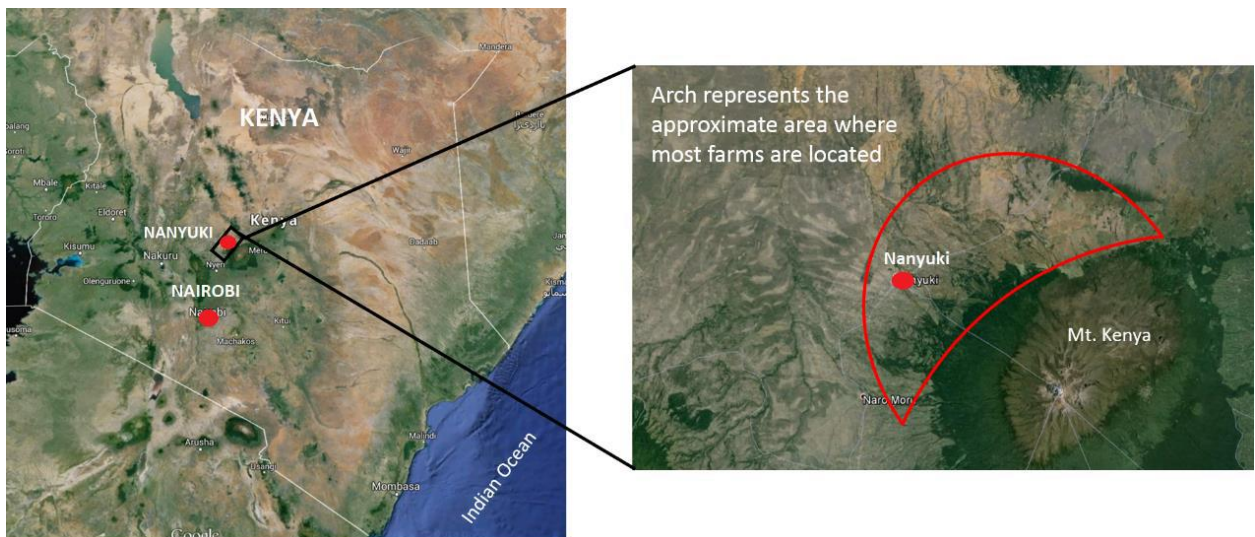
Source: Google (2018)

3.3 Sampling and Sample Size

The study employed a multi-stage sampling method in which the first stage involved purposive sampling of the flori-horticulture farms. This was important in order to represent both horticulture and floriculture. Using this method, a representative sample of five farms was chosen out of a possible thirty-five (35) based on their geographical locations as well as whether the farm was purely a vegetable farm, flower farm or both.

The second stage involved sampling the wage workers using simple random sampling technique, and once a wage worker had been sampled for interviewing, their household was also automatically enumerated through serialized questionnaires. Through these methods, twenty-four (24) workers from every farm were selected, resulting in a total sample of one hundred and twenty (120) wage workers and, therefore, one hundred and twenty (120) households linked to them. Data collection involved face-to-face administration of questionnaires at the farm level, and in instances where farm policy did not allow for wage workers to be interviewed on-farm or where respondents felt that the information they gave would put their employment at risk as was also noted by (Kabiru, et al., 2018), the wage workers were identified as they were leaving the gate of their farms.

3.4 Data Collection Instruments

To address the research objectives, this study used structured wage worker questionnaires and corresponding household questionnaires to collect data. Questionnaires are a popular and fundamental tool used to collect information and perceptions from respondents (Bird, 2009). In this study, for every wage worker

interviewed at farm level, a follow up interview at household level was also done. In order to do this, the questionnaires were serialized in order to avoid any mix ups, and for cross-verification of information collected. This information was collected by the researcher with the guided help of a trained research assistant.

3.5   Pilot Testing of the Instruments

Prior to starting the actual data collection, the researcher conducted a one-day instrument testing of the structured questionnaires. This was done within Equinox flower farm and the neighboring Mathangiro trading center where some wage worker households lived. The objective of the pilot test was to ensure that respondents not only understand the questions, but also that there were no ambiguous and uncomfortable questions to the respondents. At this piloting stage, each session took eleven (11) minutes on average with the wage worker respondent and approximately twenty-three (23) minutes with the household respondents.

The pilot test was administered to eighteen (18) wage worker respondents and eighteen (18) households, and the researcher used this information to refine the tool to include among other things; area of origin if not from the study area, land ownership status, types of food items purchased and from which markets. This helped the researcher in enriching the tool and the quantitative data collected thereof, as the piloted questionnaire had an in-depth interrogation of key issues raised by respondents and their households.

3.6   Theoretical Framework

The study used the Household Livelihood Security Theory in its framework. The theory argues that individuals allocate their scarce resources among various goods and services with an aim of welfare maximization subject to some constraints.

The analysis of household food security was based on the demand approach which is explained through the household livelihood security theory as put forward by (Frankenberger & McCaston, 1998) and (Chambers & Conway, 1989). The theory assumes that household incomes, either on-farm, off-farm or both, is allocated towards the purchase of food among other essential and unlimited needs. The achievement of food security is therefore dependent on what proportion of the income is allocated to food consumption.

Therefore, following (Frankenberger & McCaston, 1998) and (Chambers & Conway, 1989), suppose a household wants to maximize a utility function given by:

U= f (F, NF) …………………………………………………………………………….. **1**

Where, **U** is the utility to be maximized, **F** represents food items consumed while **NF** denotes non-food goods consumed by a household.

In order to maximize the utility in (1) above, the household is faced with a budget constraint of the form;

Y= P_fF + P_{nf}NF ………………………………………………………………………… **2**

Where, **P_f** is the per unit price of food, **F** is the quantity of food items purchased, **P_nf** is the per unit price of non-food items, **NF** is the quantity of non-food items purchased by the household, and **Y** is the total income for the household.

The household is thus faced with a utility maximization problem and in order to establish the optimal quantities of food and non-food items that will maximize utility for the household, we form an Augmented Objective Function (AOF) by introducing a multiplier (β), which should not be equal to zero. Thus, our constrained maximization problem becomes;

L = f (F, NF) + β (Y − P_fF − P_nfNF) = 0…………………………………………3

(Where L is the maximand)

We then take partial derivatives with respect to F, NF and β, equating all resulting equations to zero (0), in order to find the first order condition for utility maximization.

$\dfrac{\Delta L}{\Delta F}$ = **F'NF − βP_f = 0** …………………………………………………..4

$\dfrac{\Delta L}{\Delta NF}$ = **F,NF' − βP_nf = 0**………………………………………………..5

$\dfrac{\Delta L}{\Delta \beta}$ = **Y − P_fF − P_nfNF = 0**…………………………………………………6

From equations 4 and 5, we can generate the below equations;

F'NF = βPf …………………………………………………………………7

F,NF' = βPnf………………………………………………………..……….8

Therefore, by dividing equations (7) and (8) above, we arrive at the first order condition for utility maximization;

$$\frac{\mathbf{P}f}{\mathbf{P}nf} = \frac{\mathbf{F'NF}}{\mathbf{FNF'}}$$

This means that in order for a household to maximize utility (U) and therefore achieve food security subject to their wage income (Y), the price ratio for food items (P_f) and non-food items (P_{nf}) must be equal to the rate of marginal substitution between the consumption of non-food and food items i.e. how many units of non-food items is the wage worker willing to forego so as to achieve food security and *vice versa*. The relationship is thus negative as it represents a trade-off.

In order to assess food security determinants among flori-horticulture wage workers, the present study is hinged on the household livelihood security theory as it mirrors the problem of utility maximization. Illustrations above indicate that wage workers allocate their wage income towards competing needs, including purchase of food. And their ability or lack thereof to achieve food security depends on the trade-off they are willing to make between food and non-food items.

3.7   Econometric Model

In order to analyze food security among the flori-horticulture wage workers in Northwest Mt. Kenya region, the study used the logit regression model since the outcome variable is binary (Wooldridge, 2010). This estimation method was consistent with similar previous studies that sought to establish household food security determinants, as in the case of (Tefera & Tefera, 2014; Muktar, 2011; Oloo, 2014; Kirimi et al., 2013).

Since the logit regression technique is used to model variables that have a dichotomous outcome, a set of exogenous variables will be given by $X_i = (X_1, X_2...X_k)$ whereas the logistic regression model, which is a Sigmoid function takes the form;

$$P_i = (Y = \frac{1}{X_i}) = \frac{e^t}{e^t + 1} = \frac{1}{1 + e^{-t}} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.1$$

where; e is the exponential term

P_i is the probability of household i being food secure or not. The value takes on 1 if the household is food secure and 0 if otherwise.

Y is the observed food security status of the household

X_i is the household set of exogenous variables

t_i is a function of exogenous variables (X_i) which can be expressed in a linear as;

$$t_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots\dots\dots \beta_k X_k \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.2$$

3.8   Model Specification

Following equation (2) above, household food security determinants can be modeled as below;

FS = f (G, ED, HS, AHH, OFE, NLO, OFP, IW) …….….………..…………………..3

Where the variables are as defined in Table 3.1 below.

Table 3. 1: Definition of Variables

Variable	Definition	Measurement
FS	Food security	1 if household is food secure, else 0
G	Gender of household head	1 if head of household is male, else 0
ED	Education level of household head	Number of years spent in school
HS	Size of household	Number of members in household
AHH	Age of household head	Age in years
OFE	Off-farm employment	Monthly off-farm income in KShs.
NLO	Number of livestock owned	Number of animals owned
OFP	Own food production	Quantity of food produced in Kgs/bags
IW	Income from wage work	Monthly wage in KShs.

3.9   Data Analysis Techniques

The collected data was cleaned, coded, entered then analyzed. Descriptive statistics for all the variables were generated to provide a preliminary view of the study population. The data was analyzed using the logistic regression command in STATA software.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1   Descriptive Statistics

Tables 4.1 and 4.2 below give a summary of the descriptive statistics of the regression results for the wage workers and their households.

Table 4. 1: Descriptive Results for the Wage Worker Dataset

Dummy Variables	Mean	Standard Deviation
Insufficient food	0.9091	0.29194
Low food availability	0.5455	0.50565
Average food availability	0.2424	0.43519
High food availability	0.2121	0.41515
Food not easily available	0.2424	0.43519
Food accessible	0.4242	0.50189
Food easily accessible	0.3333	0.47871
Insufficient income	0.4444	0.50637
Average income	0.4074	0.50071
Sufficient income	0.1481	0.36201
Improved access	0.3750	0.49186
Male gender	0.3636	0.48850
Female gender	0.6363	0.48850
No education	0.0303	0.17408
Primary education	0.4848	0.50752
Secondary education	0.3636	0.36411
Middle level college	0.0909	0.29194
University	0.0303	0.17408
Male household head	0.7272	0.45227
Household size	3.4848	1.7161
Age in years	37.212	10.6147
Income per month (KShs.)	9866.7	7676.37
Owns sheep	0.2121	0.41515
Owns poultry	0.4242	0.50189
Owns cattle	0.1818	0.39167
Owns pigs	0.0313	0.17678
Owns land	0.3636	0.48850
Permanent employment	0.5151	0.50752
Temporary employment	0.4848	0.50752
Three meals	0.8485	0.36411
Other sources of income	0.1515	0.36411
Borrowed for food	0.1612	0.33143
Reducing amounts of food	0.2821	0.41515
Purchasing available food	0.5642	0.50189

Table 4.1 shows that nearly 91% of the sampled wage workers reported that they had received insufficient food during certain months of the year, based on the mean for insufficient food dummy. This means that a majority of the wage workers were faced with food insecurity. From the table, the mean age of the respondents in years was 37. The youngest respondent was 21 years old while the oldest respondent was 68 years old, indicating a preference for youthful labour force by the flori-horticulture farms.

By wage incomes, the table indicates that the mean monthly income for the respondents was KShs. 9, 866. On the other hand, the minimum amount reported by the respondent was KShs. 700 while the maximum amount earned was KShs. 20,000. From Table 4.1, using availability as a measure of food security, nearly 55% of the respondents confirmed to have experienced low food availability. On average, food availability was at 24% while high food availability was at 21%. This shows clearly that majority of the households faced food insecurity.

Using food accessibility as a measure, and in particular, using distance to the markets, those who reported that food was not easily accessible were 24%, while those who reported food to be accessible were also 24% while a further 33% reported that food was easily accessible. In addition, using income levels as an indicator of food accessibility, those that reported they had insufficient incomes to purchase food were 44%. While respondents that had average income were 40% as those with sufficient income represented only 15%.

By utilization as a measure, the descriptive table shows the three categories namely: not improved access (50%), improved access (38%), and much improved access (13%). Table 4.1 also shows that there were more female respondents (64%) than male (36%) especially in the flower and vegetable farms. By highest education level attained, 3% of the respondents had no education level. Those with primary and secondary education levels were 48% and 36.4% respectively.

On the other hand, those who had tertiary college and university education were 9.1% and 3% respectively. Majority of the respondents thus had no formal college training to advance their skills on their area of employment and probably also to position themselves for better earnings. This can be one of the factors explaining why majority of the respondents are food insecure.

Respondents also indicated ownership of various domesticated animals. This ownership is shown as: Poultry (42%), Cattle (18%), and Pigs (3%). More respondents had poultry than any other category of animals probably due to the ease of keeping and maintaining poultry. The descriptive table also indicated that only 36.4% of the respondents owned land and had put their lands into agricultural production, which significantly boosted their food security status by improving their access to food. However, much of this land was ancestral and was therefore not within the study area.

From Table 4.1, those who were permanently employed were at nearly 52% while those who were in temporary or contractual employment were at 48% indicating improved working conditions and terms for the wage workers. In terms of number of meals taken per day and based on a 7-day recall period, respondents who reported they had three meals in a day, that is, breakfast, lunch and dinner were about 85% while those that had two meals a day, breakfast and dinner and or lunch and dinner were 9.4% and 3.1% respectively. In terms of income diversification, respondents who reported they have other sources of income other than wage work income were 15.2% as opposed to nearly 74.8% who had no other sources of income apart from working in the farms.

This indicates that most of the respondents solely relied on wage work within the flori-horticulture farms for their livelihood. In terms of coping strategies to bridge food gaps, 16.1% of the respondents indicated that they borrowed funds to buy food or borrowed material food, those that reported reduced quantity and quality of food taken and those that said they purchased available food stuffs were 28.2% and 56.4% respectively.

Table 4. 2: Descriptive Results for the Household Dataset

Dummy Variables	Mean	Standard Deviation
Insufficient food	0.7119	0.4568
Male gender	0.4000	0.4940
Female gender	0.6000	0.4940
No education	0.0167	0.12910
Primary education	0.3000	0.46212
Secondary education	0.6167	0.49030
Tertiary education	0.0667	0.2515
Age in years	30.42	8.5556
Male household head	0.400	0.4940
Female household head	0.600	0.4940
Household size	3.217	1.5840
Monthly Income (KShs.)	10734	5860
Owns cows	0.4255	0.4998
Owns goats	0.2500	0.4380
Owns poultry	0.3542	0.4833
Owns sheep	0.2195	0.4191
Other income sources	0.2069	0.4086
Can diversify income	0.7119	0.4568
Borrow to buy food	0.3415	0.4265
Reduce food quantities	0.4634	0.5049
Take food on credit	0.1951	0.4012
Same food for everyone	0.7797	0.4180
Owns land	0.4576	0.5025
Permanent employment	0.7000	0.4621
Temporary employment	0.3000	0.4621
One meal a day	0.0333	0.1810
Two meals a day	0.2000	0.4034
Three meals a day	0.7458	0.4392
Four meals a day	0.0169	0.1302

From Table 4.2, respondents who reported food insufficiency within their households were 71.2% as opposed to about 28.8% who said they were food secure. This indicated that a majority of the households were likely to be food insecure. The descriptive statistics have also shown that from those sampled, for the household head variable, 60% of households were female headed while 40% were male headed. Similarly, the average household size was three (3) people per household while the minimum number of people in any household was one (1), with the maximum household size being eight (8).

The mean age of the household head was 30 years with the youngest respondent being 19 years and the oldest being 68 years old. The descriptive statistics have indicated that the mean monthly income per household was KShs. 10,734 while the least amount earned per month was KShs. 4,000 while the highest amount earned was KShs. 48,000.

Table 4.2 also shows that that the respondents who had no education level were 1.7%. Those who had primary and secondary education were 30% and 62% respectively. A further 6.7% had tertiary education level. Animal ownership at the household level indicated that; ownership of Cows (42.6%), ownership of Goats (25%), ownership of Poultry (35.4%) and the ownership of Sheep (30%). The respondents who indicated that they owned land were 45.7% as opposed to about 55% who owned no land.

In terms of income diversification, respondents who reported other sources of income were 20.7% compared to nearly 80% who solely relied on wage work employment at the farms. Similarly, 71.2% of the respondents indicated they could diversify their income sources but were yet to do so. In terms of coping strategies during periods when food was insufficient, respondents indicated their strategies as follows: borrow to buy food and or borrow food (34.2%), reduce quantity and quality of food taken (46.3%), and take food on credit (20%).

4.2   Determinants of Food Security

Since the coefficients of the logit model cannot be interpreted directly in themselves and can only be interpreted qualitatively, we therefore, in interpreting both the sign and magnitude of the estimate coefficients, have further computed the marginal effects presented in the subsequent tables below.

Table 4.3 shows the logistic regression model results for food security among wage workers, as a function of a set of predictor variables. The logistic regression results show that the coefficients for primary education, ownership of cows and age of the wage worker were negative, indicating that holding everything else constant, a unit change in these predictor variables was less likely to lead to food security of the wage workers. Estimates of the coefficients for secondary education, income of the wage worker, household size, land and livestock ownership on the other hand were positive meaning that a unit change in these predictor variables, holding all other factors constant, was most likely to increase chances of food security of the respondents.

Table 4. 3: Determinants of Food Security for Wage Workers

DV = Food is sufficient	Coefficients	Std. Err.	z	P>z	95% Conf. Interval	
Education						
Primary education	-3.521	2.051	-1.72	0.246	-7.541	0.499
Secondary education	5.942	4.339	1.37	0.017	3.996	1.878
Livestock ownership						
Owns cows	-5.675	4.573	-1.24	0.215	-14.638	3.287
Owns goats	1.796	1.223	1.47	0.553	2.332	3.888
Owns poultry	0.772	1.553	0.50	0.619	-2.272	3.816
Owns sheep	1.367	1.259	1.09	0.278	-1.101	3.834
Others						
Income diversification	0.889	1.341	0.66	0.705	1.225	1.856
Land ownership	0.157	1.721	0.09	0.927	-3.215	3.530
Age (in years)	-1.606	1.129	-1.42	0.521	-2.339	1.233
Male household head	2.936	1.702	1.73	0.084	-3.996	6.271
Household size	0.799	0.378	2.11	0.435	0.578	1.541
Monthly income	1.939	1.666	1.16	0.024	5.205	1.326
_cons	-0.274	2.063	-0.13	0.894	-4.318	3.770
Number of observations	60					
Wald chi2(12)	9.68					
Prob > chi2	0.2882					
Log pseudo likelihood	-10.8277					
Pseudo R2	0.3199					

Using the marginal effects interpretation as shown in Table 4.4 below, if the secondary level of education of the wage worker was changed by a unit, holding all other factors constant, their chances of being food secure would increase by 45 percentage points. Similarly, if the income of the wage workers was increased by one unit holding all other factors constant, the chances of a wage worker being food secure would increase by nearly 56.2 percentage points as had been expected.

Land ownership was found to be positively related to the probability of wage worker food security as expected, however, this predictor was statistically insignificant at 5% level of significance. If you changed the variable of land ownership by one unit, holding all else constant, the chances of wage worker food security only increased by 3.9 percentage points as indicated in Table 4.4 below. This could be attributable to the fact that most wage workers owned land outside of the study area hence was not under food production. Age of the wage worker on the other hand was however found to be negatively correlated with the probability of wage worker food security.

Table 4. 4: Probability of Food Security for Wage Workers

Variables dy/dx	Marginal Effects	Std. Err.	z	P>z	[95% Conf. Int]	
Education						
Primary education	-0.686	0.235	-2.92	0.004	-1.146	-0.225
Secondary education	0.457	0.178	2.57	0.021	0.726	1.059
Livestock ownership						
Owns cows	-0.626	0.159	-3.94	0.201	-0.938	-0.315
Owns goats	0.163	0.073	2.23	0.449	0.112	0.735
Owns poultry	0.190	0.375	0.51	0.612	-0.544	0.925
Owns sheep	0.325	0.270	1.20	0.230	-0.205	0.854
Others						
Income diversification	0.188	0.064	2.94	0.334	0.802	0.477
Land ownership	0.039	0.427	0.09	0.927	-0.799	0.877
Age	-0.227	0.044	-5.16	0.916	0.347	0.522
Male household head	0.602	0.237	2.54	0.211	0.137	1.067
Household Size	0.198	0.092	2.15	0.432	0.017	0.378
Monthly income	0.562	0.314	1.79	0.039	0.223	0.571

The logistic regression results of the household data set as captured in Table 4.5 below indicated a positive correlation between education levels of the household head, ownership of livestock such as poultry, goats and sheep, land ownership and monthly household income. The results of the regression model on the predictor variables showed that education level of the household head, ownership of livestock and household income were also all statistically significant in positively affecting household food security as was expected. These findings were consistent with those of (Oloo, 2014).

Table 4. 5: Determinants of Food Security for Households

DV = Food is sufficient	Coefficients	Std. Err.	z	P>z	95% Conf. Interval	
Education						
Primary education	18.223	3.755	4.85	0.000	10.862	25.583
Secondary education	17.764	3.758	4.73	0.000	10.399	25.130
Livestock ownership						
Owns cows	-2.879	2.050	-1.40	0.160	-6.896	1.139
Owns goats	0.339	1.758	0.19	0.847	-3.107	3.784
Owns poultry	31.979	3.693	8.66	0.000	24.740	39.218
Owns sheep	29.253	5.006	5.84	0.000	39.064	19.442
Others						
Income diversification	-0.666	1.287	-0.52	0.605	-3.188	1.856
Land ownership	2.443	1.247	1.96	0.050	-0.002	4.887
Age (in years)	-0.011	0.108	-0.10	0.916	-0.223	0.200
Male household head	-1.091	1.405	-0.78	0.437	-3.844	1.663
Household size	-0.497	0.633	-0.79	0.432	-1.738	0.744
Monthly income	0.606	1.134	0.53	0.008	-0.001	0.001
_cons	-16.745	7.753	-2.16	0.031	-31.942	-1.549
Number of observations	59					
Wald chi2(12)	496.06					
Prob > chi2	0					
Log pseudo likelihood	-12.467516					
Pseudo R2	0.2701					

This indicates that in households where the household head had some level of education, or where a household had livestock such as sheep and poultry, they were more likely to be food secure than households that neither owned livestock nor where the household head had any level of education. Of interest however, was the findings on the age of the household head which was expected to have a positive relationship with the probability of household food security, as older household heads were assumed to be more experienced and capable of staving off food insecurity. This predictor variable however, indicated a negative relationship with household food security contrary to the findings of (Tefera & Tefera, 2014), and was also statistically non-significant.

Table 4. 6: Probability of Food Security at Household Level

Variables dy/dx	Marginal Effects	Std. Err.	z	P>z	[95% Conf. Int]	
Education						
Primary education	0.915	0.073	12.54	0.000	0.772	1.058
Secondary education	0.995	0.008	123.18	0.000	0.979	1.011
Livestock ownership						
Owns cows	-0.052	0.054	-0.96	0.336	-0.157	0.054
Owns goats	0.003	0.015	0.22	0.829	-0.026	0.032
Owns poultry	0.996	0.006	172.78	0.000	0.984	1.007
Owns sheep	-0.042	0.067	-0.627	0.000	-1.000	-0.999
Others						
Income diversification	-0.007	0.014	-0.49	0.627	-0.033	0.020
Land ownership	0.028	0.020	1.45	0.047	-0.010	0.067
Age	0.035	0.081	0.43	0.916	-0.002	0.002
Male household head	-0.014	0.022	-0.65	0.515	-0.057	0.028
Household Size	-0.005	0.006	-0.84	0.401	-0.017	0.007
Monthly income	2.151	0.000	0.64	0.019	-4.406	8.706

Table 4.6 provides a summary of the marginal effects for the household dataset and indicate that if the primary education level of the household head were to change by one unit holding everything else constant, then the expected change in the probability of food security would increase by nearly 91.5 percentage points. Similarly, if the secondary education level of the household head were to change by one unit, the household's chance of being food secure would increase by nearly 99.5 percentage points. This implies that the education level of the household head variable strongly predicts food security status of the household.

On the other hand, household size as expected was found to be negatively related with food security. This finding was similar to that of (Diallo & Toah, 2019). The marginal effect of the household size variable indicates that if the household size changed by one unit, holding everything else constant, the household's food security chances would decline by 0.5 percentage points. Hence a bigger household was more likely to be food insecure as opposed to a smaller household.

Ownership of livestock, especially poultry was also found to be positively related to household food security and was also statistically significant as was also the case for (Muktar, 2011). From Table 4.6, if ownership of poultry was changed by one unit, holding all other factors constant, household food security chances would increase by 99.6 percentage points. This can be attributable to the fact that poultry can easily be converted to liquid cash to purchase food, and in other instances can be consumed by the household.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1   Summary and Conclusion

The study sought to investigate the determinants of food security among wage workers in the flori-horticulture industry in Northwest Mt. Kenya region. In order to do this, the study collected data through structured questionnaires from 120 wage workers and 120 households. The logit regression model was employed in this regard as the dependent variable outcome is dichotomous in nature. The results of the regression model indicated that education level, ownership of livestock such as poultry and sheep, income from wage work were all statistically significant at 5% level of significance in explaining food security among the farm wage workers in the flori-horticulture industry in Mount Kenya.

5.2   Policy Recommendation

The results of the wage worker responses indicated that 91 per cent reported to have been food insecure, while at household level, only 71.2 reported food insecurity at a particular time of the year. This implies that production of horticultural products like cut flowers, vegetables and fruits for export has greatly reduced the ability of wage workers to dedicate their efforts towards domestic food production. This has greatly increased the chances of food insecurity among the wage workers who have little or no land for food production. Moreover, the perceived employment of workers on the farms further reduces the time and effort devoted for domestic food production. On the other hand, wage earnings are low which further reduces their chance of being food secure and at the same time as meet other needs from their meagre income.

Low wages are consequently attributed to low levels of education implying lack of essential skills that would guarantee better jobs and hence better incomes. The study therefore finds a linkage between the level of education of wage workers and their income levels from wage work, which this study has found out to be significant determinants of food security.

Demographic results have indicated that 64 per cent of the wage workers were female. This finding is consistent with those of other studies reviewed such as (Barrientos, et al., 2003). It is thus important for government policies to target women wage workers' empowerment. Similarly, the results have indicated that as level of education increases the likelihood of food security also increases. Therefore, relevant government policies should be in place to ensure farms have a mechanism of offering more specialized training to their employees to equip them with the necessary skills for more productivity and also for better incomes. Tailor-made tertiary college training as well as university training will also ensure improved productivity and hence, more incomes to the workers which will undoubtedly improve their food security condition, as income from wage is a significant determinant.

As concerns animal husbandry, a lot of emphasis should be put on poultry farming as these do not take up much space and can easily be sold for liquid income, or better still, consumed to cover food gaps. The only foreseen shortcoming with this recommendation is the fact most wage workers are immigrants and therefore do not own land. This paper therefore recommends more trainings from the relevant

government agencies and non-governmental bodies, especially not-for-profit institutions, to the wage workers on which kind of animal production is profitable and therefore will not wipe out their meagre incomes, thereby pushing them down to lower levels of poverty, and food insecurity, as opposed to lifting them out of poverty.

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79-89.

Appendix I: Research Introduction Letter

C E T R A D

u^b

Ministry of *Environment.*
Water and Natural
Resources
KENYA

Centre for Training and Integrated Research for ASAL Development
P O. Box: 144, NANYUKI — Kenya
Telephone: 254 62 31328
Fax: 254 62 31323
Email: cetrad@cetrad.org

Our Ref:

Your Ref: Date: 17th October, 2016

TO WHOM IT MAY CONCERN

LETTER OF
INTRODUCTION

Centre for Training and Integrated Research for Arid and Semi-Arid Lands Development (CETRAD) is a bilateral institution between the Swiss government and the Ministry of Water & Irrigation.

CETRAD is currently undertaking a Food Sustainability Project whose main objective is to *provide evidence-based scientific knowledge for the* formulation *and promotion of innovation strategies and policy options that improve individual and aggregate levels of food systems' sustainability.* The emphasis of the project is on finding ways to enhance collaboration within and between coexisting food systems. Based on this, the research will focus on **"Food Security, Poverty Reduction and Inequality among Wage Workers in the Flori-Horticulture Industry in Kenya: A Case Study of Laikipia County, Mt. Kenya Region"**

The purpose of this letter is to introduce the researchers and request for your cordial acceptance to allow them to collect data amicably. CETRAD would therefore like to introduce to you the researchers namely;

Mr. Emmanuel Kamboga   IDnumber24690720

Ms. Patricia Mambo   ID number 25169442

Any assistance accorded to the researchers will be highly appreciated.

Yours Sincerely,

Boniface P. Kiteme, PhD
DIRECTOR CETRAD

Appendix II: Wage worker Questionnaire

Dear Respondent,

I am a student at the University of Nairobi conducting a research on **Determinants of Food Security among Wage Workers in Flori-Horticulture Industry in Kenya: A Case Study of Northwest Mt. Kenya Region.** This research is a requirement for the award of Master of Arts in Economics. The information you provide will be treated with utmost confidentiality and used only for academic purposes.

<u>Background Information</u>

Serial Number……………...

Name of the Farm (*where the respondent works*) …………………………….

County……………   Sub-County…………….   District………

Location……...   Sub-Location……..…   Village…………

Contact of wage worker: Tel: .... E-mail: ……………...

Date of interview: ………………   Time of interview: ……………...

Name of interviewer: ………………………………… Contact of interviewer……………….

Section One: General Information

Area of Origin if different from current

residence……………………………………………….

1. Gender

    0=Male [ ]   1=Female [ ]

2. Which is your area of birth? _____

3. Marital status

    0=single [ ]   1=married [ ]   2= co-habiting [ ] 3=divorced [ ] 4=separated [ ]

    5=widower [ ]   6=widowed [ ]

4. Residence

   0=rural [ ] 1=urban [ ]

5. Are you the household head?

   0=Yes [ ] 1=No [ ]

   If No, what is your relationship with the household head?

   0=spouse [ ] 1=daughter [ ] 2=son [ ] 3=others

   (specify)_____

6. How many years of schooling have you have you attained?

   _____

7. What is your highest level of educational attainment?

   0=none [ ] 1=nursery/kindergarten [ ] 2=primary [ ] 3=post primary/vocational [ ]

   4=secondary [ ] 5=college (middle level) [ ] 6=university [ ] 7=others (specify)

   _____

8. How many people are there in your household?

   _____

9. Of those how many household members work in the flori-horticulture farms?

   _____

10. What are your terms of employment in the firm?

   0=permanent [ ] 1=temporary/contract [ ] 2=others [ ] (specify)

_____

11. What is your monthly income (in KShs) (*tick the appropriate category*)?

<5,000 [ ]   6,000-10,000 [ ] 11,000-15,000 [ ] 16,000-20,000 [ ] 21,000-

25,000 [ ]

25,000> [ ]

12. Other than wage income, do you have any other source(s) of income?

0=Yes [ ]   1=No [ ]

Source of income	Income per month (In KShs)

Section Two: Food Security (Availability, Access and Utilization)

13. Do you own land?

0=yes [ ]   1=No [ ]

If Yes:

Land parcel	Size of land parcel (in acres)	Location (*where land is located*)

If Yes

Land parcel	Land use type by parcel (e.g. food production)	Proportion under land use type

14. Which meals do you have in a day?

0=breakfast [   ] 1=lunch [ ] 2=dinner [ ] 3=others [ ] (specify)

_____

15. What types of foods do you consume per week by meal (*complete the tables for breakfast, lunch and supper below as applicable*)?

Type of food item for breakfast (*indicate the measurement unit e.g. KGs or litres*)	Quantity per week	Source of food item	Price per unit of food item if purchased

Type of food item for lunch (Indicate the measurement unit e.g. KGs or litres)	Quantity per week	Source of food item	Price per unit of food item if purchased

Type of food item for Dinner (Indicate the measurement unit e.g. KGs or litres)	Quantity per week	Source of food item	Price per unit of food item if purchased

16. From which markets do you purchase the food items and why?

Food item purchased	Which markets	Distance from home to market (in KMs)	Reasons for choice of market

17. Are there periods within the year that you have insufficient food within the

household? 0=Yes [ ]   1=No [ ]

Which periods do you have food insufficiency	Which foods are insufficient	How do you cope

18. How much of the total household income is allocated for the following non-food

items per month?

Non-food item	Amount per month (Kshs.)
Health	
Education (school fees)	
Transport to work	
Savings	
Entertainment	
Development projects	
Others(specify)	

Section Three: Household Assets

19. Which of the following household assets do you own?

Household asset	Description	Owned (*tick against asset owned*)	Ownership type: 1=purchased 2=hired 3=inherited 4 =own-built
House (e.g walls, roofing and floor)			
Radio (type)			
Furniture (specify)			
Television (type)			
Bicycle			
Motorcycle			
Car			
Mobile phone			
Refrigerator			
Land (acreage)			
Cattle (number)			
Sheep (number)			
Goats (number)			
Poultry (number)			
Pigs (number)			
Others (specify)			

20. What is your opinion on the following measure/aspects of food security?

Food security measure	Opinion of respondent (*mark appropriately the respondent's opinion*)	
Availability	a. Levels of food production	0=low 1=average 2=high
Accessibility	a. Access to markets	0=not accessible 1=accessible 2=easily accessible
	b. Level of income	0=insufficient 1=average 2=sufficient
Utilization	Improved access to water and sanitation services	0=no improved access 1=improved access 2=much improved access

Thank you for taking time to respond to this questionnaire and for your help.

Appendix III: Household Questionnaire

Dear Respondent,

I am a student at the University of Nairobi conducting a research on **Determinants of Food Security among Wage Workers in Flori-Horticulture Industry in Kenya: A Case Study of Northwest Mt. Kenya Region.** This research is a requirement for the award of Master of Arts in Economics. The information you provide will be treated with utmost confidentiality and used only for academic purposes.

<u>Background Information</u>

Serial Number……………...

Name of the Farm (*where the respondent works*)

………………………………………………….

County……………   Sub-County…………….   District…………

Location……...   Sub-Location……．…

Village…………………..

Contact of wage worker: Tel: .... E-mail: ……………...

Date of interview: ………………   Time of interview: ……………...

Name of interviewer: ………………………………… Contact of interviewer……………….

Household Background information

1	2	3	4	5	6	7
Household size (NO.) (*serialize household members from the oldest to the youngest*)	**Relationship to the Household Head** **1=Head** **2=Spouse/Partner** **3=Son/Daughter** **4=Daughter/son-in-law** **5=Grandchild** **6=Parent/Parent-in-law**	**Gender** **0=Male** **1=Female**	**Residence** **0=Rural** **1=Urban**	**Age** (*Indicate year of birth*)	**How many years of schooling has** (*Serial number attained*)**?**	**What is the highest level of educational attainment of** (*Serial number*)**?**

	7=Brother/Sister 8=Others(specify)				

Household Income Information

(1)	8	9	10
Household size (NO.) (*serialize household members from the oldest to the youngest***)**	**Employment status of (serial number)** **1=Not Employed** **2=Employed (specify cadre)** **3=Others (specify)**	**Income level of (Serial number)** **1=< 5,000** **2=6,000-10,000** **3=11,000-15,000** **4=16,000-20,000** **5=21,000-25,000** **6=25,000>**	**Economic activities (serial number) engaged in (***List activity***)**

Household Information: Human Capital

11. What or who is your main source of information on economic activities in the area?

_____

12. How would you rate the accessibility and quality of community level services listed

below?

Social Service	Accessibility 1=Yes 2=No	Average distance to the nearest service center (km)	Quality of services 0=Very Poor 1=Poor 2=Fair 3=Good 4 =Very Good
Schools			
Healthcare Facilities			
Markets for goods and services			

Household Information: Natural Capital

13. Does your household own land?   Yes [ ]   No [ ]

If Yes:

Land Parcel	Size of the Land Parcel (*in acres*)	Location (*where land is located*)
1		
2		
3		

Indicate the land use for each parcel

Land parcel	Land use type by parcel (e.g. *Food production*)	Proportion under land use type	Indicate food crops grown in each parcel
1			
2			
3			

Do you rent/lease land for crop production? 0= Yes [ ]   1=No [ ]

If yes, how much do you pay to use the land (Kshs.) per year? _____

14. Do you have problems with soil erosion? 0=Yes [ ]   1= No [ ]

If yes, what do you do to protect soil from erosion?

_____

15	16	17	18
What is the main source of water for your household? **0=Piped into dwelling** **1=piped into plot/yard** **2=public tap**	**What is the main source of drinking water for your household?** **0=Piped into dwelling** **1=piped into plot/yard** **2=public tap**	**If your household purchases water, indicate the cost per litre**	**What is the main toilet facility for this household?** **1=flash toilet** **2=VIP latrine**

3=tube well/borehole 4=protected dug well 5=protected spring 6=rain-water collection 7=protected dug well/spring 8=river/ponds/streams 9=tankers/vendors 10=others (specify)	3=tube well/borehole 4=protected dug well 5=protected spring 6=rain-water collection 7=protected dug well/spring 8=river/ponds/streams 9=tankers/vendors 10=others (specify)		3=uncovered pit latrine 4=covered pit latrine 5=others (specify)

19. Do you have access to irrigation water? 0= Yes [ ] 1=No [ ]

Where does it come from?

_____

How much do you pay for it?

_____

20. Are there natural resources conflicts within your community? 0= Yes [ ] 1= No [ ]

If yes, describe such conflict?

_____

Household Information: Food Security

21. What types of foods do you consume per week by meal (*complete the tables for*

breakfast, lunch and supper below as applicable)?

Type of food item for breakfast (*indicate the*	Quantity per week	Source of food item	Price per unit of food item if purchased

measurement unit e.g KGs or litres)			

Type of food item for lunch (Indicate the measurement unit e.g. KGs or litres)	Quantity per week	Source of food item	Price per unit of food item if purchased

Type of food item for Dinner (Indicate the measurement unit e.g. KGs or litres)	Quantity per week	Source of food item	Price per unit of food item if purchased

22. From which markets do you purchase the food items and why?

Food item purchased	Which markets	Distance from home to market (in KMs)	Reasons for choice of market

23. Are there periods within the year that you have insufficient food within the household?

Yes [ ] No [ ]

Which periods do you have food insufficiency	Which foods are insufficient	How do you cope

24. How much of the total household income is allocated for the following non-food items

per month?

Non-food item	Amount per month
Health	
Education (school fees)	
Transport to work	
Savings	
Entertainment	
Development projects	
Others(specify)	

25. Do you sometimes borrow money to meet the family's needs or for your activities?

0=Yes [ ]   1=No [ ]

Where from? _____

How much do you pay in interest? _____

26. What do you do if there is an urgent need for money, which alternatives do you have?

(e.g. sale of livestock, land, credits, restrictions on expenditures, etc.)?

_____

27. Do you consistently receive money transfers or remittances from the government, friends

or relatives? Yes [ ]   No [ ]

If yes, from which source and how much? _____

28. Are there many economic opportunities for you and your family? Yes [ ] No [ ]

Is it very difficult to make a living? Yes [ ]   No [ ]

Can you diversify income sources? Specify. Yes [ ] No [ ]

_____

Household information: Social capital

29. Does your household belong to any formal group (welfare or chama) within your area?

Yes [ ] No [ ]

If yes, which and why? _____

30. List the advantages/disadvantages derived from group participation?

Advantages	Disadvantages

31. Are you in contact with extension services, NGOs, or politicians who help to develop the

economic activities you are involved in? Yes [ ] No [ ]

32. Do you share resources, tools, or knowledge within your community? Yes [ ] No [ ]

33. Do you feel that your interests are well represented in local politics, in your community,

association, village etc.? Yes [ ] No [ ]

34. Do all the family members, including children and elderly people, eat the same types and quantity of food? Yes [ ] No [ ]

35. In your opinion, what can you say about food security situation for your household members?

_____

_____

36. What new ideas and innovations do you plan to implement to enhance household level of food security? (*probe on availability, access and utilization*)

_____

37. More generally, what can you say about food security situation in your community and how can it be enhanced?

_____

_____

Thank you for taking time to respond to this questionnaire and for your help.