ASSESSMENT OF HOUSEHOLD EXPENDITURE PATTERNS AND THEIR EFFECTS ON FOOD SECURITY: THE CASE OF FRENCH BEANS PRODUCING HOUSEHOLDS IN MBOONI SUB-COUNTY, KENYA

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DECLARATION

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

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DEDICATION

This work is heartily dedicated to my late husband, James Njeru, my parents, Pauline Njeri and Haron Kabugua and my daughter, Tamara Amani Wangui, who through their inspiration and support I have come this far. May God bless you.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

AFA	Agriculture and Food Authority
ASDS	Agricultural Sector Development Strategy
ASTGS	Agricultural Sector Transformation and Growth Strategy
AU	African Union
CAADP	Comprehensive Africa Agriculture Development Programme
DriVLIC	Drivers, Viability and Livelihood Impact of Compliance with Private Food Safety Standards among Smallholder Horticultural Producers in Kenya
EFA	Exploratory Factor Analysis
EPA	Economic Partnership Agreement
EU	European Union
EurepGAP	The European Retailer Produce Working Group Good Agricultural Practices
FPEAK	Fresh Produce Exporters Association of Kenya
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GlobalGAP	Global Good Agricultural Practices
GoK	Government of Kenya
HCDA	Horticultural Crops Development Authority
HDDS	Household Dietary Diversity Score
IDRC	International Development Research center
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute

IPC	Integrated Food Security Phase Classification
KIPPRA	Kenya Institute for Public Policy Research and Analysis
KMO	Kaiser-Meyer-Olkin
KNBS	Kenya National Bureau of Statistics
KES	Kenya Shilling
MFIs	Micro Finance Institutions
OECD	The Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PROVIDE	Provincial Decision-Making Enabling Project
RESET	Regression Equation Specification Error Test
RoK	Republic of Kenya
ROSCAs	Rotating Savings and Credit Associations
SACCOs	Savings and Credit Cooperative Organizations
SDGs	Sustainable Development Goals
SPSS	Statistical Package for the Social Sciences
SRA	Strategy for Revitalizing Agriculture
SSA	Sub-Saharan Africa
UK	United Kingdom
UNICEF	The United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UN SDGs	United Nations Sustainable Development Goals
USAID	United States Agency for International Development

USAID-KAVES	United States Agency for International Development-Kenya Agricultural Value Chain Enterprises
USD	United States Dollars
VIF	Variance Inflation Factor
WHO	World Health Organization
WFP	World Food Programme

ABSTRACT

One of the major cash cropping practices in Kenya is horticultural production, and includes French beans, for export. Over the years, production and export of French beans in Mbooni Sub-county, Makueni County, has shown a high increase in income but still the area remains largely food insecure. Despite the increased incomes, it is not known how the income is distributed within the households. The degree to which household expenditure patterns affect food security of the French beans producing households is also not known. This study was therefore carried out to fill this gap in knowledge. The specific objectives were to identify the household expenditure patterns, the food security situation and the effects of household expenditure patterns on food security in Mbooni Sub-county. The study used a sample size of 149 respondents. Semi-structured questionnaires were used for data collection. Descriptive statistics were used to elicit household expenditure patterns in French beans producing and non-producing households while exploratory factor analysis was used to group and condense the household expenditure items. A seven-day recall method was used to collect information on food consumed which was then used to determine the per capita calorie consumption and the household dietary diversity score (HDDS), comparing French beans growers and non-growers. Finally, OLS regression model was estimated to assess the effect of household expenditure patterns on food security. It was found that there were three distinct expenditure patterns (savings, investment on shares and entertainment) of the French beans producing households. On average, both growers and non-growers were food secure with growers having a significantly higher HDDS in comparison to that of the non-growers. Regarding the effects of household expenditure patterns on food security, the study found that an increase in entertainment expenditure pattern tended to improve food security. The study recommended that programs that aim to increase farmers' household income, such as introducing new cash/export crop enterprises, should have a clear strategy to promote food security and nutrition. The study suggests an assessment of how intra-household control of farm income affects expenditure decisions and household food security.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Agriculture is a major source of livelihood as well as the backbone of most developing countries' economies, particularly in Sub-Saharan Africa (Shimeles et al., 2018). Despite the important role played by the sector, food and nutrition insecurity has been one of the long-standing challenges, with uneven progress across Sub-Saharan Africa (OECD/FAO, 2016). According to a report by FAO et al. (2021), between 720 and 811 million people in the world were facing hunger in the year 2020 and close to 2.37 billion people did not have access to sufficient food in the same year. In addition, approximately one in five people (21 percent of the population) was experiencing hunger in Africa in the year 2020 which translates to more than double the proportion of any other region (FAO et al., 2021).

The FAO defines household food security as 'access by all household members at all times to adequate, safe and nutritious food for a healthy and productive life' (FAO, 2003). Attaining food security still remains a major challenge in many countries in sub-Saharan Africa (FAO et al., 2017; Mutea et al., 2019). Low productivity of agricultural resources has been recognized as one of the reasons for slow progress towards food security (OECD/FAO, 2016). The crucial role played by the agriculture sector in improving food security in Sub-Saharan Africa (SSA) has been acknowledged and prioritized in various development agenda such as the Comprehensive Africa Agriculture Development Programme (CAADP) (OECD/FAO, 2016). Therefore, rural communities can be transformed through promoting agriculture as an important prerequisite to achieving goal 2 of the 2030 Agenda for Sustainable Development (FAO et al., 2017).

KNBS (2019b) noted that over 70 percent of the people residing in rural parts of Kenya relied on agriculture for livelihood. Rural households in SSA, including Kenya, have for long been facing challenges of poverty, food insecurity, child mortality and malnutrition (Mutisya et al., 2016; Van de Poel et al. 2007). The Republic of Kenya (2010) attributes food insecurity in Kenya to factors such as poverty, poor economic performance, droughts, over-dependence on rain-fed agriculture, minimal value addition, inefficient marketing systems, high costs of

production due to expensive inputs and application of traditional food production technologies, poor infrastructure, amongst others. In Kenya, food security has traditionally been defined in terms of energy intake. An active adult is considered food secure if they consume a minimum of the recommended 2,250 kilocalories per day (KNBS, 2023). Achievement of national food security is a major objective of the agricultural sector (IFPRI, 2012) towards achievement of Kenya's Vision 2030 and national food self-sufficiency.

Over the years, the Government of Kenya (GoK) has made efforts, using development strategies, programs and policies to achieve food security. In 2004, the government developed and launched the Strategy for Revitalizing Agriculture (SRA) whose aim was to alter agriculture in Kenya into a "profitable, commercially oriented, and internationally and regionally competitive economic activity that provides high quality, gainful employment to Kenyans". The SRA set the target of agriculture growth to reach over 3 percent per annum by the year 2007 (Republic of Kenya, 2019). The implementation of the SRA was generally successful. According to the Agricultural Sector Transformation and Growth Strategy (ASTGS) (RoK, 2019), the agriculture sector growth surpassed the SRA's 3.1 percent per annum target and reached a high of 6.1 percent in 2007. Additionally, the GoK launched the Agricultural Sector Development Strategy (ASDS) 2010-2020 to build further on the gains made by the SRA. Some of the goals of the ASDS were to ensure food and nutritional security for all Kenyans, create employment opportunities, and raise household incomes (Republic of Kenya, 2010).

The GoK launched Vision 2030 as the new long-term development blueprint for the country in 2008. The Kenya Vision 2030 targets to convert Kenya into "a newly industrializing, middle-income country providing a high quality of life to all its citizens in a clean and secure environment". Agriculture sector was identified as a core sector towards achieving the anticipated annual growth rate of ten percent under the Vision 2030's economic pillar (Government of Kenya, 2008). This was to be realized through revamping Kenya's agriculture sector into an economic activity that is profitable and also able to entice private investment as well as offer the people lucrative employment. One such approach is the commercialization of agriculture as already evidenced in the horticulture sub-sector.

In 2019, the GoK launched the Agricultural Sector Transformation and Growth Strategy (ASTGS) with the aim of transforming Kenya's agricultural sector and making it a regional powerhouse (Republic of Kenya, 2019). The ASTGS goals are in line with the Constitution of

Kenya 2010, medium term national agriculture sector priorities and Third Medium Term Plan (MTP III) 2018 – 2022, in addition to the longer-term commitments to the CAADP/Malabo Declaration, the United Nations Sustainable Development Goals (UN SDGs), and the African Union (AU) Agenda 2063.

Kenya's agriculture sector accounted for 23 percent of the economy's total value and remained the dominant sector in the year 2020 as noted by the Economic Survey 2021 (KNBS, 2021). The sector accounted for 57.5 percent of the total employment and was the dominant employer as of 2018 (KIPPRA, 2020; World Bank, 2019). Kenya's agricultural sector in general and some specific sub-sectors like horticulture in particular, have been used in many economies to steer the rural development agenda, which include enhancing rural incomes.

Kenya's horticultural production is characterized by vegetables, fruits, and cut flowers as the main products. Over the past two decades, Kenya's horticultural sector has received a lot of attention due to the fast and steady growth (Muendo et al., 2004). In the last three decades, the horticultural industry in Kenya has been noted to be very successful in offering possibilities for satisfying own food needs, food security and enhanced nutrition, foreign exchange earnings, and increased incomes and employment (Irungu, 2011). Similarly, Tyce (2020) noted that horticulture is a major source of foreign earning, employment, and poverty reduction.

According to the Economic Survey 2022 report, Kenya's horticultural sector accounted for 24.8 percent of the total value of Kenya's export and was the leading sector of the economy with regards to foreign exchange earnings followed by tea, articles of apparel and clothing accessories, coffee, iron and steel (KNBS, 2022). In the year 2021, there was a 15.5 per cent increase in total export earnings from the previous year with horticulture registering a 5 percent increase from KES 150.2 billion in the year 2020 to KES 157.7 billion in the year 2021 in export earnings.

Kenya has become the largest exporter of horticulture in the region. The horticulture sub-sector employs approximately 350,000 people directly and supports over 6 million livelihoods in the country (FPEAK, 2021). About 96 percent of the horticultural production (fruits and vegetables) is utilized at the local level and about 4 percent of the produce is exported (FPEAK, 2021). Consequently, horticulture provides the ideal option for satisfying own diet needs, enhancing nourishment and guaranteeing improved incomes and employment (Irungu, 2011).

French beans are highly specific vegetables mainly produced for export in several Counties including Makueni County that comprises of six Sub-counties (Makueni, Mbooni, Kaiti, Kibwezi East, Kibwezi West and Kilome). The major producers of French beans for export in Kenya are small-scale farmers who own less than 5.4 acres of land (SNV, 2012). Over the years, export of French beans in the country has exhibited gradual growth. The speedy growth in the sector has undoubtedly played a major role in enhancing incomes in the rural areas including in Mbooni Sub-county (Chege et al., 2013) as well as contributed to decreased rural poverty in Kenya (HCDA, 2007).

Incomes, expenditures and consumptions are the most common approaches used in determining living standards. Income is measured as the total earnings from productive activities and current transfers. Due to the tendency of income to vary widely over time, consumption or expenditure tends to be a better indicator of living standards (Cingano, 2014).

Consumption comprises of all goods and services that are obtained or secured for utilization by a household excluding those items that are utilized for purpose of business or for amassing wealth. OECD further defines household spending/expenditure as the final consumption incurred by the inhabitant household in order to satisfy their needs, for example, healthcare, clothing, food, transport, housing, leisure, durable goods, energy and miscellaneous services (OECD, 2020).

Omotoso (2022) defines household expenditure patterns as the mix of quantities, qualities, acts and trends distinguishing a community or a human group's utilization of resources for comfort, survival, and enjoyment. This definition is adopted by the current study. The level of household income has been noted to be a crucial determining element of a household's expenditure patterns (Chai et al., 2015). Consequently, household expenditure patterns are affected largely by the financial means of the household. Household income has been noted to determine the quality and quantity of goods and services that a household could consume. Furthermore, the amount of income accessible by a household is considered as a major determinant of the differences in household expenditure patterns (Elonge, 2022).

Evidence shows that adoption of horticulture for export has led to increased household incomes, sparking optimism on the positive impact of embracing horticulture for export on the welfare of adopters. Despite this crucial role that horticulture export plays, it is not well documented how households spend the increased incomes. In addition, the existing empirical data on the effect of household expenditure patterns on food security in horticulture exporting

households, is relatively weak and inadequate to draw solid policy conclusions. Therefore, this study determined the household expenditure patterns of French beans growers and non-growers in Mbooni Sub-county, assessed the food security situation and compared it to Chege et.al (2013) findings. The study also assessed the effect of household expenditure patterns on food security.

1.2 Problem Statement

The horticulture sub-sector is an acknowledged success story as one of the top foreign exchange earners (Tyce, 2020) generating over United States Dollars (USD) 1 billion value of exports annually (KNBS, 2022). The success story, however, may not be evident at the household level in some instances, like in Mbooni Sub-county whereby it was found that despite an increase in farmers' incomes from French beans production, the households of the small-scale farmers were still food insecure (Chege et al., 2013).

Although previous studies have highlighted the role of French bean production in improving living standards, they have not examined the effect of household expenditure patterns on food security in Mbooni Sub-county. Consequently, the existing literature is not able to inform policy on the effect of household expenditure patterns on food security. Furthermore, there is scarce knowledge on the household expenditure patterns and food security situation for French beans producing households in Mbooni Sub-county. To the best of my knowledge, since the introduction of French beans as a cash crop in Mbooni Sub-county, no study has been undertaken in the study area to determine the effect of household expenditure patterns on household food security.

1.3 Broad Objective

This study's broad objective was to assess the household expenditure patterns and their effects on food security in French beans producing households in Mbooni Sub-county.

1.4 Specific objectives

The following were the specific objectives of this study:-

1) To determine household expenditure patterns of French beans producing and non-producing households in the study area.

2) To assess the food security situation among the French beans producing and non-producing households in the study area.

3) To determine the effect of household expenditure patterns on food security among the French beans producing households.

1.5 Hypotheses

The hypotheses to be tested were:

1) Household expenditure patterns are the same across French beans producing and non-producing households.

2) Households in the study area are not food secure.

3) Household expenditure patterns have no influence on food security among the French beans producing households

1.6 Justification

Over the last half a century, worldwide agriculture has observed far-reaching changes in food production. Subsistence farming patterns have been replaced by production of cash crops for exports in many countries of the developing world (Achterbosch et al., 2014). For instance, small-scale farming households in Mbooni Sub-county have embraced French beans production for export in an effort to increase their incomes and subsequently better their living standards (Chege et al., 2013).

This study is in line with the international efforts to address food insecurity as reflected by United Nations Sustainable Development Goals (SDGs) that came into effect in January 2016 to build for the next 15 years on the successes of the Millennium Development Goals. This study is specifically key in achieving SDG 2, of putting an end to world hunger, realizing food security, enhancing nutrition and boosting sustainable agriculture (United Nations, 2015). Secondly, this study also contributes in achieving the long-term development targets in Kenya's Vision 2030, which recognize the crucial role that agriculture continues to play towards the goal of converting Kenya into "a newly industrializing middle-income country providing a high quality of life to all its citizens in a clean and secure environment" (Government of Kenya, 2008).

Previous studies on French beans production in Kenya have mainly focused on food safety standards, income, food security and poverty. For instance, Okello et al. (2007) focused on food safety requirements; Muriithi et al. (2011), concentrated on compliance with EurepGap and Owuor (2014) assessed if complying with GlobalGAP standards had any impact on the poverty status of the smallholder French bean producers. A previous study (Chege et al., 2013) on French beans production for export was carried out in Mbooni Sub-county. A major finding was that even though French beans exportation had led to increased household incomes in the study area, the households were still food insecure. An investigation was suggested into the persistent food insecurity regardless of the recorded increased incomes.

This study interrogated a better understanding of households' expenditure decisions when their household income rises, to inform policy makers (National and County governments) on issues of food security. The study has further contributed to the knowledge bank important for scholars. Although this was carried out in Mbooni Sub-county, the findings of this study will inform similar studies in other counties in the entire country. The outcome of the study is open to decision-makers at all levels in formulating household expenditure and food security policies. Recommendations from the study are expected to assist households understand the effect of their expenditure patterns on food security and be able to appropriately plan their household expenses.

1.7 Thesis Organization

This section explains how this thesis is organized. Chapter one presents the introduction consisting of the study's background information, the problem statement, the broad objective, the specific objectives, the hypotheses, the justification and organization of the thesis. Relevant studies are reviewed in Chapter two. The data collection procedures, conceptual and empirical frameworks are presented in Chapter three. The results and discussion are presented in Chapter four. Lastly, the summary of major findings, conclusions and policy recommendations are presented in Chapter five.

CHAPTER TWO

LITERATURE REVIEW

This chapter highlights some of the related studies and their findings about food security, export horticulture farming, household income distribution concept, and household expenditure effects on food security. The chapter also discusses the methodological issues of the study.

2.1 The Concept of Food Security and Cash Cropping

There have been many discussions about food security. A household with the potential to attain the food required by its members is considered to be food secure (Sarkar, 2022). For a household to be regarded as food secure, it should satisfy the four pillars of food security which are accessibility of food, availability of food, utilization of food and stability of food supply (Guiné et al., 2021). Food availability is affected by the amount of food produced, levels of stock and net trade, and it addresses the "supply side" of food security (FAO and UNIDO, 2008). Availability focuses on the attainability of enough amounts of food of suitable quality (Mockshell, and Villarino, 2019). When all household members have adequate resources to obtain food and to satisfy their dietary requirements, then physical and economic access to food is achieved. The food access pillar addresses the "demand side" of food security (Barrett, 2010).

Food utilization implies the way in which the various nutrients in the food are maximized in the body. Good sustenance and feeding habits, food preparation, diversification of the diet and household apportionment of food results in sufficient energy and nutrient intake leading to achieving food utilization (FAO and UNIDO, 2008). On the other hand, stability refers to the assurance of food sources being available and accessible by people at all times without the risk of losing the access due to unanticipated events (Jones et al., 2013).

It is noted that the amount of food produced globally is adequate to feed the entire population with at least 2,720 kilocalories daily. The 2,720 kilocalories is higher than the minimum recommendation of 2,250 kilocalories by Food and Agriculture Organization (FAO, 2003). Even so, food scarcity is still persistent across the globe and widely spread. The estimated number of globally food insecure and undernourished people was almost 690 million people in the year 2019, which is equivalent to 8.9 percent of the global population. The number of

globally underfed people rose by 10 million from the year 2018 and is projected to increase by nearly 60 million in five years (FAO et al., 2020). If the current trends continue, the figure of undernourished people globally is projected to exceed 840 million by the year 2030. According to the 2020 United Nations Report on the situation of food security and nutrition in the globe, the hungry are most numerous in Asia, but expanding fastest in Africa. Currently, it is estimated that in Sub-Saharan Africa alone, 239 million people are food insecure. The worsening food security situation over the years in SSA is attributed to climate shocks, conflict and economic slowdowns (FAO et al., 2020).

The fundamental question on whether growing of cash crops is a successful approach for boosting food security in developing countries has dominated the food policy debates (Hashmiu et al., 2022). Several studies have attempted to assess the effect of cash cropping systems on food security. The findings of these studies have shown mixed results with some studies noting negative effect whereas other studies have exhibited positive effect of cash cropping systems on food security.

The relationship between production of cash crops by households, income and food security situations have been assessed, with mixed indications (Hashmiu et al., 2022; Rubhara et al., 2020; Tankari, 2017, Maithya et al., 2015, Chege et al., 2013). Rubhara et al. (2020) found that cash crop farming had a positive relationship with household food security. On the contrary, Tankari (2017) found that growing of cash crops had a negative influence on household food security. Maithya et al. (2015) assessed whether commercial crops compromised food security in western Kenya. The authors noted that production of sugarcane as a cash crop threatened the food security situation in the study area by placing a limit on the size of land allocated for subsistence farming of vegetables. Similarly, Khisa (2019) examined the effect of tobacco farming on household food security in Bungoma County, Kenya. The author found that tobacco farming had contributed to food insecurity in Bungoma as a consequence of allocating most of the land to tobacco farming at the expense of food production. These findings are an indication that cash cropping does not certainly translate to improved livelihoods of the farming households.

Chege et al. (2013) assessed the impact of horticulture export of French beans on food security status of smallholder farmers in Eastern region (Mbooni Sub-county) and Central region (Kirinyaga county) in Kenya. The authors found that the incomes of horticulture producing households in the study areas had increased as a result of horticulture export. However, despite

the increased incomes, households in Mbooni Sub-county were food insecure whereas those in Kirinyaga were food secure. In addition, the study noted that participating in horticulture farming had a positive impact in Kirinyaga county and a negative impact in Mbooni Sub-county. Therefore, the authors suggested further investigation on how income resulting from export horticulture farming is utilized as this could contribute to food insecurity in a household.

2.2 Measurements of Food Security

Reaching an all-inclusive and uniform measure of food security has been a challenge as posited by Hashmiu et al. (2022). Over the years, several indices (e.g., Global Hunger Index, Global Food Security Index, Food Production Index etc.) have been suggested as estimates of food security at the macro level. Notwithstanding, Santeramo (2015) noted that measuring food security situation as a whole continues to be problematic. Consequently, different methods have been used to measure food consumption in determining households' food security and as yet no indicators or methods have been agreed upon as adequate for measuring household food security (IPC Global Partners 2019; Russell et al. 2018). Hashmiu et al. (2022) noted that measures such as dietary diversity or other quantifiable estimates of food consumption do well in measuring food and nutrition security at the individual and household levels than macro level indicators. Pinstrup-Andersen (2009) noted that household food security could be measured from estimates of food prices and overall household incomes. The author indicated that this is possible if assumptions on the share of income that a household consumes on food are made.

One of the methods used in measuring food security at the household level is the use of per capita calorie consumption from food expenditure data. However, evidence-based literature has shown that the use of per capita calorie intake from food expenditure data to measure food consumption creates an upward bias in the estimates of calorie income elasticity (Aromolaran, 2004). This is as a result of deriving calorie intake consumption from food expenditure data. This study addressed this problem by using actual food intake quantities by undertaking a seven-day recall together with Household Dietary Diversity Score (HDDS) to estimate the calories consumption in the households in Mbooni Sub-county. Chege et al. (2013) found that despite the increased incomes from the export of French beans production households in Mbooni Sub-county, the households remained largely food insecure. In literature; owning assets such as land and livestock, wealth, and income are hypothesized to be good predictors of food security. On the contrary, the authors' findings were in contrast to the conventional view that an increase in the household's income would lead to increased food security.

10

Some studies in literature have focused on different interventions aimed at reducing food insecurity. For instance, Feleke et al. (2005) studied determinants of household food security in Ethiopia's rural areas. The author found that technology adoption does increase household food security. Additionally, several measures have been put in place to minimize food insecurity in the country including in Mbooni Sub-county. Some of these measures include food security projects. However, most of these food security projects have been noted to be unsuccessful due to diverse factors. Nyasimi (2013) assessed the factors influencing successful outcome of food security projects in Mbooni Sub-county and came to the conclusion that the projects were not delivering what they were supposed to, due to low institutional capacity. The author noted that food security projects were not effective in Mbooni Sub-county due to poor leadership and lack of managerial skills. Poor management and leadership were unlikely to be encountered in the current study area since the French beans farming households have guidelines put in place for production as well as marketing of their produce to the European Union.

It was prudent to use the per capita calorie consumption method with a seven-day recall, along with HDDS in the current study, which was the same as the methods used for measuring food security by Chege et al., (2013) since this study was a follow up assessment. Similarly, Belay (2012) assessed food security situation in Ethiopia by integrating calorie intake method with coping strategy method.

2.3 French Beans Export Farming in Kenya

Several research efforts have noted that in the long-haul food security and elimination of poverty in developing countries will largely depend on commercialization of small-scale agriculture production (Kirimi et al., 2013; Muriithi and Malz, 2015). Most of the producers in Kenya constitute the small-scale farmers' category. In order to increase economic growth and development, the long-term development blueprint for the country, Kenya Vision 2030, encourages small-holder farmers to shift to commercialization of agriculture (Government of Kenya, 2008). Ongeri (2014) noted that horticultural production is a sector in developing countries that can provide good opportunities for increasing incomes of households in the rural areas. Moreover, it was noted to improve nutrition of the people, enhance diversification of exports, provide raw materials for agriculture based industries and job creation especially for the youth and women.

French beans are amongst the significant horticultural produce grown by smallholder farmers mainly in Central and Eastern Kenya for export. The European Union (EU) is a major market for Kenya's horticultural crops and Kenya is the second largest exporter of French beans in Africa to the EU (Kok et al., 2019). Approximately 70 percent of the total vegetables produced for export in the country are grown by small scale farmers with as many as 50,000 famers producing French beans in small scale (Minot and Ngigi, 2004). The French beans supply chain is estimated to employ between 45,000 and 60,000 people depending on the season (USAID-KAVES, 2015).

The 2020 Kenya Economic Survey report noted that the quantities of fresh horticulture exports have been rising over the years since 2015. For the first time the proceeds from the fresh horticultural exports decreased by 5.9 per cent in 2019 and increased by 3.9 per cent to stand at KES 150.2 billion in 2020 (KNBS, 2021). Similarly, the quantity of vegetables exported has been performing well in the recent past as shown in Table 1. The vegetables accounted for 18.1 per cent of the total horticultural export returns in the year 2021. In addition, the export vegetables recorded an increase in value of 17.5 percent from KES 24.2 billion to KES 28.5 billion in the year 2020 (KNBS, 2022).

Table 1: Quantities and values of vegetable exports in Kenya from year 2017 to 2021

Year	Volume '000 Tonnes	Value KES Billion
2017	87.2	24.1
2018	85.8	27.7
2019	72.7	27.2
2020	62.6	24.2
2021	78.1	28.5

Source: Kenya National Bureau of Statistics, Economic Survey 2022

USAID-KAVES (2015) noted that Kenya had a competitive advantage in terms of its climate and geographical positioning, adherence to trade certification procedures and value addition through modern packaging. These factors played a key role in the country's original success in production and exportation of French beans. However, the fate of the small-scale producers of French beans is unpredictable following progressively strict requirements expected of EU market suppliers. The total number of farmers producing horticulture for export was estimated to have declined by about 5,000 farmers in the years 2013 to 2014. Following a reduction in the costly inspection procedures in July 2015 that had previously been exacted by the EU on exporters in Kenya, a total of 3,000 farmers re-joined the market.

In order to improve living standards through increased household incomes, farmers in Mbooni Sub-county have been producing French beans with the aim of gaining entry to the lucrative export markets in Europe. Existing studies concur that horticultural farming in Kenya can improve farmers welfare as a result of increased incomes from export of the produce (McCulloch and Ota, 2002; Muriithi et al., 2011; Chege et al., 2013; Muriithi and Matz, 2015). McCulloch and Ota (2002) examined the linkage between export horticulture and poverty in Kenya by comparing the incomes of horticulture exporting and non-exporting households. The authors found that the horticulture exporting households had significantly higher incomes than the non-exporting households. It was concluded that enabling more households to participate in horticulture sector could reduce poverty substantially both in the urban and rural areas.

One of the challenges facing French bean smallholder farmers in Kenya is the high cost of compliance with specific food safety and quality standards as a requirement before exportation of French beans (USAID-KAVES, 2015). However, despite the high costs of complying, several studies have shown that the levels of gross and net incomes of the compliant farmers were greater compared to those that did not comply. For instance, Muriithi et al. (2011) analyzed the profitability of French beans farmers in Kirinyaga District. The authors found that farmers who complied with the EurepGap had considerably larger sizes of land under production of French beans, additional years in export production as well as higher incomes as compared to the non-compliant farmers. Compliance affected household income positively as noted by Mithofer et al. (2007) and Chege et al. (2013).

Chege et al. (2013) indicated that the incomes of French beans producers in Mbooni Sub-county had increased between 2010 and 2011. Intuitively, the increased incomes from French beans export were expected to positively influence food security in the Mbooni area. However, the area was found to be largely food insecure despite the increased incomes (Chege et al., 2013). The reported financial gains and the apparent lucrativeness of the sector does not seem to have translated to positive food security outcomes in all the producer zones.

Several studies have been undertaken to measure different indicators in the area of French beans export farming. The current study builds on the present literature by assessing the household expenditure patterns and their effects on food security in the French beans producing households in Mbooni Sub-county.

2.4 Concept of Household Income and Expenditure

Household income can be defined as income acquired either in cash or in kind by all the members in a household. This includes salaries and wages, agricultural and non-agricultural activities, pensions, proceeds from businesses or investments, steady rental income, disability and relief payments and regular remittance receipts.

The extent of a household's income, in many instances, is a determining factor of the household's expenditure patters. Therefore, variations in expenditure patters are to a large extent an impression of the income differences between household categories or independent households (Babalola and Isitor, 2014). The structure of the household, needs, preferences and financial resources predominantly influence the household expenditure patterns. Certain households will view a particular type of item as a necessity, whereas other households will consider it as a luxury. As a result of the different income levels, households normally have divergent perceptions if certain goods are luxuries or necessities thus affecting their expenditure patterns.

Several studies have focused on assessing the effects of different indicators on household expenditure patterns. For instance, Rivera and González (2009), using a Tobit model, assessed the effects of remittances on household expenditure patterns of rural Mexico; they found that as rural incomes rise, expenditure patterns change regardless of whether the income gains are from migrant remittances or other sources. On the other hand, PROVIDE (2003) analyzed the effect of income levels on household expenditure patterns in South Africa. The author found that expenditure patterns differed depending on the income group that a household belonged to. PROVIDE (2003) concluded that the differences between expenditure patterns reflected the variations in income among household sets or independent households. Anumudu et al. (2015) adopted a logit model to analyze the effects of household expenditure patterns on Nigeria's odds ratio of poverty and found that health and food expenditure were significant expenditure patterns that had an inverse relationship with the odds of poverty. The authors recommended sustenance of agriculture in order to ensure food availability.

Other studies such as Omotoso et al. (2022) focused on rural households food expenditure patterns and their effect on food security using OLS regression model. The authors found that household size, household income, and age of household head significantly influenced food expenditure. Policies focusing on food price control systems were recommended to ensure food was affordable for rural inhabitants.

Considering the studies discussed in the foregoing paragraphs, it was desirable to delve deeper into household expenditure patterns in Mbooni Sub-county and assess their effects on food security to add to the existing literature on household expenditure patterns. The current study brings in a new dimension by assessing the effects of the household expenditure patterns on food security in the study area.

CHAPTER THREE

METHODOLOGY

3.1 Conceptual Framework

Drèze and Sen's (1989) capability approach defines the distinct phases applied in analysis of food security. These are: (i) food entitlements; (ii) basic capabilities for food security; and (iii) capability to be food secure (Burchi and De Muro, 2015). The analysis of food entitlements include information on endowments (productive resources, labor force, intangible assets, wealth among others); exchange conditions (cost of food commodities, remunerations, and costs of other non-food products) and production abilities such as expertise and technology. Sen (1981, p. 2) further listed in the entitlement approach four legal categories of food sources: "production-based entitlement" (growing food), "trade-based entitlement" (purchasing food), "own-labour entitlement" (working for food) and "inheritance and transfer entitlement" (being given food by others).

The second phase of the capability approach involves analysis of some basic abilities which include other factors that are over and above food entitlements. These basic abilities influence the possibility to be hunger free or potential to have enough food/calories. To a great extent, these factors exceed a person's control and are mainly the institutional and environmental factors. Being educated, good health care and having the ability to participate in decision making within the household are part of basic capabilities (Burchi and De Muro, 2015).

The third phase of capability approach, is dependent on relations between the basic capabilities. The ability to be food secure further depends on an individual's food utilization. The capability approach surpasses the "access" aspect of food security by switching the focus from "command over food" as indicated by Sen's (1981) entitlement theory to "nutritional capabilities".

Drèze and Sen, (1989) explained further that access alone is not sufficient and usage is fundamental in ensuring food security. Therefore, the analyses in this study were based on a capability approach as it embraces better the four dimensions of food security as defined at the World Food Summit of 1996 (Gebru et al., 2019; FAO, 1996). That is availability, access, utilization and stability.

Subsequently, this study perceives the food security state as an end result of interactions of social economic characteristics of the household and/or farmer, household expenditure patterns (basic capabilities) and uncontrollable external environmental and institutional factors. The environmental and institutional factors also influence the decision of the farmer to produce French beans for export or not to produce as illustrated in Figure 1. For instance, compliance with the necessary macro and trade policies such as food safety standards influence farmer's decision to export or not to export French beans.

The production of French beans for export is deemed to increase household income. The decision of a farmer to produce French beans for export or not to produce affects their sources of income and their decision on how to allocate resources. That is, either to grow French beans for export, for subsistence and/or take part in non-farm employment or a combination among the aforementioned alternatives. The other sources of income, apart from French beans export income, include; sale from other crops, livestock, bee keeping for honey and wax harvesting, non-farm income (wages and salaries, pension and business activities), remittances and gifts or from combination of the income sources. If a household was not producing French beans, its source of income was from the other aforementioned sources. Household income was utilized on various household expenditure items including food. The current study categorized household expenditures into food, utilities (lighting energy and cooking fuel), donations, entertainment and relaxation, clothing, health and medicare, savings, investment, capacity building (school fees and training), insurance and furniture. The expenditure patterns of a household may affect how decision makers in a household allocate income which may in turn affect food security.

The conceptualization of the effect of French beans exporting households' expenditure patterns on food security in Mbooni Sub-county is as shown by Figure 1.
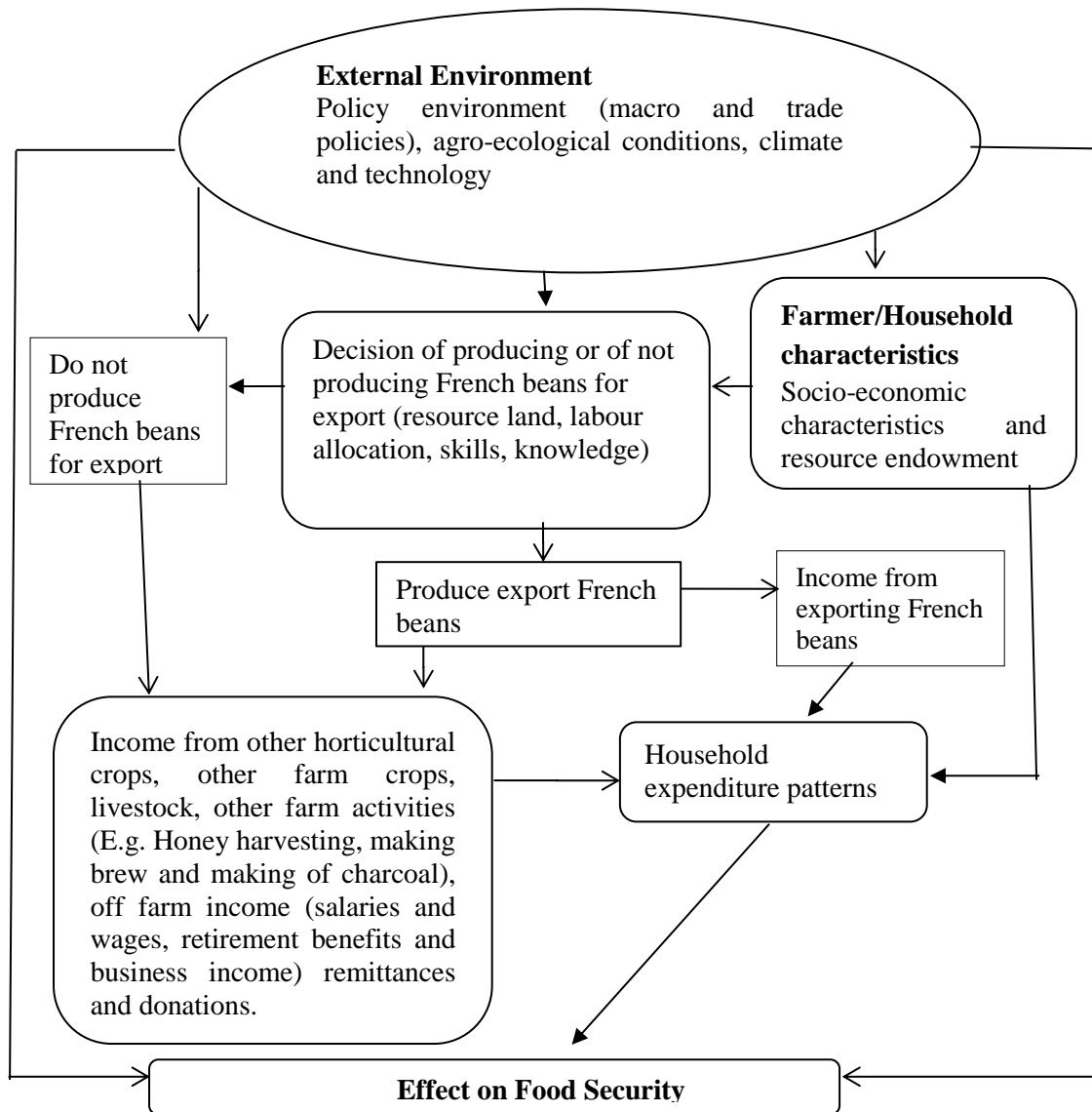
Figure 1: A conceptual model of the effect of French beans exporting households' expenditure patterns on food security

Source: Author's Conceptualization

Consequently, the ultimate effect of household expenditure patterns of the French beans exporting households on food security becomes an empirical matter given the complex interplays. Furthermore, the probable effects and relations are not straightforward, and differ based on the socio-economic factors and expenditure patterns of the household as well as the environmental factors.

3.2 Empirical Framework

3.2.1 Household expenditure patterns of small-scale farmers in Mbooni Sub-county

In order to elicit the expenditure patterns for the French bean growing and non-growing households in Mbooni Sub-county, the study used descriptive analysis. A two-sample t-test was used to compare the difference in means of the expenditure items between the French beans producing and non-producing households. The differences indicated the expenditure patterns in the two groups of farming households. The study used expenditure items as shown in Table 2.

Table 2: Expenditure items used in Exploratory Factor Analysis

Variable	Variable description
SCHOOLFEES	Total annual expenditure on school fees
TRAINING	Total annual expenditure on training
SAVINGS	Total annual expenditure on savings
CLOTHING	Total annual expenditure on clothing
ENTERTAINMENT	Total annual expenditure on entertainment, relaxation and recreation activities
LIGHTING	Total annual expenditure on energy for lighting
COOKINGFUEL	Total annual expenditure on fuel / energy for cooking
LAND_INVEST	Total annual expenditure on land investment
SHARES_INVEST	Total annual expenditure on shares investment
BUS_INVEST	Total annual expenditure on business investment
OTHER_INVEST	Total annual expenditure on other investment excluding land, shares and business
FURNITURE	Total annual expenditure on furniture
DONATION	Total annual expenditure on donations contribution
TRANSPORT	Total annual expenditure on transport to work and/or to perform other household activities
INSURANCE	Total annual expenditure on insurance
FOODEXPE	Total annual expenditure on food
MEDICAL	Total annual expenditure for medical expenses

The two-sample t-test was used to ascertain whether the means of the two groups (growing and non-growing households) differ from each other based on autonomous samples from each population. If the two-sample means showed sufficient difference from each other, it was then argued that the population means are different (Elliott and Woodward, 2007).

Since the household expenditure items were too many to handle individually, there was need to aggregate some. Therefore, the expenditure items were subjected to Exploratory Factor Analysis (EFA) to condense the variables by examining the pattern of correlations while still retaining the original information. Factor analysis encompasses an array of multivariate techniques used to delineate the influence of underlying factors on a group of observed variables (Alavi et al., 2020). EFA explores the composition of correlations among observed variables by simplifying composite datasets (Alavi et al., 2020). The advantage of such an approach is to reduce the redundancy across variables, by examining the relationships between them (Reio and Shuck, 2015). The information from the original measured variables is presented in a smaller number of derived factors (Gorsuch, 2014). EFA could be described as the methodical streamlining of interconnected variables (Suhr, 2006).

EFA and Principal Component Analysis (PCA) are both variable reduction techniques that have many similarities (Jain and Shandliva, 2013). These techniques are used to condense a set of original parameters into a smaller group of factors or elements that maximize the possible information and variation from the data in the original variables (Meyers et al., 2013). PCA varies from EFA in that it is used to simplify composite data by establishing a small number of principal components which represent the maximum variance. On the other hand, EFA is used to examine the likely underlying factor composition of a group of observed variables without imposing a prejudged structure on the outcome (Jain and Shandliva, 2013).

The EFA attempts to determine to what extent connected variables can be grouped together so as to be treated as one combined variable or factor rather than as a series of separate variables while still retaining the original information (Abdullah and Asngari, 2011). Thus, a more authentic measure can hence be formed by combining the observed variables (Widaman, 2018). The common factors obtained are unique to each of the observed variables (Tabachnick and Fidell, 2007). Therefore, EFA was used as a variable reduction technique, where many variables representing household expenditure items (observed variables) were condensed into smaller sets of new composite variables called factors.

The Promax, which is one of the methods of oblique rotation, was applied for better interpretation of the factors obtained. When entries for the factor correlation matrix exceeds the Tabachnick and Fiddell threshold of 0.32, then promax rotation is recommended (Tabachnick and Fidell, 2007). This means that there is 10 percent (or more) overlap in variance among factors, enough to necessitate oblique rotation (Brown, 2009). In deciding the number of factors to retain, as a rule of thumb, Kaiser's criterion was used. This criterion proposes that all factors with eigenvalue of greater than 1 are retained (Ifezue et al., 2016). Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was performed as one of the reliability tests. The recommended KMO measure threshold should be higher than 0.5 (Everitt and Hothorn, 2011).

The first hypothesis that household expenditure patterns are the same across French beans producing and non-producing households was rejected if any of the household expenditure patterns (French beans producers and non-producers) varied; otherwise failed to reject if all the household expenditure patterns were the same across the sampled households in Mbooni Sub-county.

3.2.2 Assessing household food security situation in Mbooni Sub-county

There are different approaches to measuring a household's food security (Carletto et al., 2013). Following Chege et al. (2013), the study employed household per capita calorie consumption and household dietary diversity score (HDDS) as measures of household food security. To calculate the per capita calorie intake, measure of food security, the amount of food consumed in a household was converted into food energy units. The quantity of every food item consumed within the household was then converted to grams, and the calorie intake was estimated using the Kenya food composition tables (FAO/Government of Kenya, 2018) using the formula:

$$C_i = \sum_{i=1}^{n} W_i Z_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \text{(1)}$$

Where;

C_i is the estimate of the total calorie consumed by a household

W_i is the weight in grams of consumption of food commodity i

Z_i is the food energy content of the ith food commodity from the food composition table.

n is the aggregate of the types of foods that a household consumed

The total calorie intake of the household C_i was divided by the size of the household to obtain per capita calorie intake which was then compared with the average dietary requirement in Kenya of 2,250 kilocalories (as used by the Kenya National Bureau of Statistics) to determine the food security status. A household was considered food secure when the per capita calorie intake was equal or greater than the 2,250 kilocalories threshold (KNBS, 2023).

HDDS was computed as the number of food groups consumed using seven-day recall food consumption data. HDDS was used to capture the household's access to quality diet in terms of access to food variety. The study used 12 food categories which include pulses/legumes, cereals, milk and milk products, root and tubers, fruits, vegetables, meat, fish and seafood, sugar/honey, eggs, oils/fats, and miscellaneous. Following Swindale and Bilinsky (2006), each food group was assigned '0' if no food in the food group was consumed and '1' if at least one food item in the food group was consumed during the seven-day recall. The information on the food group was used to compute a score ranging from 0 to 12, where a score of 12 showed that the household consumed food for all the food groups.

The HDDS was computed by summing up the HDDS variable for the 12 food groups in the household. Each HDDS variable either had a '0' value if the food group was not consumed or '1' if the food group was consumed in the household during the previous 7 days. The average HDDS was then calculated for the sample population using the formula:

$$\text{Average HDDS} = \frac{Sum\ (HDDS)}{Total\ number\ of\ households} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

A comparison of the differences in means of the key food security indicators (per capita calorie intake, HDDS and the proportion of secure households) for the growers and the non-growers was undertaken by performing a two-sample t-test.

If the average per capita calorie consumption from French beans producing households was greater than the recommended minimum of 2,250 kilocalories, then the second hypothesis that households are not food secure was rejected; else failed to reject the second hypothesis if the per capita calorie consumption was below 2,250 kilocalories threshold.

3.2.3 Effects of household expenditure patterns of French beans producing households on food security in Mbooni Sub-county

To achieve the third specific objective, the effect of household expenditure patterns of French beans farmers on food security was assessed. The dependent variable used in this model was per capita calorie intake, a measure of household food security. Ordinary Least Squares (OLS) was the most appropriate model because the dependent variable is continuous and normally distributed. Linear relationship of variables where the dependent variable is continuous can be estimated using Tobit regression model, which is specified like OLS (Mazibuko et al., 2018). Wilson and Tisdell (2002) noted that in some instances, tobit regression model has been argued to have theoretically superior estimates to OLS. However, for this status quo to hold the authors indicated that the data set or the dependent variable must be censored or truncated. Data is said to be censored when information about some of the observations is below or above a specified value. On the other hand, truncated data set does not include observations in the analysis that are beyond a boundary value. Since the dataset and the dependent variable were neither censored nor truncated, OLS was the most suitable model to estimate the third specific objective.

In OLS regression, the value of the dependent variable is the linear combination of independent variables and an error term (Gujarati, 2004).

The model was specified as follows:

$$Y_i = \beta_i + \beta X_i + \beta X_i + \varepsilon_i \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3)}$$

Where;

Y_i is the per capita calorie intake for i[th] household

β_i are the parameters to be estimated

X_i is a vector of expenditure patterns and household characteristics that explain the variation of Y_i

ε_i represents the error term, with mean zero, and constant variance

The post estimation tests to establish the suitability of the OLS model were considered. Breusch-Pagan/Cook-Weisberg test was used to check out heteroscedasticity; the Ramsey's RESET test for misspecification, and VIF test to check for the presence of multicollinearity.

Independent variables included in the OLS model and their expected signs

The explanatory variables included in the model are shown in Table 3.

Table 3: Variables to be included in the OLS model

Explanatory variables	Description	Anticipated sign
Age	Age of the head of the household in years	+/-
Male head	Male headed household; 1= Yes, 0=No	+
Education	Years of education of the head of the household	+
Household size	Number of members constituting the household	_
Farm size	Total farm size in acres both owned and rented	+
Distance to market	Distance in kilometers to the nearest market center	-
Energy Expenditure	Household expenditure on energy (lighting and cooking)	+
Asset index	A composite index of all the assets	+
Food expenditure	Household expenditure share on food	+
Entertainment	Household expenditure pattern on entertainment and relaxation	+
Capacity building	Household expenditure on school fees and trainings	+
Investment	Investment (land, shares, business etc.) expenditure pattern	+
Savings	Savings expenditure pattern	+

Age of the household head: The hypothesized sign for the age of the household head was either positive or negative. A negative sign would be expected since younger people are more likely to perform tougher field jobs and cultivate large farm areas that will increase the food supply in the household unlike the old people who are less strong (Bashir *et al.*, 2012). On the other hand, the number of years that a household head has could have a positive relationship with the food security situation of a household. An elderly head is more knowledgeable in farming activities leading to increased food production and consumption in the household (Arene and Anyaeji, 2010). The age of the household head was captured in years.

Male head: The male headed households were speculated to positively influence the food security status of the household. Intuitively, widows and unmarried women tend to suffer

dependency burdens more than their respective male counterparts. A higher dependency burden in the household would mean more pressure on income and the food consumed hence food insecurity. The gender of the head of the household was either male or female.

Education of the household head: Increase in the years of education of the household head was hypothesized to increase food security in the household. An educated household head has knowledge and awareness of the advantages of innovations as well as diversification of household's income. In return innovations and income diversification lead to increased food supply in the household (Najafi, 2003).

Household size: Increase in household size was hypothesized to decrease food security. The households in the study area are small-scale semi-subsistence farmers whose participation in non-farm activities is very minimal. Because of this, increase in family size will put forth more pressure on consumption than the labor used to produce in the land which is also limited (Haile et al., 2005). The size of the household was the number of members who belong to a household. That is individuals who cooked and ate together from a common pot and/or depended on the household resources.

Farm Size: Farm size was expected to affect food consumption positively in this study. If areas under farming were increased, then it was expected that food production will also increase (Najafi, 2003). Higher food production leads to increased supply of food in the household and hence good food security situation. The farm size was captured in acres for owned and rented land (1acre = 0.405 hectares).

Distance in kilometers to the market center: Distance to the market center which was used as a measure of access to market was hypothesized to negatively influence food security. This is because market centers are one of the means in which rural households access food via purchasing. If the distance to the market increases it was expected that the calories intake in the household would be low due to lack of access to purchased foods. Tembo and Simtowe (2009) found that households without market access consumed more calories from their own production and gifts as compared to purchases. The distance to the market center was captured in kilometers.

Household's food expenditure: If budget allocated for food expenses increased in the household, the household would most likely multiply the amount of food purchased, hence an increase in the per capita kilocalories consumed by each household member. In this case, the

expected sign was positive indicating a positive correlation on the household's food security status. The household's food expenditure was captured as an average for one month and an annual estimate was generated.

Household's expenditure on energy (lighting and cooking): Increase in household expenses on energy for lighting and cooking was hypothesized to positively affect household food security. It is likely that in the presence of adequate supplies of fuel for cooking, the frequency of meal preparation may be increased. Makungwa et al. (2013) argued that there is a direct link between household cooking energy and food security. The authors further noted that full achievement of nutritional well-being of households required due consideration of access as well as availability of cooking energy. The household's expenditure on energy for lighting, cooking and other specified energy uses was captured as an average for one month for each type of utility and an annual estimate was generated for each utility. The total household's utilities expenditure for the year was generated by summing up all the annual expenditures on all types of utilities.

Household's expenditure on entertainment and relaxation: Increase in household's expenditure on entertainment and relaxation was hypothesized to have a positive relationship with household's food security. The most common form of entertainment and relaxation in most rural communities in Kenya including in Mbooni Sub-county is socializing with friends and family. This is undertaken through holding festivities, parties, athletics, and storytelling sessions that are accompanied by eating and drinking together. Consequently, the increased spending on food for entertainment and relaxation is predicted to positively influence food security. Nchanji et al. (2021) noted that spending leisure time had a positive relation with households' food security in Narok and Bomet Counties in Kenya. During rotating savings and credit association (ROSCAs) meetings (locally known as *merry go rounds*) as a leisure activity, women mobilized finances to invest in small businesses to enhance food security in the households. Household's expenditure on entertainment and relaxation was estimated per month on expenses such as alcohol, holidays, holding parties for friends and relatives, holding religious ceremonies, recreational activities among others. The annual expenditure on entertainment and relaxation was then generated.

Capacity building expenditure: The hypothesized sign for the effect of increased household's capacity building expenditure (school fees and training) on food security was positive. This is so because as the level of a household's education/training increases due to the increased

expenditure on capacity building, opportunities for employment and jobs with higher wages increase. Besides the advantages of finding a job, household members with higher levels of education/training were expected to have a higher level of awareness for family health and better diet, important for food security. In addition, higher levels of education/training among the family members translated to more knowledge and skills for budgeting, saving and using the resources (Quandt et al., 2004). The household's annual capacity building expenditure was captured in terms of the total expenditure on school fees and total expenditure on training for the year.

Assets Index: Increase in household's expenditure on assets[1] was speculated to positively contribute to the household's food security. A household's ability to generate income is based on its assets. Wealth status of a household can be measured by the valuable assets and livestock owned by a household. Livestock acts as a supplementary source of food, draught power and can be used as a source of cash income (Haile et al., 2005). The food security situation of a household that owns livestock is good as reported by Kassa et al. (2002).

Efforts to increase household incomes through the household's assets or by establishing more solid income sources would enable households to buy foods in case adverse weather affected household production. This would ultimately increase food security in the household. Thus, a positive sign would be expected. The expenditure on durable assets was estimated for physical capital of the household such as furniture, machinery, livestock and houses at the current market value.

Household's expenditure on savings: Increase in a household's expenditure on savings was speculated to have a positive relationship with food security. Dinegde et al. (2022) reported that households that took part in saving increased their ability to meet dietary energy requirements and to diversify their diets. In addition, a household's savings are a safety cushion that help in avoiding hunger during a crisis as noted by Pruntseva et al. (2021).

Household's expenditure on investment: Increase in household's expenditure on investments was predicted to positively influence household's per capita calorie consumption. Diversification of a household's income through income generating investments would increase its purchasing power. Consequently, the household would be able to cope with high

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[1] Assets in this study refer to the physical capital of the household such as furniture, machinery, livestock, houses etc.

food prices and any localized shortages ultimately affecting the food security in the household. Thus, a positive sign would be expected.

The third hypothesis that household expenditure patterns have no influence on food security in French beans producing households was rejected if any of the household expenditure patterns influenced the food security status; otherwise failed to reject.

3.3 Data Collection Procedures

3.3.1 Study Area

This study was undertaken in Mbooni Sub-county which is one of the six sub counties of Makueni County and is situated in the arid and semi-arid areas in the Eastern part of the country. Mbooni Sub-county has an estimated population of about 200,350 people (KNBS, 2019a) and covers an area of approximately 949.2 square kilometers. The average rainfall in the study area ranges between 500 millimeters and 800 millimeters per annum; sometimes irrigation is used for vegetable production. French beans, garden peas, snow peas and chilies are grown for export in the study area.

The target of this study was small-scale farmers and the study area was chosen for three main reasons. Firstly, previous study by Chege et al. (2013) found that despite increased incomes from production of French beans in the study area, food insecurity was still persistent and therefore suggested an investigation into the persistent food insecurity. Secondly, the study area is known to be a major French beans producer in Makueni County for both local and export markets. Thirdly, the study area also forms part of the areas targeted by Drivers Viability and Livelihood Impact of Compliance with Private Food Safety Standards among Smallholder Horticultural Producers in Kenya (DriVLIC) project baseline survey of 2009. The main objective of DriVLIC project was to evaluate the driver's influencing adoption of private food safety standards, the economic and financial viability of compliance with these standards and the livelihood impacts.
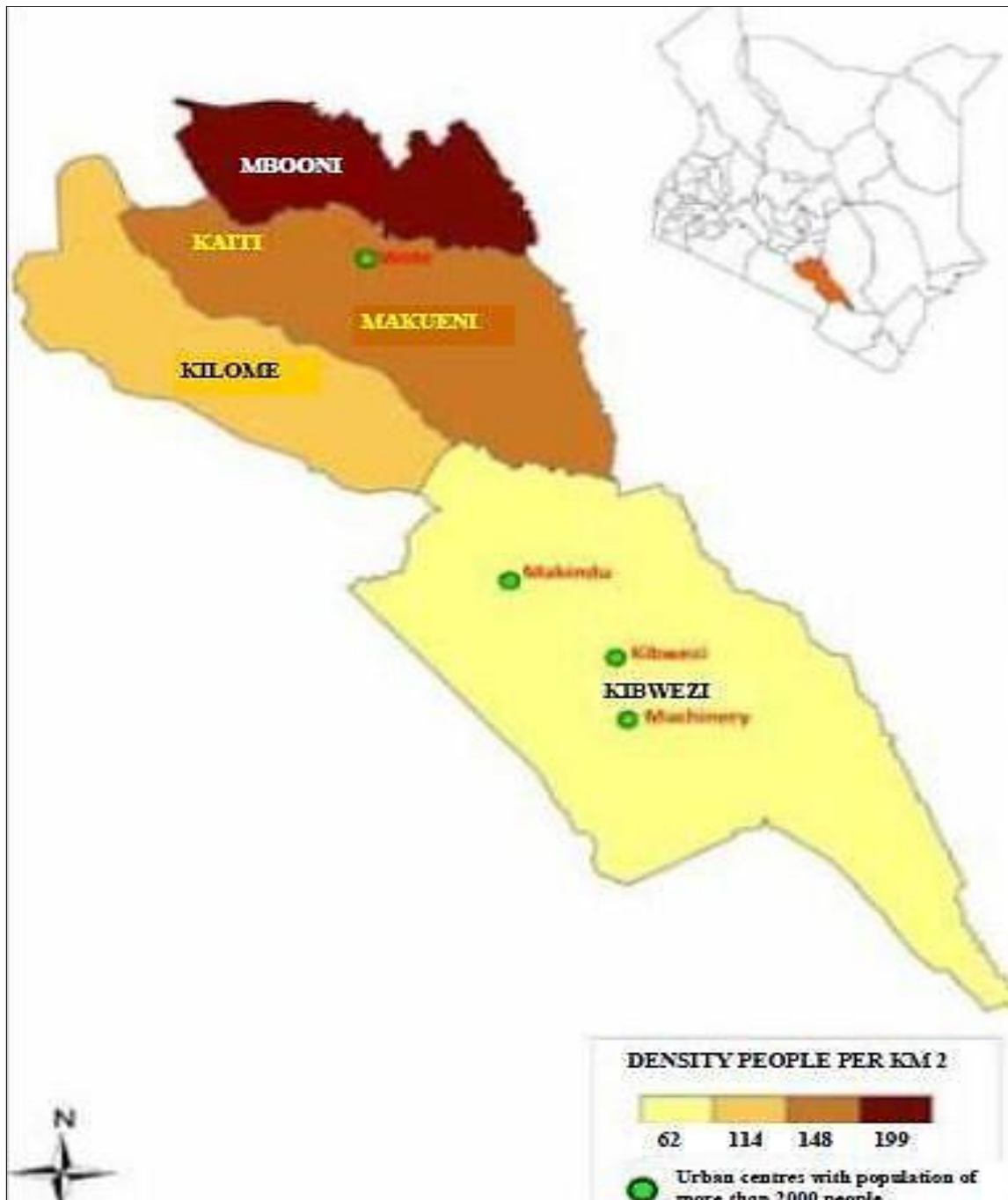
Figure 2: Map of Makueni County

Source: www.makueni.go.ke

3.3.2 Data sources

This study was prompted by Chege et al. (2013) study. The authors suggested an investigation on the persistent food insecurity in Mbooni Sub-county. Therefore, the current study measured the current food security situation and compared it with the findings by Chege et al. (2013). A household was the sampling unit in this study, consisting of individuals who lived together, had one person as the head and had a common cooking plan. The households sampled by Chege et al. (2013) were revisited in February and March 2014 and data on socio-economic characteristics, production information, household consumption, income sources and expenditure patterns were collected using a semi-structured questionnaire.

The 2014 survey data on household expenditures captured the amount of money spent on certain household items, depending on the expenditure period. For instance, data on school fees expenditure was captured per annum. This is because normally school fees in the study area are paid per term and each term does not constitute the same number of months. Therefore, the respondent was asked to give information on the amount of money paid as school fees for each term which was then added together to get the total expenditure on school fees per annum. Some expenditure variables such as energy for lighting was captured as the average amount spent monthly. Using Excel all the data captured per month was converted to an annual estimate to ensure there was consistency.

A structured questionnaire was used to capture information on the household characteristics, the quantity of food and the total types of food consumed over the preceding day through recall method. The respondents to these questions were the persons responsible for preparing the meals in the household. This ensured accuracy in the consumption data collected. In cases where the person responsible for preparing the meal was not present, the food consumption section was not filled and was marked and revisited later. The food consumption data was utilized to estimate the dietary diversity and household calorie consumption level, so as to determine the food security in the study area. The amounts of the various foods consumed was noted and translated to kilo calorie which was then divided by the size of the household and compared to the 2,250 Kcal threshold.

The survey data was entered using SPSS and MS Excel. Estimations and changing of food units to their calorie contents were done using Excel whereas descriptive analysis and summary statistics were performed using SPSS version 21 and Stata 14.

3.3.3 Sampling Procedures

This study was part of the various assignments under a broad research project known as DriVLIC Kenya. International Development and Research Centre (IDRC) funded DriVLIC project and the University of Nairobi in association with the Fresh Produce Exporters Association of Kenya and the Ministry of Agriculture in Kenya undertook the project.

A sample size of 149 households were used. The sampling frame for this study was derived from the list of farmers from the initial baseline survey of the DriVLIC Kenya Project. During the initial baseline survey that covered Kirinyaga District, Mbooni District and Buuri District, an aggregate sample of 573 households was used (Chege et al., 2013). The sampling method that was applied was the Probability Proportionate to Size (PPS) selection of the follow-up respondents. By using PPS sampling, each sampling unit had a distinct probability of selection on any given draw, which was related to its size. The main advantage of using PPS is that the sample is selected in proportion to the relevant variable therefore reflecting the heterogeneity of the population.

The households interviewed were the same households interviewed during Chege et al. (2013) study since the current study was a suggestion from the findings by Chege et al. (2013). Therefore, the sample size used in the current study consisted of the households that were sampled in the study area by Chege et al. (2013). The households interviewed consisted of two categories of farmers: French beans growers and non-growers.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

This chapter presents and discusses the findings of the study, organized into three sections to answer the three specific objectives of the study. The first section assesses the households' expenditure patterns of French bean growers and non-growers in the Mbooni Sub-county. The subsequent sections present the households' food security situations, summary statistics of variables used in the regression, and the regression outputs to assess the effect of expenditure patterns on food security among households of French bean growers in the Mbooni Sub-county.

4.1 Assessing household expenditure patterns of households in Mbooni Sub-county

In order to elicit the household expenditure patterns, the study used the expenditure items presented in Table 4. On average, households in the study area spent a large amount of their income on food followed by savings. A considerable amount of household income also went to school fees and transport.

Table 4: Summary of the household expenditure variables in Mbooni Sub-county

Variable	Variable description	Mean (KES)	SD
FOODEXPE	Total annual expenditure on food	127,637	60,276
SAVINGS	Total annual expenditure on savings	34,057	77,913
SCHOOLFEES	Total annual expenditure on school fees	19,069	29,756
TRANSPORT	Total annual expenditure on transport to work and/or to perform other household activities	15,280	28,944
TRAINING	Total annual expenditure on training	950	5643
CLOTHING	Total annual expenditure on clothing	6,478	6,599
ENTERTAINMENT	Total annual expenditure on entertainment, relaxation and recreation activities	5,714	10,876
LIGHTING	Total annual expenditure on energy for lighting	5,190	9,705
COOKINGFUEL	Total annual expenditure on fuel / energy for cooking	2,651	14,026
LAND_INVEST	Total annual expenditure on land investment	3,087	23,564
SHARES_INVEST	Total annual expenditure on shares investment	822	7,555
BUS_INVEST	Total annual expenditure on business investment	2,597	15482
OTHER_INVEST	Total annual expenditure on any other investment excluding land, shares and business	913	6,643
FURNITURE	Total annual expenditure on furniture	1,438	3,639
DONATION	Total annual expenditure on donations contribution	2,642	5419
INSURANCE	Total annual expenditure on insurance	766	2373
MEDICAL	Total annual expenditure for medical expenses	2,365	2,663

Source: Computation from survey data

Table 5 shows the results of the two-sample t-test. The findings show a significant statistical mean difference in the total annual expenditure between French bean growers and non-growers. The average annual household expenditure captured in the study was KES 261,671 and KES 194,108 for the French bean growers and non-growers respectively. The French bean growers having a higher annual expenditure than non-growers at 1 percent significance level could be an indication of increased purchasing power as a result of rising income in French bean growing households. The results further show that the mean annual expenditure on school fees, food, furniture and clothing were significantly different between the French bean growing and non-growing households at 1 percent, 5 percent, 5 percent and 10 percent levels respectively. The

expenditures on other items were not significantly different among the growing and non-growing households.

Table 5: Comparison of the annual household expenditure in Kenya shillings between French beans growers and non-growers in Mbooni Sub-county (n=149)

Expenditure Item	Growers (n=76)		Non-growers (n=73)		Difference
	Mean	Std Error	Mean	Std Error	
Total Annual Expenditure	261,670.8	19,391.88	194,108.40	13,023.17	**67,562.45*****
Food	137,206.2	7,743.48	117,675.20	5,880.18	**19,531.04****
School fees	25,894.08	4,140.28	11,964.11	2,229.07	**13,929.97*****
Furniture	2,100	492.34	747.80	311.55	**1,352.19****
Clothing	7,511.184	890.58	5,402.74	578.38	**2,108.44***
Total investment	9,736.84	4,060.91	5,623.28	2,707.93	4,113.55
Training	1,401.31	845.32	479.45	340.17	921.86
Savings	42,011.05	10,797.24	25,775.34	6,529.68	16,235.71
Medical	2,400.67	307.18	2,328.56	311.96	72.11
Entertainment and relaxation	6,623.68	1,413.10	4,767.12	1,068.02	1,856.56
Lighting	6,195.00	1530.57	4,144.43	286.00	2,050.56
Cooking fuel	4,245.78	2,099.18	990.41	828.07	3,255.37
Donation	3,357.76	830.82	1,897.60	251.29	1,460.16
Transport	18,407.37	4,370.24	12,023.01	1,608.81	6,384.35
Insurance	1,027.23	352.06	494.79	148.82	532.44

*Note: *, **, *** indicate significance at the 10%, 5% and 1% level*
Source: Computation from survey data

To further assess the household expenditure shares, the percentage mean difference of the expenditure items for the growers and non-growers were compared using t-test as shown in Table 6. The largest share of the households' budget was spent on food which accounted for at least 58.6 percent and 65.5 percent of the total annual expenditure for French bean growers and non-growers respectively. Interestingly, the food expenditure share of French bean growers was significantly lower at 5 percent level in comparison to the share for the non-French bean

producers. The school fees annual expenditure share was higher for French bean growers than non-growers; this was at 5 percent significance level. This is consistent with Engel's law, which states that "the proportion of income spent on food declines as income rises". Other than food and school fees the expenditure shares of other household items did not differ significantly between French bean growers and non-French bean growers.

Table 6: Comparison of the average expenditure shares of the selected expenditure items among French beans growers and non-growers in Mbooni Sub-county

Expenditure share	Growers	Non-growers	Difference
Food	58.61	65.49	**-6.88****
School fees	9.02	5.51	**3.51****
Training	0.50	0.49	0.01
Savings	11.46	8.62	2.84
Cooking fuel	1.18	0.39	0.79
Lighting	2.88	2.54	0.34
Medical	1.03	1.41	-0.38
Transport	6.53	6.29	0.24
Furniture	0.77	0.38	0.39
Entertainment	2.20	2.57	-0.37
Clothing	3.02	3.26	-0.24
Donation	1.41	1.21	0.20
Insurance	0.29	0.24	0.05
Total Investment	4.55	1.61	2.93

*Note: *, **, *** indicate significance at the 10%, 5% and 1% level*
Source: Computation from survey data

The household expenditure items were then subjected to exploratory factor analysis so as to group related expenditure items together in order to condense them. The variables were tested for suitability of factor analysis using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. The KMO measure was 0.52, indicating that the data is appropriate for factor analysis. The EFA was conducted and three factors were retained because their eigenvalues were greater than one.

The three factors retained explained 76 percent of the total variance, which is considered satisfactory. The oblique promax rotation was used to obtain a simple structure of loadings to allow for easy interpretation of the factors. Investment on shares, savings and entertainment loaded highly in factors 1, 2, and 3 respectively as shown by Table 7.

The results show that the households in the study area have a tendency to spend their extra income on non-food items such as savings, investing on shares and entertainment. A possible explanation for this finding is that male headed households are dominant in the study area. This is evident since 79 percent of the French beans producing households and 69 percent of the non-growing households are male headed. The gender of the head of the household determines the expenditure decisions within the household by making important income decisions as noted by Muktarbek (2016). In addition, this finding is consistent with Paxton (2009) and Abukari et al. (2022), who found that male-headed households spent most of their income on savings and investment compared to the female headed households who spent a large part of their income on household expenses which reduced their capacity to save and invest.

Further, household entertainment which was characterized in this study by spending on alcohol, holidays, holding parties and ceremonies, recreational activities, leisure among others was found to be one of the distinct expenditure patterns. An explanation for this finding is that since most of the French beans producing households are male headed they tend to spend more on entertainment compared to female headed households. Similarly, Mabali et al. (2022) found that male-headed households spent a considerable share of their income on alcohol and leisure in comparison to the female-headed households.

Table 7: Rotated factor loadings (pattern matrix) and unique variances

Variable	Factor 1	Factor 2	Factor 3	Uniqueness
SCHOOLFEES		0.6851		0.4875
TRAINING				0.9890
SAVINGS		**0.8209**		0.3279
CLOTHING		0.4843	0.2960	0.5926
ENTERTAINMENT			**0.6386**	0.5569
LIGHTING				0.9958
COOKINGFUEL	0.2598	-0.1924	0.4774	0.6571
LAND_INVEST				0.9825
SHARES_INVEST	**0.8588**			0.3089
BUS_INVEST				0.9820
OTHER_INVEST		0.3123		0.8959

Source: Author's computation from survey data

This finding led to the rejection of the first null hypothesis that expenditure patterns are the same across French beans producing and non-producing households in Mbooni Sub-county. These expenditure patterns (savings, investment on shares and entertainment) were then used as independent variables in the subsequent OLS regression model.

4.2 Food security situation in Mbooni Sub-county

To realize the second specific objective, the household food security situation was assessed and compared to the findings of Chege et al., (2013) survey of 2011 as depicted in Table 8. The average per capita calorie intake and the HDDS was higher in the survey data of 2014 (current study) than in 2011 survey data. Chege et al., (2013) assessed the household food security situation for the same farmers in 2011 and found that both the French bean growers and non-growers were food insecure.

These findings could be explained in two ways. Firstly, data collected in 2011 by Chege et al. (2013) took place at the time when French beans farmers were working on securing certification and this required investing a substantial amount of capital at the expense of producing staple crops or purchasing food. Secondly, the 2011 data was collected between June and July, when farmers in Mbooni Sub-county experience transitory food insecurity because most of the crops are usually in the field and not yet harvested. On the contrary, the 2014 data was collected between February and March, when most households have adequate food after harvesting crops from the October-December short rains cropping season.

Table 8: Per capita calorie intake by French bean growing and non-growing households in Mbooni Sub-county.

	Per capita calorie intake (Kcal)		HDDS	
Survey Year	2014	2011	2014	2011
Growers	2852	2139	8.63	6.54
Non-growers	2962	2168	8.30	6.58
Overall	2908	2154	8.46	6.56

Source: Author's computation from survey data

Table 9 presents key food security indicators, comparing households of French bean growers with non-growers. The average per-capita calorie consumption was lower in households growing French beans than in the ones without French beans, however, the difference in calorie intake was not statistically different. Chege et al. (2013) found that on average, both growers and non-growers were food insecure, given that the per capita calorie intake was less than the 2,250 Kcal threshold. Similarly, the food security situation was assessed by comparing the proportion of food-secure households. Using the 2,250 Kcal as a threshold for food security, the proportion of food secure households was 79 percent and 72 percent in French beans

growing and non-growing households respectively. The proportion of food secure households was however not significantly different for growing and non-growing households.

On the contrary, the mean HDDS was significantly higher (8.63) at 5% significance level in French bean growing households compared to non-growing households (8.3). This shows that French beans producing households had a more diversified diet than the non-growers. The results reveal that although rise in income may not result in increase in staple foods as indicated by the mean calorie intake, households with increased income tend to diversify their diet and hence greater access to more nutritious and quality diet (Babatunde and Qaim, 2010). No significant difference was found between the growers and non-growers for the calorie intake and proportion of food secure households.

Table 9: Comparison of Food security status between French growers and non-growers

Food security measure	Growers	Non-growers	Diff	p value
Calorie intake(kcal/day)	2852	2962	-79.1	0.2994
Proportion of food secure households (%)	79.1	72.3	0.68	0.3387
HDDS	8.63	8.30	**0.33****	0.0365

Note: *, **, *** indicate significance at the 10%, 5% and 1% level
Source: Computation from survey data

These findings led to the rejection of the second null hypothesis that smallholder farmers are not food secure in Mbooni Sub-county since the average per capita calorie consumption for both French beans producers and non-producers was beyond the 2,250 Kcal threshold.

4.3 Effect of household expenditure patterns on food security in Mbooni Sub-county

4.3.1 Summary statistics of variables used in regression

This section presents the summary statistics for the variables incorporated in the regression model. The statistical differences in the mean of key socioeconomic and household demographic characteristics of French bean growers and non-growers in the Mbooni Sub-county are shown in Table 10. Out of the 149 farming households interviewed, 76 were French bean growers while 73 were non-growers.

The average age of the head of the households involved in the study was about 51 years old, with French bean growers having slightly younger household heads (49.5 years) compared to non-growing households (53 years), though not statistically significant. The average age of farmers in Kenya is about 60 years (KNBS, 2019a). This shows that farming as an occupation

is generally taken by relatively older people. Although older farmers could have more farming experience to easily adopt new technologies, sometimes the older farmers are more risk-averse and may be less likely to invest in new agricultural enterprises such as French beans production for export.

Male-headed households were more dominant (73%) in the study area. When comparing French bean growers and non-growers, the results show a greater proportion of male-headed households in French bean growers (79%) compared to non-French growers (67%), though not statistically significant. In most rural Kenya, gender disparities in access to productive resources and market information persist, hence, women are disadvantaged in the adoption of new technologies because income-generating activities such as French beans for export attracts men's control as is evident from a study by Fischer and Qaim (2012).

The mean difference test indicated significant difference between the growing and the non-growing households in the mean years of education of the household head; this was significant at 5 percent. Overall, the average years of formal education in the study area was 7.6 years. French bean growers had significantly higher average years of formal education (8.4) than non-French bean growers (6.8), implying that French bean growers were more educated than non-French bean growers. The level of education may influence technology adoption and new farming practices (Asfaw and Admassie, 2004) by increasing access to information and the market. At the same time, education may enable the farmers to easily comprehend the components of the new technology, increasing their probability to adopt new technologies.

The average household size was about 5.8 people. The households with French beans had a higher number of people in the households (6.3 persons) than households without the French beans (5.4 persons); it was significant at 5 percent. This is however higher than the national average of about 3.2 persons (KNBS, 2020). Household size could be a proxy of household labor endowment but may also indicate the household consumption, where larger household size needs extra income to reduce the consumption pressure (Tizale, 2007).

The results also show that the French bean producers owned assets of higher value than the non-growers as indicated by the asset index which was a composite index of main household assets owned. The mean asset index values were 7.8 and 3.5 for French bean growers and non-growers respectively; this was significant at 5 percent. The estimate of total assets possessed by a household is connoted as a proxy of wealth. The higher asset index value for the French beans producing households is consistent with findings of several studies including that by

Awotide et.al. (2015) who noted that adoption of improved cassava varieties had a significant and positive effect on ownership of assets. This suggests that improving of agricultural practices can be instrumental in reinforcing small scale farmers' possession of assets for boosting income generation and agricultural productivity.

Table 10: Summary statistics of selected household characteristics in Mbooni Sub-county

Variable	Variable description	Mean			Mean Difference	Std. Error
		Growers (n=76)	Non-growers (n=73)	Aver age		
HH_AGE	Age of the household head in years	49.53	53.56	51.50	4.04	2.50
HH_MALE	Male headed households	0.79	0.67	0.73	-0.12	0.07
HH_EDUC	Formal education of the household head in years	8.37	6.78	7.59	**-1.590****	0.66
HH_SIZE	Size of the household	6.29	5.37	5.84	**-0.920****	0.39
FARM_SIZE	Total acres of land owned by the household	2.72	2.61	2.67	-0.10	0.31
DISTMARKET	Distance to nearest market (km)	5.03	5.60	5.31	0.56	0.72
ASSET_INDEX	Asset index	7.76	3.49	5.66	**-4.266****	1.75

Note: *, **, *** indicate significance at the 10%, 5% and 1% level
Source: Estimations from author's survey data

4.3.2 Model Diagnostic Tests

The OLS was fitted and diagnostic tests were carried out to assess the potential multicollinearity and heteroscedasticity. The collinearity of the independent variables was tested using the variance inflation factor (VIF). Some variables were dropped after exhibiting a high correlation. For instance, total household income was dropped since it was highly correlated with the household expenditure variables. After dropping the variables, the mean VIF was 1.6, with values ranging from 1 to 3 for all the independent variables (Appendix 3). If the VIF value exceeds 10, the model is said to have a multicollinearity problem (Gujarati, 2004). Therefore, multicollinearity was not a problem in the model. Further, the Breusch-Pagan test was used to assess the existence of heteroscedasticity in the model. Breusch-Pagan test

failed to reject the null hypothesis of homoscedasticity, indicating that there was no heteroscedasticity in the model.

4.3.3 Effect of expenditure pattern on per capita calorie intake in Mbooni Sub-county

Table 11 presents the linear regression results on the effect of expenditure patterns on per capita calorie intake (measure of food security). Other covariates were included in the model to control for their partial effects on per capita calorie intake. The F statistics were all significant at 1 percent significance level, indicating that overall, the independent variables influenced the household per capita calorie intake. The R^2 value was 0.33, explaining 33 percent variation in the dependent variable based on changes in the independent variables (Gujarati, 2004).

Age of the household head, household size, asset index, food expenditure share, and entertainment expenditure pattern significantly influenced household food security. The age of household head positively influenced the per capita calorie at 5 percent level of significance. This suggests that households with older heads were presumably food secure. Older heads of the households may indicate more farmer experience who are able to make better farming decisions that may lead to an increase in the food produced and ultimately food security at the household level. This finding is in line with Arene and Anyaeji (2010) observation that age had a positive and significant effect on food security. Age may also imply greater accumulation of wealth and social capital, and exposure to production technologies, making households with older household heads to have better access to adequate food and hence food security.

The size of the household negatively and significantly affected per capita calorie intake. This implies that an increase in the number of members of the household would lead to a decrease in per capita calorie intake. Similar results were reported by Nyariki et al. (2002) in the Makueni district. The inverse relationship between household size and calorie consumption is expected when most household members are not providing farm labor or income, and therefore higher dependency on limited household resources in the households. On the contrary, studies such as Becker (1990) showed that if households make good use of labor, that with a larger membership is able to produce more food per capita than that with a smaller membership.

The asset index, a proxy for household wealth, was significant and exhibited a positive effect on the household food security measure. Relatively wealthier households increase expenditure on food, even though demand for staples may not increase as income rise in the short run (Hendricks and Lyne, 2003). Asset index as a measure of long-term household endowment

reveals that wealthier households have the purchasing power to buy food or to invest in farming activities, hence more food secure than the relatively less endowed households. Many studies (such as Holden et al., 2004; Bryan et al., 2009) show that wealth increases the ability of farmers to adopt technologies and practices, leading to increased food production.

The expenditure pattern indicators were hypothesized to influence per capita calorie consumption. The food expenditure share had a positive effect on calorie consumption at 1% level of significance. This implies that an increase in the annual food expenditure led to an increase in the household's food security. Increase in food expenditure translates to increased food consumption in the household through increased food purchases.

Table 11: Factors affecting per capita calorie intake among French bean producers and non-producers in Mbooni Sub-county

Variables	Coefficient	Standard error
HH_AGE	**0.001****	0.002
HH_MALE	0.112	0.058
HH_EDUC	-0.001	0.008
HH_SIZE	**-0.041*****	0.010
FARM_SIZE	-0.014	0.013
DISTMARKET	-0.008	0.006
ASSET_INDEX	**0.009****	0.004
FOOD_EXPSHARE	**0.010*****	0.002
SAVINGS_EXPPATTERN	-0.044	0.040
INVEST_EXPPATTERN	0.009	0.033
ENT_EXPPATTERN	**0.111*****	0.035
Constant	**7.466*****	0.217
Observations	140	
R-squared	0.327	

Note: *, **, *** indicate significance at the 10%, 5% and 1% level

Source: Author's survey data

The three expenditure patterns generated through factor analysis were included in the OLS regression model. The entertainment expenditure pattern had a positive and significant (1% level) effect on household per capita calorie intake. There are two likely explanations for this result. The first one is that during entertainment activities (holidays, holding parties and ceremonies, recreational activities, leisure) households spend money to purchase food. The increased spending on food for entertainment and relaxation positively influences food security. The second explanation is that households engage in other income generating

activities or mobilize finances during entertainment activities to enhance food security through purchase of food. This finding is consistent with Nchanji et al. (2021) who found that finances were mobilized during leisure time to invest in small businesses to enhance food security in the households.

The household expenditure patterns on savings and investment on shares did not have any effect on the households' food security. Therefore, the third null hypothesis was rejected and it was concluded that the expenditure patterns, particularly those on entertainment, affected household food security in Mbooni Sub-county.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

Over the years, the Kenyan government has made efforts, using development strategies, programs and policies to achieve food security. Such strategies include the long-term development blueprint for the country, Vision 2030, whose aim is to revolutionize Kenya into "a newly industrializing, middle-income country providing a high quality of life to all its citizens in a clean and secure environment". Agriculture sector was pinpointed as a core sector towards realizing the anticipated economic growth rate of ten percent per annum under the economic pillar of the Kenya's long-term development blueprint. One approach to transforming agriculture and increasing household income is through the introduction of cash crops such as French beans for export.

Introduction of new crop enterprises such as French beans for export/cash cropping certainly has a positive effect on the household welfare such as rise in the household income, but shows mixed results on household food security indicators. This is so because production of most horticulture products for export is perceived as cash cropping meant only for the global market place and not for the domestic market though frequently consumed at the household level. Therefore, the part played by export horticulture towards food security in Kenya is viewed as inferior but more identical to crops grown for sale such as coffee and tea. Conversely, an apprehension has been that producing French beans for the local market and to a smaller extent as a cash crop could compromise food security. On the contrary, other previous studies reported that cash crop farming negatively influenced food security arguing that commercialization does not necessarily improve livelihood.

The impact of increased household income on food security may not be certain. A study by Chege et al. (2013) found that food insecurity persisted among smallholder farmers' households in Mbooni District (now known as Mbooni Sub-county) despite the rise in incomes from growing French beans for export. Achievement of food security at the household level may depend on the household's expenditure decisions. Yet, there is not enough empirical evidence to show how expenditure patterns affect household food security.

Therefore, the current study builds on the available literature and endeavored to address three specific objectives; firstly, determining the household expenditure patterns for the smallholder farmers in Mbooni Sub-county, secondly, assessing and comparing the food security situation between French beans growers and non-growers, and lastly, assessing the effects of household expenditure patterns on food security in Mbooni Sub-county. Descriptive statistics were used to elicit household expenditure patterns and EFA was used to condense the household expenditure patterns into smaller sets of new composite variables. In the second specific objective, a seven-day recall was used to collect information on food consumed within the household. The food information was utilized to determine the household per capita calorie intake and the household dietary diversity score (HDDS), comparing French bean growers and non-growers. In the last specific objective, Ordinary Least Squares regression model was estimated to assess the effect of expenditure patterns on food security.

The OLS model estimations were subjected to diagnostic tests for heteroscedasticity and multicollinearity. The collinearity of the independent variables was tested using the variance inflation factor (VIF) and the Breusch-Pagan test was used to assess the existence of heteroscedasticity. The variables that exhibited high correlation were dropped. Breusch-Pagan test failed to reject the null hypothesis of homoscedasticity, implying that there was no heteroscedasticity in the model. Similarly, in conducting exploratory factor analysis, variables were tested for appropriateness using Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. The KMO measure was 0.52, signifying that the data was suitable for factor analysis. The results of the VIF and KMO are presented in the appendices.

The study found that there were three distinct expenditure patterns for the French beans producing households which were savings, investment on shares and entertainment. In addition, French bean growers had a significantly higher total annual household expenditure in comparison to non-French bean growers. On average, the annual household expenditure on food, education, furniture and clothing for the growers were significantly different from those of non-growers. Food expenditure share was lower among the French bean growers, whereas the education expenditure share was higher in French bean growing households compared to non-growing households. On average households were more food secure in 2014 (2,908 kcal) than in 2011 (2,154 kcal). The average HDDS was also higher in 2014 (8.5) than in 2011 (6.6) and differed significantly between French bean growers and non-growers. Regarding the effects of household expenditure patterns on food security, the study found that the

entertainment expenditure pattern had a positive and significant effect on food security. Other than food expenditure share, expenditure items included in the model did not significantly influence household food security. The age of the household head, size of the household, and asset index (a proxy for wealth status) significantly influenced household per capita calorie consumption.

5.2 Conclusion

The results show that households that grow French beans had a higher expenditure than those without the French beans, implying that French bean growers may have a significantly higher income that gives them a superior spending power. However, the significant increase in expenditure, points to only food, education, furniture and clothing expenditure items. The study further reveals that the food expenditure share tends to be lower in French bean growers, which is consistent with Engel's law. The findings further show that there were three distinct expenditure patters; savings, entertainment and shares investment in French beans producing households. The first hypothesis that household expenditure patterns are the same across the French bean growing and non-growing households has thus been rejected.

The per capita calorie consumption measure indicate that both the growers and non-growers were food secure. Although the per capita calorie intake did not significantly differ between French bean growers and non-growers, the findings show a higher HDDS in French bean growers, underscoring the importance of using different food security indicators in this assessment. The findings for the second hypothesis tests led to the rejection of the hypothesis that small-scale farmers are not food secure.

To determine the effect of household expenditure patterns on food security, OLS regression model was estimated. As hypothesized, entertainment expenditure pattern was found to positively influence food security whereas other expenditure patterns did not influence food security. The results for the third hypothesis tests led to the rejection of the null hypothesis that household expenditure patterns have no influence on food security among French beans producing households.

5.3 Recommendations

In light of the empirical evidence from the study analysis, an important recommendation to policy makers and development partners is to integrate French beans production and other new

cash/export crop enterprises with programs that have clear strategy to promote household food security and nutrition. This will avoid outcomes that may perpetuate food insecurity because of variations in the household expenditure patterns given that the increased income does not necessarily translate to food security.

5.4 Suggestions for Further Studies

This study concentrated on the expenditure patterns at the household level and how they influenced food security. Future studies should consider exploring the intra-household dynamics of expenditure patterns and how they affect food security. This could be through assessing the intra-household control of farm income and how it affects the expenditure decisions and food security at the household level. The need to understand intra-household expenditure decisions may help to come up with better solutions to achieve food security.

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APPENDICES

UNIVERSITY OF NAIROBI (DEPARTMENT OF AGRICULTURAL ECONOMICS)

1	Name of enumerator:			Enumerator code:	
2	Date of interview: (dd/mm/yr)		**Start time:**		
			End time:		
3	County		Division		
4	Sub location		Village		
5	Reference respondent from Baseline Survey (2010)				
6	Name of current respondent: (skip if respondent is the same)			Phone No.	
7	Respondent's position in the household_____	**Codes for relationship with household head** **1**= head 2=spouse **3**=own child **4**=step child **5**=parent **6**= brother/ sister **7**=nephew/niece 8=son/daughter in law **9**= grandchild **10**=other relative (specify)			
8	Age of respondent		Sex of respondent	Male [ ] Female[ ]	

SURVEY IDENTIFICATION

SECTION A: GENERAL INFORMATION ON EXPORT VEGETABLES PRODUCTION

A1.1	Do you grow export vegetables?	1 [___] YES 2 [___] NO	(*If **Yes,** specify the main crop*_____ *1*=French beans 2= Snow peas 3= Sugar snaps 4= Other (Specify)
A1.1.1	Do you grow vegetables for domestic market?	1 [__] YES 2 [__] NO	
A1.2	If you don't grow **export** vegetables (**No, in** *question A1.1*) why? (codes) [___] [___][___]	1 =No market 2 =Lack of water for irrigation 3 =High production costs 4 =low returns 5 =Small piece of land 6 =Not interested 7 =Other specify_____	
A1.3	If *No (question A1.1*) were you previously growing any export vegetable and then abandoned production**?**	1 [___] YES 2 [___] NO	
A1.4	What were the reasons for abandonment? **Rank with the most important first**	[___]Many compliance requirements [___]Low productivity of the crop [___] Crop Failure	

		[___]Lack of buyers [___]High costs of required inputs [___]Low profitability (losses) [___]Large amounts of rejects by exporters [___]Lack/unavailability of required inputs [___]Other(specify) _____ _
A1.5	(**For Growers)** Do you comply with EurepGap (Global Gap) requirements?	1 [___] YES 2 [___] NO
A1.6	Did you use to comply with EurepGap (Global Gap) requirements then stopped?	1. [__] 2. [__] NO YES
A1.7	If Yes (*question A 1.6*), what were the reasons for abandoning compliance? **Rank** with the most important first	[___]Many compliance requirements [___]Low productivity of the crop [___]Lack/unavailability of required inputs [___]Large amounts of rejects by exporters [___]Other (specify) _____

SECTION B: HOUSEHOLD DEMOGRAPHIC INFORMATION

B1. 1	How many members belong to the household? (*NB: people who cook and eat together from the same pot and /or depend on the household resources*)_____

B1. 2	Name of the household member *(start with household head)*	Relationship with household head (*codes below table*)	Age	Sex 1= M 0= F	Highest level of formal education completed in years	Number of days the member has been present for the last 7 days.
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
	Codes for relationship with household head 1= head 2=spouse 3=own child 4=step child 5=parent 6= brother/ sister 7=nephew/niece 8=son/daughter in law 9= grandchild 10=other relative (specify)					

SECTION C: EXPENDITURE, INCOME, CONSUMPTION AND WEALTH

C1.1_1	**Household Expenditure on school fees** **a)** Are there any household members that were attending school in 2013? 1) Yes [ ] 2) No [ ] **b)** If yes to (a) above, how many household members? _____ **c)** What was the **TOTAL SCHOOL FEES** paid per year? _____
C1.1_2	**Household Expenditure on training** **a)** Are there any household members that were attending **TRAINING** in 2013? 1) Yes [ ] 2) No [ ] **b)** If **yes to (a)** above, what kind of training? _____ **c)** If **yes to (a)** above, where was the training undertaken? _____ **d)** What was the total amount paid for the year 2013? _____
C1.1_3	a) Was any member of the household **SAVING** during the year 2013? 1. Yes [ ] 2. No [ ] b) If **yes** to **(a) above**, how many household members were saving in the year? _____ c) If **yes** to **(a) above**, where do the member/ save? _____ 1) Commercial Bank 2) ROSCA groups 3)MFIs 4) SACCOs 5) mobile banking 6)Other specify_____ d) What is the **average monthly** household **savings** in a **normal month**? _____
C1.1_4	a) Does any household member spend on **ENTERTAINMENT AND RELAXATION**? 1. Yes [ ] 2. No [ ] b) If yes to a) above, what is the total **average monthly** expenditure on **entertainment and relaxation**? (E.g. beer, holidays etc.) _____
C1.1_5	What is the **average annual** expenditure on **CLOTHING**? _____
C1.1_6	a) Did any of the household member fall sick in the year 2013? 1. Yes [ ] 2. No [ ] b) If yes to (a) above, how many household members fell sick in 2013?_____ c) What were the **ANNUAL MEDICARE EXPENSES** for 2013? _____ d) Do you think 2013 was a normal year? _____ 1) Yes [ ] 2) No [ ] e) If **No** to (b) above, what are the **average annual Medicare expenses** in a normal year? _____
C1.1_7	a) What is the **monthly** expenditure on **ENERGY FOR LIGHTING?** _____ b) **What is the average monthly** expenditure on **FUEL/ ENERGY FOR COOKING?** _____ c) **What is the monthly** expenditure on **FUEL/ ENERGY FOR OTHER USES?(SPECIFY)**_____ ____

C1.1_8	**Household's investments**
	a) Did any household member **INVEST** in the year 2013? 1. Yes [ ] 2. No [ ]
	b) If **yes to (a) above**, what was the investment in the year 2013 for the following.
	    1. Land _____ 3. Business (capital) _____
	    2. Shares _____ 4. Other investments(**specify**)_____
	c) Do you think 2013 was a normal year? 1. Yes [ ] 2. No [ ]
	d) If **No to (c) above**, what is the **annual household expenditure on investment** in a normal year? _____

C1.1_9	**a)** Does any member of the household contribute donations? 1. Yes [ ] 2. No [ ] **b)** If **yes to (a) above,** where or to whom does she/he donate? _____ **c)** What is the Annual household expenditure on **DONATIONS?** _____
C1.1_1 0	Total annual expenditure on **FARM WORKING IMPLEMENTS, INPUTS, LABOR. etc.** (e. g. Jembes, Panga, hoes, water pipes e.t.c) _____
C1.1_1 1	a) Was there any **FURNITURE** bought in the household during 2013? 1. Yes [ ] 2. No [ ] b) If **yes to (a) above,** what was bought? _____, _____,_____ c) What was the total expenditure on furniture for the year 2013? _____
C1.1_1 2	**a)** Does any member of the household spend money on **TRANSPORT** to work or to perform other household activities? 1. Yes [ ] 2. No [ ] **b)** If **yes to (a) above,** what is the **average monthly** expenditure on transport? _____
C1.1_1 3	**a)** Does any member of the household spend money on **INSURANCE?** 1. Yes [ ] 2. No [ ] **b)** If **yes to (a) above,** what kind of insurance? _____ **c)** What was the **annual expenditure on insurance** for 2013? _____ **d)** Do you think 2013 was a normal year? 1. Yes [ ] 2. No [ ] **e)** If **No to (d) above**, what is the **annual household expenditure on insurance** in a normal year? _____
C1.1_1 1	a) Are there any other expenses in the household**?** 1. Yes [ ] 2. No [ ] b) If **yes to (a) above,** specify? _____ c) What is the **Monthly** household expenditure on **other specify?** _____
C1.2.1	*Does the household or farm have the following?*

<table>
<tr><th>Assets</th><th>No. Owned now</th><th>Current total value</th><th>Assets</th><th>No. Owned now</th><th>Current total value</th></tr>
<tr><td>1=houses</td><td></td><td></td><td>27=weighing machine</td><td></td><td></td></tr>
<tr><td>2=stores</td><td></td><td></td><td>28=grinder</td><td></td><td></td></tr>
<tr><td>3=water tanks</td><td></td><td></td><td>29=cattle dip</td><td></td><td></td></tr>
<tr><td>4=Radios</td><td></td><td></td><td>30=power saw</td><td></td><td></td></tr>
<tr><td>5=TV</td><td></td><td></td><td>31=spray pump</td><td></td><td></td></tr>
</table>

	6= telephone/ mobile			32=irrigation equipment	
	7= Solar panel			33=water pump	
	8=battery (car)			34=cart	
	9=gas cooker			35=animal traction plough	
	10=bicycle			36=motorcycle	
	11=wheel barrow			37=car	
	12=beehives			38=truck	
	13=sewing/knitting machine			39=trailer	
	14=milking equipment/ shed			40=tractor	
	15=zero grazing units			41=harrow/tiller	
	16=chaff cutter			42=ploughs for tractor	
	17=water trough			43=planter	
	18=poultry houses			44=sheller	
	19=pig-stys			45=ridger/ weeder	
	20=borehole			46=generator	
	21=well			47=boom sprayer	
	22=dam			48=Furniture (total)	
	23=jaggery unit			49=boat (rowing)	
	24=cane crasher			50=motor boat/ engine	
	25=pestle and motor			51=fishing hook	
	26=posho mill				

C.1.2.2	Livestock Assets	Number Owned	Current Value
	Cow		
	Bull		
	Heifer		
	Goat		
	Sheep		
	Donkey		
	Turkey		
	Chicken		
	Other (specify)		

INCOME SECTION

C1.3.1	How much would you estimate your total monthly household income (KES), from all activities, working members, business income, pensions and remittances to be? _____
C1.3.2	Rank source of income starting from main to the least (Rank from list provided below) and amount from each category

INCOME SOURCE	Monthly Amount	Rank
Export crops		
Other horticultural crops		
Other farm crops		
Livestock and livestock products (e.g. milk)		
Other farm activities (e.g. bee keeping, brew making, charcoal burning)		
Wages/ salaries/ non-farm, pension and business activities		
Remittances/ gifts from absent family members and other external income		
Other sources (Specify)_____		

C1.4.1	How many weeks in the year is the main bread winner able to get employment in or outside your farm?	_____weeks
C1.4.2	What do you think is the daily income of the main bread winner?	_____KES
C1.4.3	How do you suppose the main bread winner's income was in 2010?	1 [___]Higher 2 [___]Lower 3 [___]About the same 4 [___]Can't remember / Don't know
C1.4.4	What is the total farm size (owned and rented) in hectares?	_____ _____
C1.4.5	What is the distance from your farm to the nearest market center in kilometers?	_____
C1.4.6	What is the walking distance in hours from your farm to the nearest inputs shop?	_____
C1.4.7	If you are a grower, what is the distance in kilometers from your farm to the nearest French beans collection shop?	_____

C1.6 What were the consumption levels and cost/ value of the following food items consumed in the household for the last one week? (**Specify the units**)

Food items	Qty Day 1	Cost per unit	QTY Day 2	Cost per unit	QTY Day 3	Cost per unit	QTY Day 4	Cost per unit	QTY day 5	Cost per unit	QTY Day 6	Cost per unit	Qty day 7	Cost per unit	Total QTY
A=CEREALS															
Maize (githeri)															
Maize flour F/M (ugali)															
Maize flour H/M (ugali)															
Chapati flour H/M (Atta)															
Chapati flour F/M															
Rice															
Bread															
Sorghum/ millet															
Other (specify) _____															
B=STARCHY FOODS															
Irish Potatoes															
Sweet potatoes															
Cassava															
Arrow roots															
Yams															

Cooking bananas													
Other (specify)_____													
C=VEGETABLES													
Sukuma wiki													
Tomatoes													
Onions													
Carrots													
Spinach													
Pumpkin leaves													
Amaranthus (terere)													
Cabbages													
Other Local vegetables													
Other (specify)_____													
D=FRUITS													
Mangoes													
Passion fruits													
Pears													
Pineapples													

Avocado														
Bananas														
Oranges														
Lemon														
Guavas														
Pawpaws														
Water melon														
Others (specify)_____														
E=MEAT , POULTRY														
Beef														
Mutton														
Pork														
Rabbit														
Goat meat														
Chicken														
Other(specify)_____														
F=EGGS														
Eggs														

G=FISH and SEAFOOD														
Fish														
Other sea food (specify) _____														
H=PULSES and LEGUMES														
Beans dry														
Beans fresh														
Peas fresh														
Peas dry														
Green grams														
Ground nuts														
Other pulses specify _____														
I=DRINKS														
Milk														
Soda														
Cocoa or derived products														
Others (specify) _____														

J=Oil/ fats													**J= Oil/ fats**	
Margarine														
Edible oils														
K=OTHERS														
Sugar														
Honey														
Miscellaneous (specify)														

SECTION D: PERCEPTION OF STATUS

D1	Do you consider yourself (household) as food secure?	1. Yes [ ] 2. No [ ]	3. Don't Know [ ]
D2	**(N.B. Ask the growers only)** Since the adoption of Global GAP, do you think your food security has:	1. [__] Increased 2. [__] Decreased	3. [__] Stayed about the same 4. [__] Don't know
D3	What are your biggest worries about next year? [TICK ALL THAT APPLY. DO NOT PROMPT]	1. [__] Production related (rainfall, yield) 2. [__] Health concerns 3. [__] Drought 4. [__] Feeding the family 5. [__] Flooding	6. [__] Political or social unrest 7. [__] Pests 8. [__] Marital strife 9. [__] School fees/tuition 10. Other[specify] _____

THANK YOU FOR YOUR TIME!!!

Appendix 2: Energy Composition in terms of 100g of selected food items

Name of food stuff	Kcal	Name of food stuff	Kcal	Name of food stuff	Kcl
Brown Bread	254	Irish potatoes	81	Strawberry	44
White Bread	261	Yam	110	Water melon	16
Maize grain	348	Beans	325	Beef	220
Maize meal	373	Black gram	360	Chicken	163
Finger millet	336	Green beans	139	Pork	114
Rice	330	Dry cowpeas	334	Pork Sausage	370
Sorghum	343	Green cowpeas	123	Cooking oil	900
Weetabix	340	Green gram	231	Biscuits	450
Wheat grains	333	Fresh peas	123	Guava	50
Wheat flour	340	Dry peas	338	Tangerine	89
Arrow roots	129	Pigeon peas	351	Sugar	373
Cassava	134	Cashew nuts	588	Egg	154
Sweet potatoes	143	Groundnuts	543	Goat meat	166
Amaranthus vegetables	45	Cabbage	28	Beef sausage	270
Cassava leaves	90	Cowpeas Leaves	41	Milk	305
Kales	52	Pumpkin Leaves	39	Margarine	745
Lettuce	22	Managu	32	Potato chips	250
Spinach	34	Sweet potato leaves	45	Pineapple	54
Carrots	38	Cauliflower	25	Avocado	128
Onion	65	Pumpkin	30	Bananas ripe	94
Tomatoes	28	Apple	59	Bananas raw	109
Orange	43	Mangoes	31	Passion	57
Pears	52	Mutton	218	Soft drink	35
Lemon	27	Fish	230	Honey	311

Source: FAO/Government of Kenya: Kenya Food Composition Tables 2018

Appendix 3: Variance inflation factor (VIF) test for multicollinearity

Variable	VIF
Expenditure share-food	3.060
Expenditure share-education	2.430
Education	1.980
Expenditure share-entertainment	1.750
Age	1.480
Asset index	1.280
Expenditure share-lighting	1.260
Male	1.230
Farm size	1.120
Household size	1.120
Market distance	1.050
Mean VIF	1.620

Appendix 4: Kaiser-Meyer-Olkin measure of sampling adequacy

Variable	KMO
School fees	0.65
Training	0.37
Savings	0.58
Clothing	0.68
Entertainment	0.57
Lighting	0.39
Cooking fuel	0.48
Normal investment	0.47
Land investment	0.38
Shares investment	0.46
Business investment	0.28
Other investment	0.29
Furniture	0.56
Donation	0.78
Transport	0.47
Insurance	0.58
Food Expenditure	0.79
Overall	0.52