COMPLIANCE WITH EUREPGAP STANDARDS: DETERMINANTS, COSTS AND IMPLICATIONS ON PROFITABILITY AMONG SMALLHOLDER FRENCH BEANS EXPORTERS IN KIRINYAGA DISTRICT, KENYA

BY

BEATRICE WAMBUI MURIITHI.

A Thesis Submitted to the Graduate School in partial fulfillment for the requirements of the Collaborative Master of Science Degree in Agricultural and Applied Economics (CMAAE) of Egerton University.

EGERTON UNIVERSITY

AUGUST, 2008

DECLARATION AND RECOMMENDATION

Declaration

I hereby declare that this is my original work and has not been presented in this or any other university for the award of a degree.

Beatrice Wambui Muriithi.

Sign: ----------

Date: ----------

Recommendation

This work has been submitted with our approval as supervisors.

Dr. Margaret Ngigi (Department of Agricultural Economics and Agribusiness Management, Egerton University)

Sign: ----------

Date: ----------

Dr. John Mburu (Department of Agricultural Economics, University of Nairobi, and International Livestock Research Institute (ILRI), Nairobi).

Sign: ----------

Date: ----------

COPYRIGHT

DEDICATION

I dedicate this thesis to my parents Mr. and Mrs. Muriithi. It is through your encouragement and sacrifices that I have made it this far. To my beloved son Collins Muthuki for your inspiration, may God bless you all.

ACKNOWLEDGEMENTS

I cannot be able to individually thank all those who have contributed directly and indirectly to this work but I take this chance to sincerely thank all of them for their support. Due to the limitation of space, I mention a few of them for the special role they played in this work.

First and foremost, I wish to express my gratitude to my supervisors Dr. Margaret Ngigi and Dr. John Mburu for the advice, encouragement, and support they provided me with during the whole period that the work was in development to the end. My deepest gratitude goes to them. I would also like to appreciate effortless support from the Department of AGEC/BAM, Egerton University and particularly Dr. Benjamin Mutai who facilitated the whole process of proposal presentation. I also wish to acknowledge the contribution of my colleagues, John Olwande, Vivian Busienei, Geophrey Sikei, Eliud Mathu, Peter Musyoka, and Stephen Njogu who encouraged me with insights into my work.

I want to thank Prof. Willis Kosura, and CMAAE secretariat as a whole for the financial support which has been the key to the success of my research work. I also wish to extend my gratitude to Mr. Wilfred Yako, Manager and Mr. Francis Makhoha, field assistant both of Horticultural Crops Development Authority (HCDA), Mwea Division. Appreciations are also extended to the research assistants; Caroline Nguru, Patrick Musyoka and Helen Wairimu. Special thanks to Kirinyaga farmers who gave me an opportunity to interview them, Mr. Apollo Owour of Kenya Horticultural Exporters (KHE), Mr. Timothy Mwangi of Kenya Horticultural Development Program (KHDP, USAID), Mr.Silveester of Woni Exporters, Mr.Cosmas Kyengo of Fresh Produce Exporters Association of Kenya (FPEAK), and all others who saw the success of my field work, I say thanks to you all.

Last but not least is to my family members and friends for their encouragements. Most notably, I owe the greatest debt to my husband George Kihuria, my son Collins Muthuki and sister Mary Wangari and sister-in-law Alice Gathoni for their strong moral support and constant encouragements that were very crucial to the success of my work.

ABSTRACT

Horticulture provides many developing countries with opportunities for export diversification, poverty alleviation and rural development. However, stringent public and private-sector food-safety standards, for example EurepGap, pose a challenge especially to small export farmers. Compliance with these standards entails costly investments that may be a burden to smallholder farmers, failure to which might lead to their exclusion in the global market. A number of questions which require empirical research arise to confirm or refute these concerns. The study assesses awareness of the EurepGap standards among smallholder farmers and analyzes the critical factors influencing their compliance. It also identifies the costs of complying with these standards and their implications on profitability of smallholder French bean farming business in Kirinyaga District in Kenya. The study uses simple random sampling technique to collect primary data from 103 respondents. Descriptive statistics, cost-benefit accounting (partial budgeting) and binomial probit model are used to analyze the data. The results show that an information gap exits as regards to awareness of EurepGap standards especially among the non-compliant farmers. Compliance with the standards requires high costs of investment and this is a major constraint to the smallholder farmers. Strategies such as contract farming and collective action through group membership were found to enhance compliance among smallholder farmers. Further, empirical analysis shows that compliance with the standards is positively influenced by socio-economic and farm characteristics such as area under French beans production, and availability of external support from extension services, but negatively influenced by access to off-farm income. In addition to high cost of compliance, farmers face other constraints such as high cost of recommended chemicals and that of hiring extra personnel. Results also show that compliance is not for profit enhancement but may be for market assurance. However, farmers are enjoying non-financial benefits from compliance such as skills on good farm management and record keeping. Since the standards require high cost of compliance with EurepGap standards, the study suggests that the government and other stakeholders in this sub-sector should assist the smallholder farmers to ensure their continued access to the lucrative markets. The government should lead in disseminating information about the standards through extension training, besides encouraging farmers to form groups to share the cost of compliance. A policy to ensure the right prices translate to the farmers should be put in place. It is also worth exploring less strict market where Kenyan products can be channeled to.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

CDA	Community Development Agency
EU	European Union
EPZA	Export Processing Zones Authority
Eurep	European Retail Produce Working Group
EurepGap	European Retail Produce Working Group Good Agricultural Practices
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Statistics Division
FICCI	Federation of Indian Chambers of Commerce and Industry
FPEAK	Fresh Produce Exporters Association of Kenya
GAP	Good Agricultural Practices
GOK	Government of Kenya
HACCP	Hazard Analysis and Critical Control Points
HCDA	Horticultural Crop Development Authority
ISO	International Organization for Standardization
KARI	Kenya Agricultural Research Institute
KEPHIS	Kenya Plant Health Inspectorate Service
KHDP	Kenya Horticultural Development Program
KHE	Kenya Horticultural Exporters
NGO	Non Governmental Organization
NIB	National Irrigation Board
PAPPA	Policy Analysis for Participatory Poverty Alleviation
PMOs	Production and Marketing Farmer Organizations
SPS	Sanitary and Phytosanitary standards
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
USAID	United States Agency for International Development
WTO	World Trade Organization

CHAPTER ONE
INTRODUCTION

1.1 Background information

Kenya's economy is heavily dependent on agriculture with nearly three quarters of Kenyans deriving their livelihood from farming, producing both for local consumption and for export (PAM, 1995). Agriculture's contribution to rural employment, foreign exchange earning and rural incomes are so important that any broad-based improvement in rural living standards requires substantial productivity growth in agriculture (Nyoro and Jayne, 2005). Agriculture accounts for about 24% of Kenya's Gross Domestic Product (GDP).

The horticulture sub-sector of the agriculture sector has in the last decade grown to become a major foreign exchange earner, employer and contributor to food needs in the country. Currently the horticulture industry is the fastest growing agricultural sub-sector in the country and is ranked second to tea in terms of foreign exchange earnings. Fruits, vegetable and cut flower production are the main aspects of Kenya's horticultural production. The sub-sector has undoubtedly contributed to increased rural incomes and reduced rural poverty, through both direct production effects and linkage effects, as horticultural incomes are re-spent in rural areas (Mutuku et al., 2004). The success of the sub-sector has seen the export of horticultural produce rising from 1,480 tonnes in 1968 to 163,233 tonnes in 2006 fetching over US $600 million during this period. Exported vegetables constitute only 4% of the total production, while 96% is consumed locally (Mutuku et al., 2004). It is estimated that 70% of exported vegetables are grown by smallholders, with up to 50,000 smallholders growing French beans (Minot and Ngigi, 2004). The major export market is the European Union countries taking 80% of the exports; with the UK, Netherlands and France being the main markets. Other markets include Middle East, South Africa, Norway, USA, Canada and Japan (HCDA 2007; Minot and Ngigi, 2004).

Kenya, having an ideal climate for production of horticulture, produces a wide range of vegetables, fruits and cut flower for both local and international markets. More than 90% of Kenyan farmers are involved in horticultural production on an estimated

250,000 hectare (McCulloch and Ota, 2002; Mutuku et al., 2004). This sub-sector has become a recommendable diversification strategy for farmers as horticultural crops often generate higher returns per hectare than staple food crops. Even the poorest farmers market a significant proportion of their produce (Minot and Ngigi, 2004). The main vegetable crops grown for export in Kenya include; kales, cabbages, tomatoes, indigenous vegetables, garden beans, onions, carrots, garden beans and French beans (HCDA 2002). The other important export vegetable crops include; garden pea, sugar snap pea, mangetout and baby corn.

The sub sector has shown a steady 10 – 20% annual increase in export earnings over the last five years. The private sector has contributed largely to this steady growth with the government providing structural and macroeconomic reforms including a liberalized trading environment. There however exist several constraints, which deter the industry's steady growth. These include poor infrastructure and increasing market regulations in the international market. To improve and sustain efficiency in production and marketing processes and to maintain Kenya's competitiveness, the industry needs to enhance production, technology generation and dissemination as well as comply with international market requirements (EPZA, 2005; HCDA, 2007).

While over 90% of Kenyan farmers in all but the arid regions of Kenya produce horticultural products, the smallholder farmers who produce directly for export are fewer than 2% of the total producers (Jaffee, 2003; Mutuku et al., 2004). Kenyan smallholders who have succeeded in producing for the export market are now facing new challenges related to changes in the structure of consumer demand for food quality and safety. Another challenge is as a result of transformation of the food retail market in Europe through consolidation which has led to increased market power, and much more control over production practices. European Union (EU) retailers increasingly ask for produce certified according to specific food safety and quality standards.

The European Retailer Produce Working Group Good Agricultural Practices (EurepGap) is the most widely known example of a common EU retailers' standard. Though it is a private standard, it is regarded as a condition of entry to EU markets and

does not provide price premiums. Compliance to these standards for smallholders entails costly investments in variable inputs (for example approved pesticides) and long term structures (e.g. grading shed, disposal pit and pesticide store). These investments are "lumpy" and mostly specific to the fresh export vegetable business. It is questionable whether small-scale farmers have the resources and skills to comply with the standards. The costs of implementing the standards may drive them out of lucrative export market for horticultural produce. Researchers, development practitioners, and government are concerned that these changes in requirements by the international supply chains for horticultural and other high-value agricultural products will make it increasingly difficult for smallholders to maintain their position in the export market trade (Dolan and Humphrey, 2000; Dolan et al., 2002; Jaffee, 2003).

French beans production in Kenya

French beans are a highly specific vegetable. In Kenya they are mainly grown for export. There is a large demand for this vegetable in both fresh and processed form in West European countries. However, in the local markets, there is a limited but growing demand (Tineke, 2003).

Production of French beans is labour intensive. They employ 3285 man-hours (mhrs) per ha per year which is considerably high compared to other crop and animal enterprises such as hybrid maize which employs 984 mhrs/ha/year, maize and beans intercrop 1579 mhrs/ha/year, irish potatoes 1760 mhrs/ha/year, and milk production 380-482 mhrs/ha/year (Salasya, 1989).

Exporters require French bean produce that has a specific size (not too large and not too small), is not infected by insects and has a particular shape. The beans are packed in boxes in extra-fine and fine grades and shipped by air to Europe. Both output per hectare and the ratio of the two grades vary depending on the frequency of harvest. The beans are not only picked and shipped, but also chopped, washed, combined into multi-product packs, labeled and bar-coded. For the produce to be exported, the exporters must comply with various local and international food safety and control laws and regulations (Tatter et al., 2001).

French beans exports have grown steadily over the last decade. In 1998, they accounted for 18 per cent or 13,765.14 tonnes of total volume of exported horticultural products. This was equivalent to 44.6 per cent of total volume of vegetables exports and it contributed to US $ 30.18 million in foreign exchange out of the US$ 48.45 million from vegetables exports. In the year 2006, French beans increased to about 55.9% of total volume of vegetables exported, weighing about 34.3 million tonnes. This contributed an equivalent income of about US $ 151.88 million (HCDA, 2007).

French beans are grown by large scale as well as small scale farmers. Depending on the total size of the farm, the French bean growers can be categorized as follows; small-scale producers with less than 2.2 hectares, medium-scale producers with between 2.2 to 4.4 hectares, large-scale producers with between 4.4 and 44.0 hectares and plantations are farmers with more than 44.0 hectares (Mausch et al*.,* 2006).

The EurepGap protocol

The EurepGap[1] was originally initiated in 1997 by retailers belonging to the Euro-Retailer Produce Working Group (EUREP) and developed into an equal partnership of agricultural producers and their retail customers. The aim was to develop widely accepted standards and procedures for the global certification of Good Agricultural Practices (GAP).

The development of EurepGap was driven by the desire by retailers and producers to reassure their consumers of food safety following scares such as mad cow diseases (BSE) and foot-and-mouth epidemic in U.K (Friedberg, 2004). Other concerns include pesticide levels in food products and the rapid introduction of genetically modified (GM) foods (EurepGap, 2004). The EurepGap protocol has 250 rules or control points. The goal of this protocol is to provide the tools that objectively verify best good agricultural practices to reduce the risk in agricultural production in a systematic and consistent way throughout the world.

[1] Last year (2007), EurepGap was expanded to cover more countries and changed to Globalgap. However, this study maintains use of EurepGap since this was the standard analyzed during the fieldwork conducted in April 2007.

All farmers, retailers or trade operators who join the EurepGap protocol are committed to five main principles (EurepGap, 2001):

- To maintain consumer's confidence in the quality and safety of the EUREP certified food.
- To practice good agricultural practices.
- To minimise the use of pesticides and other chemical inputs as much as possible.
- To use non renewable resources (as soil, water, etc.) efficiently.
- To be responsible for the occupational health and safety of their workers.

Consequently, it can be easily deduced that the EurepGap protocol is not only limited to the implementation of integrated production in the fields, but it is also concerned about the environment, even beyond the agricultural production process, or about socially related issues, as worker's health, safety and welfare.

1.2 Statement of the problem

Most of the fresh fruits and vegetables from Kenya target the European market. However, the high cost of implementation of the private-sector food-safety standards set by the European Union (EU) retailers, for example EurepGap, present a major challenge especially to smallholder exporters. The standards have increasingly become a major determinant of access to markets in the developed countries. Lack of implementation of these standards might lead to the exclusion of smallholder farmers from the international market and related market income-earning capabilities and hence worsening the welfare of rural households. The cost elements that are mostly affected by these standards and their implications on the farming business however are not known. Further, there is limited research on factors affecting compliance with the EurepGap standards and their level of awareness among the smallholder farmers. This makes it difficult to design tailored policies to assist the farmers.

1.3 Objectives of the study

The overall objective of the study is to assess determinants and costs of compliance with EurepGap requirements and their implications on profitability levels of smallholder French bean production in Kirinyaga district in Kenya.

Specific objectives

(i). To identify and document the level of awareness of EurepGap requirements among smallholder farmers**.**

(ii). To characterize the cost structure (types and magnitudes) associated with compliance with EurepGap standards.

(iii). To identify the critical factors affecting compliance with EurepGap standards.

(iv). To determine the implications of compliance costs on profitability of French bean production for smallholder farmers.

1.4 Hypothesis of the study

(i). Farm and household characteristics do not influence compliance with EurepGap standards.

(ii). Compliance with EurepGap standards has no influence on the profitability of smallholder horticultural farming.

1.5 Justification of the study

The EurepGap requirements pose a threat to the Kenyan horticultural production and marketing, in essence they are likely to act as non-tariff barrier to the international market. Lack of compliance will result to loss of Kenya's market share and subsequent substantial loss on foreign exchange earnings. This might further reduce the level of job creation.

To sustain production and ensure that small-scale producers enjoy the benefits of lucrative market, they need to comply with food safety standards such as EurepGap to make them more competitive. High cost of compliance with these standards might depress their marketed output, resulting in reduced farm income and reduced farm activities. Compliance with these standards can therefore be useful in the country since this can

contribute to poverty reduction in the rural areas where most people face declining outputs, low prices and imperfect factor prices.

It is therefore important to understand the implications of the EurepGap standards on smallholder production. Are smallholder farmers able to maintain their position within the chain? The understanding of these implications requires, assessing the level of awareness, identification of the key cost components of the standards, their magnitude and their effect on net income, which will guide policy makers in formulation of policies that can reduce this burden for the smallholder farmers. Results are also likely to be useful to stakeholders in the French beans supply chain in addressing this very sensitive part of the country's economy. Ways and means of assisting smallholder horticultural farmers in meeting the required standards will be identified.

1.6 Scope and limitations

The study was confined to Mwea division within Kirinyaga district in Central province. The results could not be generalized since this was a case study involving only 103 respondents and therefore could only find limited application to other French beans producing districts in Kenya and especially those with similar socio-economic characteristics as Kirinyaga district.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

Food safety and security issues are gaining more attention worldwide as a result of emerging apprehensions by majority of consumers, especially in Europe. Emerging concerns among others include: the negative perception on genetically modified food and the recent emergence of mad cow disease in the United States and a few years ago in Great Britain. As a result, consumers have lost confidence in food industries (Jaffee, 2003). Further, the recent focus on liberalized market economies and globalization has brought concerns of food quality and safety, sustainable production practices, workers welfare and safety all aiming at putting in place good agricultural practices. EurepGap is one of the many standards put in place in response to these consumer concerns (Dolan and Humphrey, 2000).

The measures included in the EurepGap protocol may act as restrictions of trade of agricultural and food products. The level of enforcing these measures is expected to escalate as other trade barriers are reduced as a result of bilateral and unilateral freeing trade agreements (Tatter et al., 2001). Studies worldwide have shown that abiding by EurepGap measures will result in additional cost that will be incurred by exporting countries in terms of new inspection and testing facilities and laboratories and certification of inputs and outputs causing delays in shipping products to their final destinations. The additional costs are expected to hinder exports to the EU region and may negatively impact on employment in agricultural and export sectors in the developing countries (Muaz et al., 2005).

2.2 Cost of complying with EurepGap Requirements

The cost of implementing the EurepGap can vary widely depending on the technical competence of producers and the country of production. In developing nations, much work on infrastructure need to be accomplished before EurepGap standards can be efficiently implemented. By contrast, producers in developed countries have an advanced infrastructure and possibly sets of national regulations or good agricultural practices (GAP)

which allow a quicker, cheaper and easier transition to EurepGap compliance (Thiagarajan et al., 2005).

Limited research is available on the impact of EurepGap requirements on smallholder horticultural production and marketing. Few researchers have tried to explore the impact in terms of cost of compliance, and those who have done so have come up with mixed observations. Some studies, such as Wechter and Grethe (2006), show that cost of compliance is too high thus acting as a non-tariff barrier to trade, while others such as Giac et al., (2006), show a positive response to compliance with EurepGap requirements. Most of the studies however agree that cost of compliance is a burden to smallholder farmers which threatens them of being excluded from the export market as will be shown in the following literature.

EurepGap and the International Market

Wechter and Grethe (2006) in a study on EurepGap adoption by mango exporters in Australia, note that there is a need to support poorer and smaller producers in adopting of EurepGap standards. Smaller farmers may otherwise not make to comply to obtain certification thereby running a risk of being excluded from the lucrative European markets. Their study is based on a theoretical framework of a compliance process of three stages (information stage, decision stage, implementation stage) adopted from Rogers (1995). In each stage, they looked at factors influencing adoption of the standards. Using full cost accounting method they determined the monetary cost of compliance at the implementation stage. An inspection of the implementation stage showed that the costs of compliance are at 9.51 US$/ton/year on average or 3.8% of the product price (ranging between 0.3% and 15.2%). This meant that the costs of compliance are real costs which can lead to reduction of returns especially to the small scale farmers.

Mauz et al., (2005) in a study on economic analysis of food safety in Jordon found that exporters complying with the EurepGap standards have increased total cost of exported products by 17%. However, some of them estimated the additional cost to be approximately 50% of the total cost of production. They found that Sanitary and Phytosanitary Standards (SPS) and EurepGap regulations create a bias in favour of large

scale farmers. This is simply because complying with these regulations requires high amounts of fixed (investment) cost in terms of suitable infrastructure and operational costs of employing new staff and procuring new materials, among others. Using a partial budget analysis from one of the major strawberry producer/exporter in the Jordan Valley who has been exporting fresh strawberries to the EU markets for the last ten years, they showed in figures what it takes, in terms of new investment, to comply with the EurepGap regulations. The additional costs of EurepGap certification were estimated to be about 22% of the costs incurred using the traditional production system. Farmers face both technical and financial constraints when complying with the standards. The technical impediments are those related to: 1) lack of highly qualified labourers; 2) absence of modern and efficient packing and grading facilities; and 3) absence of quality control laboratories in the region especially for testing chemical residues. The commercial impediments: 1) high cost of exported products from the sources of origin; 2) difficulties in shipping and forwarding procedures to EU markets; and 3) difficulties in issuance of needed certificate.

In India, a survey conducted by Federation of Indian Chambers of Commerce and Industry (FICCI, 2006), reveals that exporters to EU were finding it increasingly difficult to comply with EurepGap standards set by EU. The survey found that in some cases the cost of complying with EU standards could cost as high as 65% of the production cost. Exporters of a wide variety of products like grapes, chillies, mango, papaya, pineapple and other crops reported that high cost of certificates for complying with European standards was making it difficult for them to export to EU.

In Vietnam, Giac et al., (2006) noted that, although obtaining EurepGap certificate will have a positive impact not only on market access but environmental and social aspects, smallholder farmers will face various constraints in adoption. These constraints are associated with heavy book keeping, high cost of maintaining field hygiene and sanitation facilities, mistrust among stakeholders in the value chain and lack of rewards for application of EurepGap. The smallholder farmers need technical or financial support or social recognition to facilitate quick compliance.

EurepGap status in developing countries

Most of the developing countries market their horticultural produce to the European Markets (Mutuku et al., 2005). Export of all horticulture products have boomed over the last decade but changes around the world are causing concern, including the saturation of the traditional European market and tightened controls by supermarkets. African growers face increasing pressure from the set controls which leads to higher production costs and political uncertainties following the demise of the Lome convention, leading to a new and so called level playing field under the World Trade Organization (WTO) from 2007 onwards.

Graffham and Vorley (2005) noted that the impact of EurepGap in the Sub-Saharan countries depends on scale and sophistication of operation. For large commercial operations (44 hectares and above) finance, infrastructure and personnel are no problem. For small-scale operations, there is a problem of lack finance and infrastructure, personnel shortages and low capacity. Large farms have the necessary financial resources and can usually complete the required facilities within six or seven months (a maximum of one year). The same task would probably take smaller farms two to three years. They analyzed the cost of compliance as a percentage of annual gross margins in some developing countries. In Zambia for example, capital (investment) costs for small scale farmers (owning between 0.3-1.8ha) averaged between 5-33% for donor supported farmers compared to 26-160% for non supported farmers. Recurring (maintenance) costs averaged between 1-8% and 9-53% for donor supported and non-supported farmers, respectively. This shows the importance of support services in determining the decision to comply with the EurepGap standards especially for the financially constrained smallholder farmers.

A study by Aloui and Kenny (2005) in Morocco revealed that compliance with EurepGap standards poses several technical and financial problems for Moroccan producers and exporters. The financial requirements are seen as the main limiting factor for implementation. Using a microanalysis approach, for a medium-sized tomato farm of 10 ha, the cost of implementing the EurepGap standard is estimated at 8% of the total accumulated farm gate costs. After post harvest, transport, and marketing costs are added,

compliance costs represent 3 % of the total cost. Recurring costs which include; training, monitoring and surveillance, and certification are estimated at 2% of the farm gate costs. The smallholder farmers cannot afford the additional costs of the investment in equipment and infrastructure needed for compliance with traceability, record-keeping, waste and pollution management, worker health, and environmental issues. For these reasons, EurepGap is now implemented only in large farms that have more than 400 ha of citrus and more than 100 ha of vegetables and tomatoes.

In Costa Rica, implementation of EurepGap increased cost of production by about 7.8% of total cost (Anderson and Somaribas, 2003). The extra cost however was incurred by the exporters (buyers of the products) who catered for cost of training, certification and laboratory analysis. Investment was made on infrastructure, including housing, toilet facilities, and storerooms for machinery and agrochemicals. Farmers were required to purchase pesticide application gears and apply newly recommended herbicide.

EurepGap in Kenya

Kenya is unique among developing countries in that the most significant player in the agricultural export sector is the smallholder. In the recent past, only a few Kenyan farmers were operating to international quality and safety standards. Export-bound produce was being sold through informal networks of brokers, traders and resellers who had limited understanding of international standards. From the first of January 2005, farmers who export horticultural produce to the European Union were required to comply with the EurepGap regulations including a sophisticated set of good agricultural practices (GAP). These requirements cover among others agro-chemical use, record-keeping, farm infrastructure, hygiene facilities and grading and packing processes (New, 2005).

To many farmers in Kenya the stringent non-legal requirements of EurepGap were seen as yet another trade barrier. Many of them ask why European consumers are so against products from Kenya with no realization that the same rules apply to producers worldwide. Even for those farmers that understand the implications of traceability and EurepGap, and are prepared to undertake the training and auditing procedures, there are

many who feel the information has come too late and they feel un-prepared for the challenges that lay ahead (News Agriculturalist, 2005).

Kenya's tropical climate demands the use of frequent applications of pesticides that have over the years proved to be effective. EU regulation force Kenyan producers to change these applications regimes and pesticide types. However, unless Kenyan horticultural producers and exporters adapt rapidly to the new measures they will lose the share of the market built up over the years (Mussa et al., 2004). Musaa et al., (2004) in their study argue that the impact of stringent consumer health requirements on large corporations and small-scale farmers will be quite different. Large corporations have much better conditions than small-scale farmers to quickly adapt to new measures, such as EurepGap. In fact, European markets have favoured larger producers and exporters since they have the capacity to respond to new requirements leaving out smallholder farmers who dominate most of the African agricultural sector.

New (2006) notes that exporters and their outgrowers in Kenya, big and small, have responded well to market demands for food safety and traceability. EurepGap has generally had a positive effect on production and marketing. Nevertheless, costs are going up at a faster rate than the provision of support services and infrastructure for the industry. Problems such as lack of rural infrastructure, high transportation cost and insufficient support services hamper the performance of smallholders in the agricultural sector. Smallholders also suffer from limited access to credit and technical information which is often tied to contracts with particular exporters or embodied in costly, often expatriate consultants (Minot and Ngigi, 2004). These constraints further limit the smallholder farmer's ability to adopt the market standards such as EurepGap.

Tineke (2003), in a study on export of french beans from Kenya notes that exporters of this product prefer producers who are up to date concerning EurepGap requirements and do keep records. Compliance with these requirements also determines the price the farmers get for their produce. He also notes that exporters prefer large suppliers because of lower transportation costs, lower production problems and low transaction costs.

2.3 Factors affecting compliance with food safety standards

There are limited studies that look at factors affecting compliance of EurepGap. However such factors can be related to studies related to other food safety standards such as SPS, HACCP (Hazard Analysis and Critical Control Points), and others.

Farm and household specific characteristics have been cited as major barriers to compliance with food safety standards. Charlotte and Fairman (2003) in their study assessing the factors affecting food safety compliance within small and medium-sized enterprises (SMEs) in UK, identified the major barriers as; lack of knowledge throughout the compliance decision process, lack of support services, lack of money to cater for the costs of compliance, and lack of information. Antle (1995) also agrees that size of the farm could explain the importance of the cost of implementation as an incentive to adopt food safety and quality practices.

Other household factors include social capital which is built up through group membership. According to the theory of institutional economics, high social capital can result to high gains from group membership (North, 1990). The farmers who are affiliated to production and/or marketing groups are therefore likely to comply with the standards than those who are not. Organized in groups, small and medium scale farmers reach the critical mass that is necessary to become certified. Groups also facilitate exchange of information, investment in infrastructure and bargaining is easier for favourable certification deals (Guenther, 2006)

Support services provided to farmers highly influences their decision to comply with the food safety standards. In Zambia for example, Graffiham (2006) notes that smallholder farmers (owning between 2-6 hectares of land) who received support from donors in implementation of the EurepGap standards incurred 2-5% capital cost of total annual gross profit margin compared to those who were not donor supported who incurred about 8-23% capital cost of total annual gross profit margin. As a result compliance was high with farmers who received this support from donors than those who did not. The support included training of workers, input supply, credit and financing certification and auditing processes.

The market destinations of products are likely to influence the compliance decision. Producers selling in the local market are not likely to comply while those selling internationally especially in the European market are required to be certified for the EurepGap standard. Costs elements involved in compliance are listed in Appendix I.

Government policies on farm land, infrastructure, information access, credit access and marketing of horticultural products influence farmer's decision on compliance. These policies may depress or promote production and marketing products from smallholder farmers. Jaffee (2003) in his study on transformation of the Kenyan fresh vegetable trade in the context of emerging food safety argues that, prevailing government policies can be a barrier towards adoption of safety standards. High levies charged in the markets can also discourage compliance since they depress the profits realised by the farmers. Policies and institutional environment that encourages horticultural production and marketing, act as a catalyst towards complying with EurepGap and other food safety standards (Charlotte and Fairman, 2003).

Cost of certification, which is a major element of the EurepGap standards, has been cited as a major barrier to compliance. Graffham (2006), in his study on Zambian farmer's experience with the EurepGap standards, notes that some African certifiers charge up to four times more than the European-based certification bodies. These high costs as well as other recurring costs such as audit expenses, training and expensive pesticides, overburden smallholder growers if no external support is provided to them (Graffham, 2006).

2.4 Conceptual framework

This study uses the theory of profit maximization to explain the behavior of business owners (farmers). The theory of profit maximization is based on the reasonable notion that people attempt to get highest utility given the constraints facing them. Business owners will attempt to manage their businesses so as to improve their profit. In a situation where competition is high (like in the horticulture export market), farmers (business owners), will improve their profits by paying attention to revenues and costs. Their objective therefore would be to maximize profits and minimize costs. To achieve this

objective, farmers will not only seek to increase their output but also try to enhance market acceptability of their produce though compliance with the required food safety standards such as EurepGap. However, compliance may of necessity increase cost of operation.

To maximize profit, farmers are faced with various constraints which influence compliance with the EurepGap requirements. These constraints includes farm characteristics and household attributes such as land size, production levels, farming experience and others as given in Figure 1 below. Other factors include; access to market for French beans, support services provided to the farmers and the current policies that may affect both production and marketing of french beans. Compliance with the EurepGap standards implies incurring additional costs which hence affect the profitability of french production.

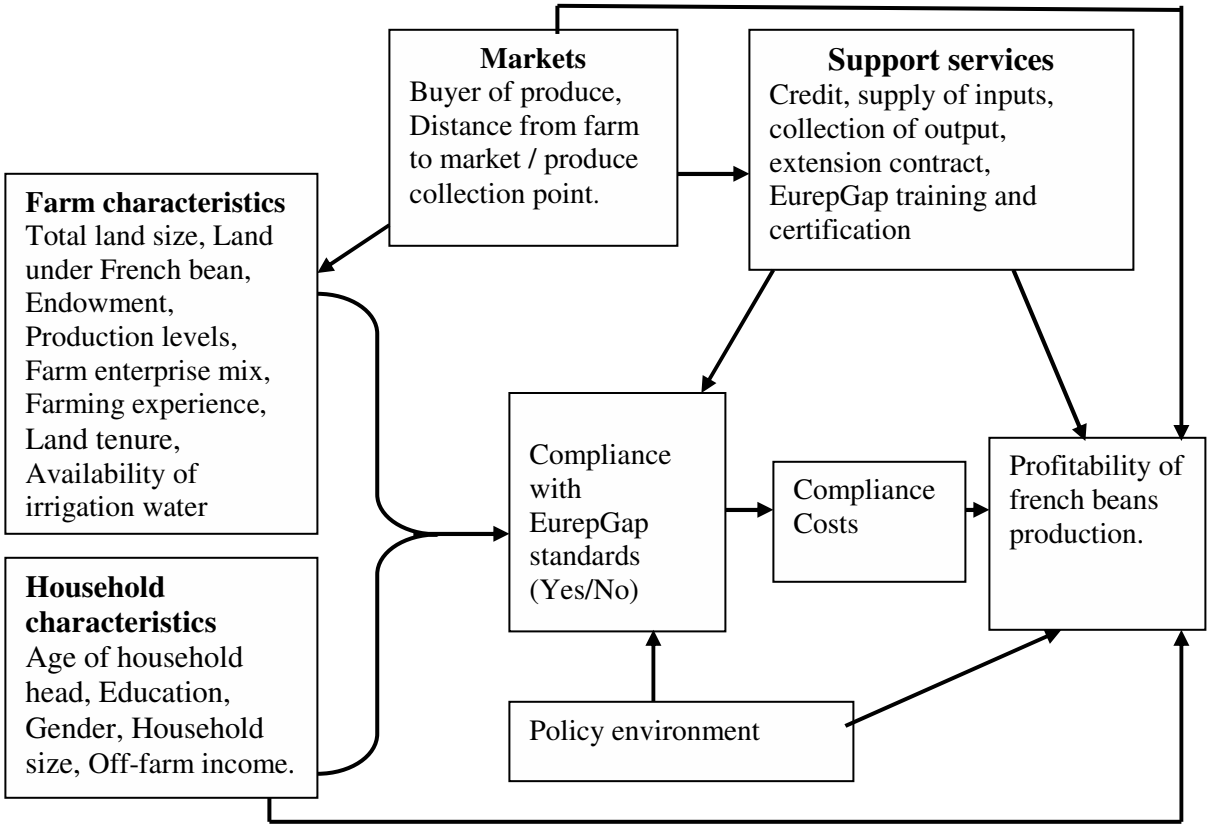

Figure 1: Factors affecting compliance with EurepGap standards and profitability of French bean (*Phaseolus vulgaris*) business.

Source: Author's presentation

For French bean producers to realize high returns from the international market, they must comply with the EurepGap standards. The decision to comply is influenced by

various factors as shown in Figure 1 above. The arrows show the source of the influence and point the factor that is influenced. Farm characteristics such as production levels/volumes, type of certification and farm enterprise mix may be influenced by the market destination of the products. The market destination and availability of support services such as credit and extension contract may also determine whether a farmer is going to comply with the standards since not all markets demand compliance with these standards. Household attributes such as age, access to off-farm income, gender, household size, and education may also determine the decision of the farmer to comply with the standards. Availability of support services may also determine compliance decision. Provision of credit for example may provide the farmers with the necessary capital required to set up the initial structures. Further credit can facilitate high levels of production, high incomes and hence compliance with the standards. The policy environment which includes aspects such as current state of the infrastructure, government policies affecting the horticultural sector and other food safety standards in place may also influence farmers' compliance decision. This may further promote or depress the profitability of the farming business. To comply with the EurepGap standards, farmers must incur additional costs associated with initial investment and recurring/ maintenance costs. These costs determine the profitability of the farming business.

2.4.1 Characterization of costs of compliance with EurepGap

Costs of complying with EurepGap requirements can be classified broadly into two categories; transaction costs and production costs. To be able to characterize these costs, it is necessary to distinguish transaction cost from production costs, which can be a difficult task in French beans business. Production of French beans for international market requires certain institutional arrangements that enhance compliance with EurepGap standards. Costs associated with these institutional arrangements are mainly transaction costs. Thus costs arising from implementing such standards such as set-up costs are regarded as transaction costs.

Compliance with EurepGap standards requires taking various technical measures such as use of specific chemicals. The costs arising from these technical measures may be

regarded as production costs but in reality they are transaction costs. One way of categorizing such costs would be to consider the reason why the farmer is using the chemical and whether he had been using it before complying with EurepGap requirement. Farmers using any specific chemical for the purpose of complying would be regarded to incur transaction costs. Thus all costs that are not associated with compliance of the EurepGap requirements will be treated as production costs. In the characterization of the costs, therefore, the study notes the difficulty of separating production and transaction costs. However any additional production costs incurred as a way of complying with the EurepGap standards will be regarded as transaction costs. This is also noted by other authors in related studies such Aloui and Kenny (2005).

Transaction costs however do not only consist of tangible costs (buildings, facilities, training, certification, auditing and other measurable costs) but also of non-tangible costs such as delay of products, uncertainty and poor governance (Lutz, 1994). These costs may be difficult to quantify hence will not be included in the study. Another common cost in this category which will also not be included is the opportunity cost of farmers' participation in meetings and other activities associated EurepGap requirements.

Many authors have used case study approaches to study the cost of compliance with the EurepGap due to complexity of both mandatory legal provisions and voluntary codes of practice. Aloui and Kenny (2005) in their model subdivided the additional costs of compliance into seven basic elements; building and facilities, equipments, technical assistance, training, monitoring and surveillance, current input use and certification. Larcher (2005) in her study on cost of compliance with agro-food safety categorizes cost of EurepGap compliance into micro and macro costs. Micro costs are costs incurred by producers themselves, while macro costs are costs incurred by regulatory institutions such a ministry of agriculture. She goes further to subdivide the micro costs into set-up costs and on-going costs. This study adapts the approaches used by Aloui and Kenny (2005) and Larcher (2005) to categorize the tangible transaction costs. However, the macro costs will not feature in the study since it is confined to costs of smallholder farmers.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 The study area

The study was conducted in Mwea Division of Kirinyaga district, located in Central Province of Kenya. It lies in the mid-altitude range, 1489 to 2000 metres above sea level. The division has an estimated population of 135,266 persons with a density of 236 persons per square kilometers (District Agriculture Office, Kerugoya, 1996). The division is divided into three agro-ecological zones as shown in Table 1. The zones are suitable for the growing maize, cotton, and sunflower depending on rainfall levels and soil types. There are several types of soils in the region; red soils, black cotton soils, sandy soils and loam soils. Their fertility varies considerably from one area to another. Most of the division is covered by black cotton soil which is suitable for rice production. Rice growing is the major economic activity in the area. French beans are interplanted with maize on the red soils on small hills, which cannot retain water and are unsuitable for rice growing. Horticulture is emerging as an activity with high prospects in this district. The main horticulture crops in the area are French beans and tomatoes.

Table 1: Agro-Ecological Zones in Mwea Division

Zone	Altitude(m)	Annual-Mean Temp (degrees)	Annual average rainfall (mm)
Sunflower, Maize-UM	1,280-1,340	20.9-20.4	950-1250
Cotton-MM	1,220-1,280	21.2-20.9	900-1100
Marginal Cotton-LM	1,090-1,220	22.0-21.2	800-950

Note: UM-Upper Midland Zone, MM-Midland Zone, LM-Lower Midland Zone

Source: District Agriculture Office, Kerugoya, 1996

This study area was purposively selected for its unique agricultural practices. First, land in Mwea is utilized principally for rice production under the National Irrigation Board (NIB) and horticulture is the main competitor for land use. Since rainfall in the area is low and irregular, production is through irrigation, hence acute competition for water and land

use between rice and French beans (PAPPA, 2000, & 2001). Secondly French beans are early maturing; this ensures that farmers get income faster compared with tomatoes and rice, which take 4 and 12 months respectively. The area also grows large quantities of French beans that are exported to international markets.

3.2 Data collection and sampling procedures

The study utilized primary data collected among smallholder farmers. They were chosen since they are important actors in the export chain of vegetables and fruits within the country. Apart from the short period of maturity, French beans were chosen for the study because (1) it is one of the most important horticultural export crop in the country, and (2) it is mainly grown by small-scale farmers.

The study adopted a survey design for collecting primary data among the Mwea smallholder French bean producers in respect to farm and household characteristics, marketing aspects, compliance with EurepGap standards and support services. A semi-structured questionnaire was used to elicit data on total output, farm size, labour resources, gender and education level of farmers, farming experience, enterprise mix, production levels, fixed assets, type of certification, product prices, quality characteristics (storage facilities, record keeping, input delivery by buyers), membership in local groups, investments when adopting EurepGap requirements, training costs and other compliance costs, benefits and constraints of compliance. Information such as general perceptions of the requirements was obtained through informal discussions with the farmers and exporters. Two locations were covered; Nyangati and Kangai locations. The two locations fall in the same agro-ecological zone and therefore treated as one unit in this study. Exporters and NGO's who assisted the farmers in the compliance process gave information mainly on initial cost of compliance.

The following sampling procedures used were: purposive, and random. Purposive sampling was used to select the two locations in the division where French bean production is dominant. Key informants such as Community Development Agencies (CDA) were used to identify the farmers who grow French beans from the population. The

CDA were particularly useful because they are involved in registration of community development groups with the Ministry of Gender, Culture, Sports and Social Services of Kenya. A sampling frame consisting 3600 farmers who grow french beans from both locations was then developed. Using the help of HCDA field assistant and exporter representatives, farmers were selected using simple random sampling procedure. A total of 103 households were selected for the interview based on the formula given by Nassiuma (2000) as below;

$$n = \frac{NC^2}{C^2 + (N-1)e^2}$$

Where: n = Sample size, N = Population, C = coefficient of variation and
e = Standard error

Nassiuma says that in most surveys or experiments, coefficient of variation of at most 30% are usually acceptable. The study took a coefficient of variation of 21% and a standard error of 0.02 to estimate a sample size of 103 as given below: -

$$n = \frac{3600(21\%)^2}{(21\%)^2 + (3600-1)(0.02)^2} = 103$$

Data collection was conducted in the month of April, 2007.

3.3. Data analysis techniques

Descriptive, cost-benefit accounting and econometric techniques were used to analyze the data. Three computer packages; Statistical Package for Social Sciences (SPSS), STATA and Ms Excel were used for data management and analysis.

3.3.1 Descriptive methods

Descriptive methods were used in this study to capture the qualitative and quantative variables that are important in explaining the decision of farmers to comply with the EurepGap standards. The mean, mode, standard deviation and medians of various variables were obtained. T-test and Chi-square tests were used to compare selected household and farm characteristics between the two categories of farmers (compliant and non-compliant farmers).

3.3.2 Cost-benefit accounting

Cost-benefit accounting techniques including partial budgeting were used to characterize the costs of complying with EurepGap standards and to determine the effect of the standards on French bean farming business.

Cost elements of complying with EurepGap standards

In the study, the costs were divided into ex-ante or investment costs and ex-post or recurring costs. Each of these two categories was further divided into seven sub-categories; building and facilities, equipment, needs assessment, training, technical assistance, current input use and certification.

Partial budgeting analysis

Partial budgets are costs and returns associated with some change in the business operation. Partial budgeting estimates the economic effects of adjustments in the farm business. With partial budgeting, we assume many aspects of the business are constant. We are only interested in the parts of the business that will change due to the adjustment. The basis of the concept is to analyze the impact of a proposed change in an already developed plan. Partial budget show whether it pays for farmers to comply with the EurepGap standards.

The partial budget is divided into three sections: added returns (added returns and reduced costs annualized on a yearly basis); added costs (reduced returns and added costs annualized on a yearly basis); and the analysis sections which include net change in return, net rate of return and a breakeven analysis. Data needs required for partial budgeting includes; production or yield levels, commodity prices, input prices and cost of production. In this study, a partial budget was used to show the effects of adjustments made in complying with EurepGap standards on farm profits. Thus added returns were taken as the increase in returns as a result of increase in prices of French beans after complying with EurepGap standards. Reduced costs were any cost reductions, for example through reduction of inputs used in production of French beans. Added costs on the other hand were taken as all additional costs incurred in compliance with EurepGap standards

including costs of buildings and facilities, equipment, technical assistance, monitoring and surveillance and certification.

3.3.3 Econometric model

Econometric analysis was used to test the key factors influencing compliance with EurepGap standards. The regression results indicates the degree to which specific farm and household characteristics, market characteristics, support services and policy environment variables influence compliance with these standards (see Figure 1). This involved estimation of a binomial probit model. The dependent variable in this multiple regression was a dummy variable of compliance with EurepGap requirements.

Model specification

This study hypothesizes that farm and farmer characteristics, alongside with exogenous contextual variables influence the decision to comply with EurepGap standards. It was assumed that the decision of the i^{th} farmer to comply with the EurepGap requirements or not depends on an unobservable variable I_i that is determined by more than one explanatory variable, represented by X_j. The regression model can be illustrated as follows;

$$I_i = \beta_1 + \beta_2 X_{ij} \quad \text{..... (3.1)}$$

Where X_{ij} represents a set of independent variables influencing the decision of i^{th} farmer. The unobservable variable I_i (also known as a latent variable) is related to the actual decision to comply with the EurepGap standards. Y=1 if the farmer comply and Y=0 otherwise, such that

$$\text{Yi} = \begin{cases} 1 \text{ if } I_i > 0 \\ 0 \text{ Otherwise} \end{cases}$$

Assuming that the unobservable variable I_i is normally distributed with the same mean and variance, the probability that the farmer will decide to make any of the above decision (to comply or not to comply) can be expressed as:

$$P_i = P(Y = 1/X) = P(Z_i \leq \beta_1 + \beta_2 X_{ij}) \quad \text{.....(3.2)}$$

$$= F(\beta_1 + \beta_2 X_{ij}) \text{..(3.3)}$$

Where $P(Y = 1/X)$ is the probability that a farmer will comply given the values of the explanatory variables and Z_i is the standard normal variable, $Z \sim N(0, \sigma^2)$. F is the standard normal cumulative distribution function, while β_1 is the constant term and β_2 is the coefficient to be estimated (Gurajarati, 2004).

If X represent a vector of determinants of the farmer's decision then the basic form of binomial probit model with *I* as the predictor variable is reduced to;

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \text{..........} + \beta_j X_j + \varepsilon_i \text{.....................(3.4)}$$

Where β_0 is the constant term, $\beta_{1,\ldots\ldots}$ β_j are the coefficients to be estimated, εi is the error term and $X_1, \ldots.\ X_j$ are the explanatory variables.

The decision to comply with the EurepGap standards varies across households according to their farm and household factors. This decision is also influenced by other exogenous variables such as support services, market destinations of the product, and policies among others as illustrated in Figure 1. The compliance decision model to be estimated is specified as follows;

$$COMP_i = \alpha_0 + \sum \delta\ FM_i + \sum \varphi\ HH_i + \sum \beta\ MKT_i + \sum \gamma\ SUPSVS_i + \varepsilon_i \text{......(3.5)}$$

Where;

$COMP_i$ is the decision made by farmer *i* to comply or not, with the EurepGap standards. This takes the binary probit expression, *COMP*=1 have complied 0=otherwise.

α_0 is the constant term, δ, φ, β, and γ are the coefficient to be estimated,

FM_i is a vector of farm characteristics variables of farmer *i*,

HH_i is a vector of household characteristics of farmer *i,*

MKT_i is a vector of market characteristics variables such distance to the nearest market,

$SUPSVS_i$ is a vector of support services available to the farmer and

ε_i is the error term.

Further, since the above model is a binary response model, the marginal effects of each independent variable on the probability of an event (compliance in this case) happening can be computed (Long, 1997).

$$\text{Let: } \Pr(y = 1/x) = F(x\beta) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.6)$$

Where F is the cumulative density function for the normal distribution.

The marginal effect is computed by taking derivative of equation 3.6 with respect to X_j.

$$\frac{\partial \Pr(y = 1/x)}{\partial x_j} = \phi(x\beta)\beta_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.7)$$

Assuming that the model is linear, the marginal effects will be computed at the mean of the independent variables, such that;

$$\frac{\partial \Pr(y = 1/\bar{x})}{\partial x_j} = f(\bar{x}\beta)\beta_j \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.8)$$

The sign of the marginal effects is determined by β_j, while the magnitude depends on the values of the other variables and their coefficients. Thus in a case of binomial probit model, one cannot confirm the sign of the relationship based on the estimated coefficients until the marginal effects are computed. For this reason, the estimates are reported in marginal effects in Section 4.3.2 (see Table 15), based on which the results are interpreted and conclusions derived.

CHAPTER FOUR
RESULTS AND DISCUSSIONS

4.1 Descriptive statistics

Out of the 103 respondents interviewed, 79% had complied with EurepGap while the remainder had not. As presented in Table 2, the average age of household heads in the study area was 40.3 years while the average household size measured in number counts was 4.5 persons. The mean level of education of the household heads was 10.1 years while the average highest education level acquired by the other members of the family living permanently in the homestead was 12.2 years. This was an indication that most of the farmers are literate. About 12% of the respondent households were female-headed. The mean farming experience in years of all the farmers was 14.7 while the mean of those adopting the standards was 15.6 years. The average farm size owned and total size of land cultivated (including rented land) was 0.88 ha and 1.38 ha respectively. The sizes of land indicate that all the farmers in the study area can be classified as small-scale farmers. The average size of land under French beans was 0.69 ha while average amount of French beans produced per hectare per year was 3781.82kg. The average price of French beans was Ksh.46.20 per kilogram with maximum of Ksh.115 and minimum of Ksh.27 per kilogram. The high price differentials are influenced by demand and supply of French beans especially in the international market (Tineke, 2003).

With an average experience of 9.3 years, most of the respondents had been engaged in French bean production for a long time. The farmers whose farms were certified had longer experience in French bean production with an average of 10 years. About 64% of the respondents were members of production and marketing farmer groups with an average of 3.8 years of group membership. About 80.6% of respondents produced under market contract. The exporters enter into contracts with the farmers to produce for them certain quantities of French beans. Out of the 103 respondents, about 80% were contracted by exporters to supply their produce for an agreed period of time and at an agreed price. The average number of years of production under contract for the farmers engaging in such kind of arrangement was 3 years. Most of the farmers had been producing French beans for export with average of 7.5 years. About 47.8% of the farmers who had complied with the

EurepGap standards had actually received certificates. The average number of years these farmers had been certified was about 1.5 years. Average distances from farm to market and from farm to urban centre were 9.5km and 9.5km, respectively. About 80% of the respondents delivered their produce to a common grading shed which was on average 1.3km from the farm. The average gross income obtained from French bean production was Kshs.112, 336 while average net income was about Ksh. 40,624.

Table 2: Descriptive statistic s of selected variable

Variable	n	Mean	Std. Deviation	Min.	Max.
Age of household head (years)	103	40.34	10.367	19	70
Farming experience (years)	103	14.65	8.579	1	40.00
Level of education of household head (years)	103	10.14	3.742	3	20
Highest level of education of all members of the family living permanently in the homestead (years)	103	12.21	3.486	7	24
Total land owned (hectare)	103	0.88	1.28	0	10.37
Total land size (owned and rented, ha)	103	1.38	0.145	0.092	10.37
Total Household size in number counts	103	4.54	1.392	1.00	9.00
Area under French beans (ha)	103	0.69	0.950	0.092	4.81
Amount produced per hectare (Kgs)	103	3781.8	728.265	1362	9080
Average price of extra and fine beans (Ksh/Kg)	103	46.17	17.240	27	115
Experience in French bean production(years	103	9.29	6.034	1	27
Years of group membership	66	3.85	3.07	1	15
Years of production under contract	83	3.04	2.4	1	12
Years of export production	103	7.47	5.357	1	27
Distance from the farm to grading shed (Km)	81	1.3	0.192	0.25	9.50
Distance from the farm to market (Km)	103	9.5	2.49	0.5	15
Distance from the farm to urban centre(Km)	103	9.5	2.49	0.5	15
Number of years certified	42	1.52	0.574	0.50	3.0
Gross income obtained from French bean production (Ksh)	103	112336	135617	12500	630000
Total cost of production (Ksh)	103	71711	101454.6	7451	489030
Net income obtained from french bean production (Ksh)	103	40624	52670.50	950.00	282300

***Source*:** Author's computation using the research survey data

Results of T-test and chi-square that show comparison of selected farmer and farm characteristics between compliant and non-compliant farmers are represented in Table 3 and 4. Household sizes measured in number counts, farming experience in years, total land size under cultivation, area under French beans, total number of farm enterprises, gross income obtained from French beans production, net income and cost of production were significantly different between the two categories. All these are related to gross production of French beans. A large household for example, is expected to supply more labour as demanded by French bean production while a large number of enterprises in the farm can provide the required capital to comply with EurepGap standards.

Table 3: Comparison of quantative variables between compliant and non-compliant farmers.

Variable	t-test	Sig.(2-tailed)
Age of household head (years)	1.576	0.118*
Farming experience (years)	2.118	0.037**
Level of education of household head (years)	-0.385	0.701
Highest level of education of all members of the family living permanently in the homestead including household head (years)	0.048	0.962
Total land owned (ha)	-0.230	0.819
Total land size (owned and rented) (ha)	1.947	0.054**
Total household size in number count	2.117	0.037**
Area under French beans (ha)	2.504	0.014**
Amount of French beans produced per acre (Kg)	2.512	0.546
Average price of extra and fine beans sold (Ksh)	-2.569	0.12
Experience in French bean production (yrs)	2.098	0.038**
Experience in export production (yrs)	1.501	0.136
Total distance from the farm to urban centre (KM)	1.019	0.31
Total distance from the farm to the nearest market (KM)	1.019	0.31
Total number of farm enterprises	3.368	0.001***
Gross income obtained from French bean production (Ksh)	2.374	0.019**
Total cost of production (Ksh)	2.438	0.017**
Net income obtained from French bean production (Ksh)	1.398	0.165

NOTE: *** Significant at the 0.01 level;** Significant at the 0.05 level; *Significance at 0.10 level. Data is coded 1-Compliant and 0-otherwise (non-compliant)
Source: Author's computation

The results suggested that EurepGap compliant farmers had significantly larger sizes of land under French beans, more years of export production and higher levels of

gross and net incomes obtained from French beans production. High percentage of farmers complying with EurepGap standards produced under contract and received constant prices which are fixed at the beginning of each season. The non-certified farmers who sold their produce mostly through brokers received higher or lower prices than the other farmers depending on market forces.

Table 4: Comparison of qualitative variables between compliant and non-compliant farmers.

Variable	EurepGap standards compliant (n=81)	EurepGap standards non-compliant (n=22)	Chi-square	P-Value
	%	%		
Earning extra Income				
Yes	64.2	54.5	2.537*	0.111
No	35.8	45.5		
Gender of household head				
Female	12.3	9.1	0.1781	0.673
Male	87.7	90.9		
Extension Contract				
Yes	82.7	36.4	3.750 **	0.053
No	17.3	63.6		
PMOs Group membership				
Yes	81.5	0.0	49.902***	0.000
No	18.5	100.0		
EurepGap training				
Yes	100.0	13.6	85.778***	0.000
No	0.0	86.4		
Contract farming				
Yes	98.8	13.6	80.130***	0.000
No	1.2	86.4		
Member of Water Organization				
Yes	85.2	81.8	0.150	0.699
No	14.8	18.2		
Buyer of the produce				
Exporter	97.5	13.6	75.020***	0.000
Broker	2.5	86.4		
Credit provision				
Yes	24.7	0.0	6.741**	0.009
No	75.3	100.0		

***Significance at the 0.01 level;** Significance at the 0.05 level; *Significance at the 0.10 level.

Source: Author's computation

From Table 4, it is evident that compliance with EurepGap was highly associated with extension contract, membership of PMOs, EurepGap training, contract farming, and access to credit. Out of the 81 respondents who had complied, 81.5% belonged to a group, 82.7% had received extension contract, 98.8% were producing under contract and 97.5% were selling their produce directly to exporters. All the compliant farmers had received training on EurepGap standards. Most farmers in the study area reported that they did not have much access to financial credit but received credit mainly in form of inputs. The source of credit was mainly from the exporters contracting the farmers or from input suppliers from whom the farmers purchased their inputs. There was no significant difference between compliant and non-compliant farmers in terms of access to extra income, gender and membership of water organization.

4.1.1 Awareness of EurepGap requirements

Table 5: Awareness of EurepGap requirements

EurepGap item	% Sample aware (N=103)	% Compliant aware (n=81)	% Non-Compliant aware (n=22)
Traceability	78.6	97.5	9.1
Record keeping and internal inspection	86.4	100.0	36.4
Site management (soil maps for the farm)	76.7	96.3	4.5
Risk assessment	77.7	97.5	4.5
Laboratory analysis	77.7	97.5	4.5
Technical services	77.7	97.5	4.5
Soil and substrate management	79.6	98.8	9.1
Fertilizer use	84.5	100.0	27.3
Crop protection	88.3	100.0	45.5
Irrigation/ fertigation	84.5	100.0	27.3
Harvesting	85.4	100.0	31.8
Produce handling	86.4	100.0	36.4
Waste and pollution management, recycling and re-use	79.6	97.5	13.6
Worker health, safety and welfare	82.5	98.8	22.7
Environment issues	80.6	97.5	18.2
Certification	83.5	100.0	22.7

Source: Author's computation

Table 5 shows the percentages of the respondents who were aware about different aspects of EurepGap requirements. Further it distinguishes the respondents in categories of those who were aware and had complied and those who were aware but had not complied. For example, out of the 103 respondents, about 78.6% were aware about traceability component of the standards. Out of 81 respondents who had complied, about 97.5% were aware about this component while only 9.1% of the non-compliant respondents were aware about the same item.

The results generally shows that majority of the respondents in the study area were aware about the various aspects of the EurepGap standards. The analysis however shows there is an information gap about the standards especially among the non-compliant farmers. It is also evident that some compliant farmers were not informed about all the aspects of these standards showing the complexity of these standards among the smallholder farmers. Most of this information came from the exporters through training of their contracted farmers. Others sources included: exporters, government extension workers, Horticultural Crops Development Agency (HCDA) and Kenya Horticultural Development Programme (KHDP).

4.1.2 Farmer's views on EurepGap contributions

Benefits/positive views of EurepGap standards

Table 6: Positive views of EurepGap standards

	% among the compliant (n=81)
Improved farm hygiene	70.4
Improved human hygiene and health of the farmer	38.3
Proper/safe chemical handling	37.0
Good farm management	27.2
Improved standards of working environment	14.8
Assured market of their produce	14.8
Proper record keeping	9.9
Rational use of inputs	2.5
Bulk purchasing of inputs and equipments	1.2
Correct produce weighing machines	1.2
Assured payment of produce	1.2
Assured produce collection	1.2
Job opportunities	2.5
Proper crop handling	3.7

Source: Author's computation

Farmers noted that the EurepGap standards had contributed positively in various aspects as illustrated in Table 6. From the results, it is clear that farmers are enjoying the non-financial benefits associated with these standards. About 70.4% noted that the standards had contributed to improved farm hygiene. About 37% were of the view that the skills gained from training on the standards had contributed to safe handling of chemicals as well as improved human hygiene and health of both the farmer and the workers. About 27.2% of the farmers complying with the EurepGap standards were of the view that their farm management skills had improved. About 14% of the farmers pointed out that compliance with EurepGap standards assured them of a ready market for their produce. Other positive contributions of the standards included skills on proper record keeping, rational use the farm inputs, bulk purchasing of inputs and equipments hence reducing per unit cost incurred by each farmer, safe handling of crops leading to reduced product rejects and improved quality of the produce. Indirectly, the standards also contributed to job opportunities to field supervisors, graders, secretaries and other support personnel employed to foresee the success of compliance process.

Negative views of EurepGap standards

Despite the positive contributions, the farmers also pointed out some negative views on the standards as given in Table 7.

Table 7: Negative views of EurepGap standards

	% among the compliant (n=81)
High cost of implementation	44.4
No price premiums	28.4
Low returns due to high cost of maintenance	13.6
Low prices of produces	11.1
High produce rejects	6.2
High cost of farming inputs	4.9
Inefficient chemicals	8.6
Unrealistic conditions such as restriction on mixed cropping	4.9
High cost of labour involved	3.7
A lot of time required for training	8.6
Lack of consistency i.e. change with time	1.2

Source: Author's computation

The results shown in Table 7 generally show that there were very few complaints about the standards. The major complaint was high cost of implementation reported by about 44% of the compliant farmers. In some cases some farmers were reported to have dropped out from the farmer groups since they could not be able to raise the money required for compliance. This was followed by lack of price premiums for compliance with about 28%, low returns due to high cost of maintenance with about 13% and incidences of reduced prices of produce with 11%. From key informants' interviews, it was noted that efforts of compliance were not rewarded. Other minor negative views about the standards included high produce rejects, high cost of involved labour, inefficient farm chemicals and non-consistency of the standards.

4.1.3 Constraints encountered in compliance with EurepGap standards

Farmers experienced various constraints at various stages of complying with the standards. Table 8 shows the constraints encountered at the initial stages of compliance while Table 9 shows constraints experienced in maintaining these standards. Constraints that have lead to non- compliance are given in Table 10.

Table 8: Constraints encountered during EurepGap certification process.

	% among the compliant (n=81)
Lack if finances/high cost of constructing buildings	49.4
Complex conditions which were difficult to understand	22.2
Unrealistic conditions	2.5
Lack of training time	8.6

Source: Author's computation

As shown in Table 8, the major constraint encountered during certification process was lack of finances in constructing the required buildings and facilities at the initial stages of compliance reported by about 49% of those who had complied. This was followed by complexity of the standards hence difficult to understand and to apply reported by about 22%. Other minor constraints included unrealistic requirements such as monocropping especially because of the small sizes of their land, and lack of training time.

Table 9: Constraints encountered in maintaining EurepGap certification.

	% among the compliant (n=81)
High cost of paying involved labour	19.8
Low prices that do not pay the cost of implementation	12.3
Time consuming	9.9
Poor quality of produce	8.6
High cost of farm inputs raising cost of production	7.4
Information barrier	2.5
Low production hence little returns	3.7
High rate of pests and diseases attack	4.9

Source: Author's computation

As shown in Table 9, the major constraint of maintaining EurepGap standards was pointed out as high cost of paying involved labour as reported by 19.8% of the compliant farmers as shown in Table 9. The involved labour included produce graders, field supervisors, chemical sprayers and clerks. About 12% complained that the prices of their produce were still very low to pay for the cost of implementation. Other minor complaints included poor quality of produce, high cost of recommended inputs, low production hence little returns and high rate of pests and disease attacks. Some farmers complained that the recommended chemicals were not as efficient as what they used before, this resulted to high rates pest and disease attack leading to high levels of rejects or in some cases total loss of the produce.

Table 10: Constraints hindering complying with the EurepGap standards

	% among the non-compliant(n=**2**1)
Lack of finances for constructing required facilities	100.0
High cost of involved labour	66.7
Lack of information about the standards	66.7
High pest and diseases affecting returns	47.6
Lack of finances to carry out auditing and training	42.9
Complex conditions which are difficult to implement	47.6
Low prices of produce	33.3
Low production hence low returns	28.6
Lack of time required for trainings	14.3
Lack of technical assistance	9.5

Source: Author's computation

Table 10 shows that, all the farmers who had not complied with the standards pointed out lack of finances for constructing required facilities as the major constraint. Some

farmers had been forced to pull out from contract farming where they are required to comply due to lack of finances. The other major constraints reported by about 66% of the no-compliant farmers were high cost of involved labour which was difficult to raise and lack of information about these standards. About 47% complained that the complexity of the standards making them difficult to implement while a similar percent complained that their returns had been affected by high pests and diseases attacks. Other constraints reported included, low prices of the produce, low production, and lack of time to attend the rigorous training.

4.1.4 Cost of compliance with EurepGap requirements

Tables 11 and 12 illustrate the additional cost of compliance incurred per year by the farmers. Table 11 shows the costs incurred by an independent individual farmer while Table 12 shows costs incurred by a farmer in a group of 30 members. The Tables show the standard's cost categories, total amount spent by the farmer on each category, percentage of total cost of each cost item, and the cost distribution.

Table 11: Distribution of the additional costs of compliance for independent individual farmers

Cost Category	Total cost/farmer	% of total cost	Contribution	
			Farmer	Others(Exporter(s) or NGO(s))
Buildings and facilities	85,375	44.1	34,150	51,225
Equipments (such as sprayers e.t.c)	2,660	1.4	2,660	-
Needs assessment	2,715	1.4	-	2,715
Technical assistance/service	1,300	0.7	-	1,300
Protective gears	3,200	1.7	3,200	-
Inputs used	4,500	2.3	4,500	-
Initial auditing	3,810	2.0	-	3,810
Certification/external auditing	6,000	3.1	-	6,000
Record keeping	36,000	18.6	36,000	-
Other additional costs	48,000	24.8	48,000	-
Total Cost (Ksh)	**193,560**		**128,510.0**	**65,050**
Total Cost (US$)	**2,765.14**		**1,835.86**	**929.29**

Source: Author's computation

Table 12: Distribution of the additional costs of compliance for group of farmers

Cost Category	Total (30 farmers)	Total per farmer	% of total cost	Contribution		
				By 30 Farmers	Contribution per farmer	Others (Exporter(s) or NGO(s))
Buildings and facilities	1,013,328	33,778	59.3	1,013,328	33,778	-
Equipments (such as sprayers e.t.c)	80,280	2,676	4.7	80,280	2,676	-
Needs assessment	81,000	2,700	4.7	-	-	81000
Technical assistance/service	33,000	1,100	1.9	-	-	33000
Protective gears	52,540	1,751	3.1	52,540	1,751	-
Inputs used	90,000	3,000	5.3	90,000	3,000	-
Initial auditing	94,654	3,155	5.5	-	-	94,654
Certification/external auditing	71,192	2,373	4.2	-	-	71,192
Record keeping	120,000	4,000	7	120,000	4,000	-
Other additional costs	72,000	2,400	4.2	72,000	2,400	-
Total Cost (Ksh)	**1,707,994**	56,933		**1,428,148**	**47,605**	**279846**
Total Cost (US$)	**24,399.91**	813		**20,402**	**680**	**3,997.80**

Source: Author's computation

From Table 11, a certified individual farmer used approximately Ksh.85, 375 to set up required buildings and facilities. Farmers however contributed about 40% of the total amount of setting up the structures while the rest was contributed by either the exporters or NGO's. Farmers using group facilities however incurred lower cost of approximately Ksh.33, 778 per member in a group of about 30 members in buildings and facilities. The buildings and facilities included grading shed, chemical and fertilizer stores, toilet facilities, and irrigation station. The additional cost of compliance incurred in purchasing additional equipments costed each farmer an approximate amount of Ksh. 2,700 in either case of farmers' category. These included spraying and irrigation equipments.

From Tables 11 and 12, needs assessment process costed Ksh. 2,700. Needs assessment is a process done on the farm before the EurepGap certification process begins in order to establish the suitability of the farm being certified with the EurepGap standards. It involves a general view of the farm in terms of location, landscape, distance from water

source, farm management practices in place, type of enterprises present in the farm and other important aspects of the farm. The cost of this process in both cases of an individual or a group of farmers was paid for by other parties and not the farmer.

Another component of EurepGap compliance was the technical services such as soil and water analysis. In the study area, this process was mainly paid for by other parties and not the farmers and it costed about Ksh. 1,300 for an independent farmer and Ksh.1, 100 per farmer in an organized farmer group. To be certified with EurepGap standards, the farmers were required to purchase protective gears. These gears which included; face masks, gloves, aprons, and gumboots are meant to protect the farmers and their workers during spraying of chemicals. Other protective clothes are used during harvesting and packaging of the produce. From the study it costed each farmer an average of Ksh. 1,700 to buy these protective clothes per year. Further, to be certified, the farmers were also required to change some of the inputs from what they used before. These included; insecticides, fungicides and fertilizers. Farmers in the study area noted that the current recommended chemicals costed them much more than before, incurring an average of Ksh.1000 more. However it's not possible to conclude that this high cost has been contributed by the standards alone. Other factors such as change in prices of chemicals may have resulted to this incremental cost.

For a farm to be certified, it must undergo two major types of certification audits; internal and external audits. Auditing process is quite expensive especially to smallholder farmers. From the study, the auditing cost was paid by either the exporters or NGOs on behalf of the farmers. The internal auditing process costed an individual independent farmer about Ksh.3, 800 while external or certification audit costed about Ksh.6, 000 on a yearly basis. Internal and external auditing costed each farmer in a group Ksh 3,155 Ksh. 2, 373 respectively. This cost however may be higher or lower across different farmers contracted by different exporters or across different certification bodies.

To maintain the certificate, EurepGap standards requires that farmers should keep records of all their activities involved from land preparation to harvesting and sale of the French beans for easy traceability of the origin of the product. Such records includes; date

of planting, variety of beans planted, chemical applied, amount applied and date of application, date of harvesting and amount harvested and many other aspects. From the study area, it costed each farmer an average of Ksh.200 per year to buy the required stationeries. Independent farmers in most cases were required to hire clerks to keep their records while farmers organized in groups hired clerks jointly. The clerks hired by individual farmers were paid an average wage of Ksh.3000 per month while those hired by a group of farmers an average of Kshs.4000 per month. Farmers organized in a group therefore incurred less cost of about Kshs.150 per farmer per month.

Other additional cost of compliance with EurepGap standards included cost of hiring other staff members including graders and field supervisors. Each of these additional staff members was paid an average of Ksh.4000 per month, costing each farmer Kshs.300 per month in a group of 30 members. In addition to the information provided in Tables 12 and 13, it was found out that every member of a farmers' group was required to contribute Kshs.3 per kilogram of French bean sold at any given time. This money was used for maintenance of the buildings and other facilities, equipments, replacement of jointly owned protective clothes and any other maintenance cost required to retain the certificate. Further internal audits must be done on a yearly basis to ensure that farmers keep to the required standards. The cost of this continuous auditing just like the initial auditing was paid for by the exporters or other supporting NGOs.

The total additional costs of compliance as given in Tables 11 and 12 per year, for an independent farmer and for a farmer in a group were Ksh.128, 510 and Ksh.47, 605 respectively. Independent farmers incurred about 162% more than farmers organized in a group. From the above analysis, it can be concluded that smallholder farmers are well off when organized in farmer groups in terms of complying with EurepGap standards.

4.2 Effect of EurepGap standards on profitability

Analysis of a partial budget was able to answer the second hypothesis of whether compliance with EurepGap standards had any influence on the profitability of the farming business. The analysis was done with the assumption that only the cost of compliance influences profits of the business, holding all other factors constant.

The partial budget was divided into three sections; the added returns, the added costs and the net change in returns. All the calculations were done per hectare per year. The added returns were calculated as amount produced in kilograms per hectare multiplied by positive changes in sale price while reduced returns equal to amount produced per hectare multiplied by negative changes in sale prices.

Table 13: Partial buget describing the change in profitability with compliance of EurepGap standards

A. Added returns	**Ksh.**	**Ksh.**
1. Average added returns(per ha per year)		
Average amount produced (Kg) per hectare * average positive change sale in prices	**34701.7**	
2. Average Reduced costs (per ha per year)		
Reduced cost of inputs used	**2359.4**	
Total added returns(added returns + reduced costs)		**37061.1**
B. Added costs		
1. Average reduced returns(per ha per year)		
Average amount produced (Kg) per hectare * average negative change in sale prices	**1920.00**	
2. Average added costs (per ha per year)		
Recurring costs of buildings and facilities	15488.84	
Recurring costs of equipments	1749.26	
Recurring costs of technical assistance/service	466.67	
Recurring costs of protective clothes	838.27	
Recurring costs of certification/external audit	17189.51	
Recurring costs of record keeping	1191.98	
Recurring costs of input used	4902.81	
Other additional recurring costs	1388.90	
Total	**43216.24**	
Total added costs(reduced returns +added costs)		**45136.24**
C. Net change in Return (A-B)		
Net Rate of Return		**-8075.14**
D. Breakeven Analysis		
Price of product per unit sold	43.95	
Number of Kgs required to pay added costs (B/D)	1026.99	
E. Comments; The above analysis shows a negative rate of return indicting that the change is not profitable		

Source: Author's computation

In the costs section, reduced cost equal to the reduced costs as a result of compliance divided by area under french beans. The reduced costs were mainly as a result of change of inputs such as fertilizers and other chemicals. Added costs equal to recurring costs as a result of compliance divided by the area under French beans. Recurring costs included cost of maintaining buildings and facilities, equipments and protective clothes, recurring cost of technical assistance, inputs, annual external auditing and record keeping.

From Table 13, average returns of Ksh.34701.70 were realized from compliance with EurepGap standards. Some farmers reported that sale prices of their produce had increased since they started complying with EurepGap standards. The differential increase in prices multiplied by average amount of French beans produced per hectare resulted to added returns. In some cases, though few cases, farmers reported that their costs had reduced especially cost of the inputs (fertilizers, seeds, pesticides and other chemicals). On average the total reduced costs were Ksh.2359.40. Reduced returns were reported in a few cases where prices of the produce were reported to have dropped. Average reduced returns were Ksh. 1920. Complying with EurepGap requirements required high cash outlays. On average added costs incurred from compliance was given as Ksh. 43,216.24. Overall, there was a negative change in returns which was calculated as the difference between total added returns and total added costs amounting to Ksh. 8075.14.

Farmers adopt a technology in order to raise their profit or for easy access of market for their products. Compliance with EurepGap standards requires high initial cash outlays which is a major hurdle to the small scale farmers. It takes smallholder farmers some years to recover this cost. In the study area it was noted that small scale farmers complying with these standards had not started to realize the benefit of compliance. They complained that the compliance efforts were not paying as they expected. Therefore in the short run, the farmers did not earn any profit but rather recovering the cost they invested in setting up the required structures. The observation was that the farmers are complying with these standards to improve market access for their produce. Compliant farmers had higher chances of being contracted than non-compliant farmers, as such they enjoyed constant prices which are set at the beginning of the season and are assured of the market of their produce throughout the year.

Analysis of the partial budget showed negative rate of return. From the findings, the main aim of compliance was mainly market assurance and not improvement of profit. However since this was a static study, a dynamic cost-benefit analysis is necessary to determine whether compliance is related to profits. The observation made was that compliant farmers may have a better bargaining position for the prices of their produce than the non-compliant farmers, hence a possibility of earning profits after recovering the initial costs of compliance.

4.3 Assessment of factors influencing compliance

4.3.1 Choice of explanatory variables used in the model

The variables used in model were generated from literature review, theoretical information and through correlation matrices. The results of the correlation matrices generated are given as Appendix 2, where correlation between two variables was above 0.6, one variable was dropped. This was not without considering the importance of a variable in the context of the horticultural sub-sector as generated from literature, for example, education of the household head and the highest education of other members living permanently in the homestead. From literature, educated farmers are found to be able to process information and search for appropriate technologies to alleviate their production and marketing constraints than uneducated farmers (Feder and Slade, 1994). It is believed that education gives farmers the ability to perceive, interpret and respond to new information much faster than their counterparts without education. The highest education of other household members living within the homestead is also expected to influence the decision of a farmer or household head to adopt a new technology. A study by Asfaw (2007) on EurepGap standard shows that more educated farmers are more likely to adopt EurepGap standards than less educated ones. Education of household head as well as the highest education of other household members living within the homestead does not significantly differ between the compliant and non-complaint farmers. These two levels of education had a high correlation; hence, the highest education of other household members living within the homestead was dropped from the model though important in determining the compliance decision of a farmer.

Total area under French beans was highly correlated to gross income obtained from French beans production and also correlated to the total cost of production. It is expected that the larger the area under French beans production, the higher the gross income as well as the cost of production. As such gross income was dropped from the model and instead area under french beans was used.

Gender of the household is an important variable in the horticultural industry. The industry is mainly associated with women and children since it is labour intensive hence inclusion of this variable in the model. Horticultural farming just like most of buyer-driven commodity chains is labour-intensive, with women frequently comprising the majority of these workers (Dolan and Sutherland, 2003). It was therefore expected that the female headed household had high probability of complying with the standards than the male headed households.

The size of the family was also included in the model as an important factor that would positively influence labour supply required in French beans production. A large family is expected to supply sufficient labour as demanded in the horticultural production hence high probability of compliance.

Experience in French beans production is expected to influence farmers' decision to comply with EurepGap standards. It was expected that farmers who have long experience in French bean production are willing to take risk by complying with food standards such as EurepGap with an aim of improving their earnings from their business.

Contract farming is argued to be a key factor that contributes to adoption of international food standards (Okello, 2005). The contractors who are usually the exporters were noted to be contributing highly towards setting up the required facilities on behalf of the farmers. Further the contractors hire the field supervisors/advisors, source chemicals on behalf of the farmers, pay for farmer's training, collect the produce from farmers and extend other services that assist the farmers in compliance with the standards. From the study, it was observed that almost all farmers who had adopted the standards were contracted by exporters. Non-compliant farmers on the other hand sold their produce

mostly to the brokers who were not concerned about any food standards like EurepGap. Contract farming was therefore considered as an endogenous variable though a key determinant of the farmers' decisions to comply with the standards.

The buyer of the product also determines the decision of a farmer to comply with the standards. This variable was not also included in the model since majority of the compliant farmers sold their produce to exporters while almost all non-compliant sold to brokers. From the study, it was observed that exporters demand certified products while brokers do not. This depends on the market destinations targeted by these two buyers. Most of the exporters target the European countries' retailers who require that the products imported to their countries are certified with EurepGap standards. On the other hand, brokers mostly supply to other exporters who sell their produce in other market destinations such as Dubai where such standards are not required (HCDA, 2003). Other variables included in the model include experience in French bean production, access to extension training, access to off-farm income, membership to a water organization and number of farm enterprises.

The variables and their expected signs are presented in Table 14.

Table 14: Description of variables and their expected signs

Variable symbol	***Description***	***Expected signs***
hhgender	Gender of the household head (1=Male, 0= Female)	+
edu1	Education of household head (number of years of schooling)	+
arefre	Area under French beans (ha)	+
yrsfrbnprd	Experience in French bean production (years)	+
totdistfmkt	Total distance from farm to the market (KM)	-
extseraccsdmy	Dummy variable for extension training received in the last12 months(1=Yes, 0=No)	+
hsehldsiz	Household size in number counts (no.)	+
watrorgmemr	Dummy variable for membership of a water organization (1=Yes, 0=No)	+
extraincm	Dummy for access to off-farm income (1=Yes, 0=No)	+
totentr	Total number of farm enterprises	+

Source: Variables determined by the Author

4.3.2 Binomial probit model results

A binomial probit model was estimated to investigate the factors that influence the decision of the farmers to comply or not to comply with EurepGap standards. Hypothesis testing was conducted and results presented.

The results of the binomial probit model are presented in Table 15. The dependent variable is a dummy variable with two categories of choices, 1 if the farmer is compliant with the EurepGap standards and 0 otherwise. The results show the marginal effects of the independent variables, standard error, and Z and P values. `

Table 15: Maximum likelihood probit model estimates for EurepGap adoption in Kenya

Variable	Marginal effects	Standard Error	z	P>|z|
hhgender (*)	0.056689	0.061655	1.1	0.273
edu1	0.0024278	0.005217	0.5	0.62
arefre	0.0480072*	0.022096	1.8	0.067
yrsfrbnprd	0.0009221	0.00288	0.32	0.752
totdistfmkt	0.0053916	0.004247	1.52	0.129
extseraccsdmy (*)	0.1689305**	0.126823	2.44	0.015
hsehldsiz	0.0144596	0.016775	1.12	0.264
watrorgmemr (*)	-0.0174203	0.039436	-0.38	0.705
extraincm (*)	-0.0782011*	0.062021	-1.83	0.067
totentr	0.0498692***	0.03681	2.81	0.005
constant			-2.72	0.007
LR chi² (10) = 40.53		Log likelihood = -33.157012		
Prob > chi² = 0.0000		Pseudo R² = 0.3794		
Observed Probability. 0.7864078				
Predicted Probability. 0.9624919 (at x-bar)				
(*) dF/dx is for discrete change of dummy variable from 0 to 1				
z and P>|z| correspond to the test of the underlying coefficient being 0				

***Significance at the 0.01 level;** Significance at the 0.05 level; *Significance at the 0.10 level.

Source: Author's computation

From Table 15, cultivated area under French beans, access to extension training, access to off-farm income and total number of farm enterprises owned by the farmer had significant influence on farmer decision to comply with the EurepGap standards. Other

variables such as gender and education of household head, household size, experience in French bean production, distance to the nearest market and water organization membership were not significant.

As expected gender and age of the household head, total area under french beans, access to extension services, total number of farm enterprises owned by the farmer, household size and experience in French bean production, were positively associated with the decision of the farmer to comply with EurepGap standards. However, against the prior expectation, access to off-farm income and water organization membership were negatively associated with the compliance decision of the farmer. Total distance from farm to the market was found to be positively associated with the decision of a farmer to comply contrary to the expected outcome.

4.3.3 Discussion of model results

This sub-section discusses hypothesis 1 as stated in Section 1.4. The hypothesis states that, "Farm and household characteristics do not influence compliance with EurepGap standards". Farm characteristics in this study included variables such as; area under french beans, number of farm enterprises, access to off-farm income and experience in French bean production. Household characteristics on the other hand included; age, gender and education of the household head and household size.

Results of marginal effects in Table 15 show that, as total farm area under French bean increases, the probability of compliance increases as prior predicted. Increase of land by one hectare increases the probability of compliance by 5%. Farmers with large farms under French beans production are likely to comply than those producing in small pieces of land. The variable was significant at 95% confidence interval, therefore does not agree with the null hypothesis.

Access to off-farm income, contrary to the priori expectation was found to be negatively associated with decision of the farmer to comply. Access to off-farm income reduces the probability of compliance by 7%. The variable was significant at 90% confidence interval hence rejects the null hypothesis. This was contrary to Okello (2005)

findings that extra income should act as a catalyst to compliance where farmers can access the capital required to set up the necessary facilities. From the study area, it was observed that farmers engaged in other non-farm businesses did not pay much attention to the farming business. They considered farming as a second alternative source of income and hence unwilling to comply with the standards.

Access to extension training had a positive influence on the decision of the farmer to comply with EurepGap standards and significant at 95% confidence interval. Exposure to information reduces subjective uncertainty and therefore increases the likelihood of adoption of a new technology. One approach used to capture the impact of information was to determine whether a farmer had access to extension training in a given time. Access to extension training increased the probability of complying with the standards by 16%. It is most likely that farmers who had received extension services were more informed and hence had higher chances of complying with EurepGap standards than their counterparts. The results agree with Okello (2005), who found out that access to extension services increases the likelihood of adoption of international food standards among small-scale farmers. The null hypothesis was therefore rejected at 5% level of significance.

Increase in the number of farm enterprises by one increased the probability of compliance by 4%. The results show a positive influence to the decision of the farmer as prior expected and the variable was significant at 99% confidence. To spread the uncertainties and risks involved in the agricultural industry, farmers invest in more than one enterprise. In the study area for example, other crops such as tomatoes, rice, maize, bananas, and beans and livestock were common. This variable does not agree with the null hypothesis.

The study identified other important factors that influence compliance in the study area which were not however tested in the model. These factors included; availability of support services such as capital to set-up the required structures and the total cost of compliance. Most of the farmers in the study area complained that the initial cost of compliance was too high. They noted that some farmers had to drop from group membership due to lack of money required to start the initial process of certification. Other

farmers complained that the certification process had drained all their savings to the extent that they had to sell-off their assets to raise the required cash for the compliance process. It was therefore evident that the total cost of compliance is a key determinant of the probability of compliance with EurepGap standards. It was found out that all the farmers who had complied with the standards had received support through various ways including trainings, advice, finances among others.

CHAPTER FIVE
CONCLUSIONS AND RECOMMEDATIONS

5.1 Conclusions

The study assessed the level of awareness of the EurepGap among the smallholder farmers, identified the costs associated with compliance with these standards, determined the implications of these costs on profitability of French bean production and also identified the critical factors affecting compliance. Further, the study identified positive and negative contributions of these standards and the constraints associated with compliance.

It was evident that most of the farmers are aware of the standards. Most of this information however comes from the exporters through training of their contracted farmers. It was also evident that majority of the farmers who have not complied with the standards are not informed about the standards. Results also show that though some farmers have complied with the standards, they do not know all their requirements.

The results of the study reveal that certification with EurepGap standards require high cost of investment in buildings and facilities as well as high cost of maintenance. These costs are a major hurdle to the smallholder farmers who cannot afford to pay from their own savings unless they are assisted to do so by other parties such as NGO's, exporters, among others.

The empirical analysis of factors influencing compliance revealed that compliance with the standards is positively influenced by farm and household characteristics such as area under french beans, total number of farm enterprises and availability of external support from extension services, but negatively influenced by access to off-farm income. Availability of capital required for the high cost of compliance was pointed out as the major constraint of compliance. In some cases some farmers were reported to have dropped out of farmer groups since they could not be able to raise the money required for compliance. It was noted that cost sharing in groups through construction of common facilities such as grading sheds, chemical stores, offices and hiring of common personnel such as graders, clerks, field supervisors and spraying team reduces the cost of compliance

making it easy for the smallholder farmers. This shows the importance of group membership in determining compliance with the standards.

Apart from the cost hurdle, the farmers pointed out other constraints such as; complex and unrealistic requirements, increased cost of hiring extra personnel, low prices of produce despite the tedious efforts of compliance, high cost of the recommended chemicals and fertilizers and reduced quality of produce and high attack of pests and diseases. The farmers however noted that the EurepGap standards had contributed to non-financial benefits such as; improved farm and human hygiene, good farm management skills, and knowledge on record keeping. Particularly, the skills on record keeping were recognized because they could help them keep track of their farming business hence making rational decisions on where or whom to sell their produce.

Compliance with EurepGap standards in the short run is not triggered by profit but by product acceptance in the market. Most farmers noted that despite the compliance efforts, prices of their produce had not changed. Most of them expected that certification with the standards would result to high prices and hence high profits. For assured and continued market, the farmers had to comply with the standards. In the long run however, the farmers might be able to earn high profit after recovering the initial cost of compliance.

5.2 Recommendations and policy implications

If small-scale farmers want to stay in business, they must comply with the EurepGap standards and any other required standards to continue exporting in the lucrative markets. Certain things however need to be improved for the smallholder farmers to adopt these standards. For example, since extension training plays an important role to compliance, the government should lead in dissemination of information on the existence and importance of the EurepGap standards. Besides, farmers should be encouraged and organized to form groups to be able to comply. They should also be assisted financially at the initial stages in setting up the required structures and facilities. Most of the farmers have been assisted by the exporters and NGOs to attain certification levels and to maintain the standards. The question is, if the exporters and the NGOs withdraw their assistance, can the farmers maintain their current status of certification? The stakeholders in French

bean sub-sector should come up with a policy that would help farmers to maintain this status and also assist those who have not been able to comply.

Most farmers complained that the prices of their produce remained the same even after certification. This calls for the need of a policy that would ensure that the right market prices are translated to the farmers who put tireless efforts in the compliance process.

5.3 Suggestions for further research

The study focused on the profitability impacts of compliance with EurepGap standards among other objectives without looking at the possibility of exploring other less strict market for small holder farmers. There is a need to explore other market destinations which do not require strict requirements such as EurepGap that are very expensive to meet for the small holder farmers. There is also a need to explore the possibility of linking farmers directly to the wholesalers in the importing countries. By elimination of the exporter or any other middlemen, the prices received by the farmers would improve. There is a need to explore whether compliance is really for market assurance or for profits enhancement. Finally, there is a need for a dynamic study to analyze the effect of EurepGap standards on profitability of the French bean farming.

REFERENCES

Andersen, M. and Somaribas, O., (2003). Producers' experiences of standard implementation and cost-benefits of certification. Case-study with the Del Oro Group, Costa Rica. Presentation given at the Third Expert Meeting on socially and Environmentally Responsible Horticulture Production and Trade. Nüremberg, Germany, 16 February 2003. Available at: http://www.fao.org/organicag/doc/meeting160203.htm

Antle, J. M., (1995), Choice and Efficiency in Food Safety Policy. Washington, DC: American Enterprise Institute.

Aloui, O., and Kenny, L., (2005). The Cost of Compliance with SPS standards for Moroccan Exports: A case Study. The International Bank for Reconstruction and Development /The World Bank.

Asfew, S., (2006), Economic Impact of Food Safety Standards on Smallholder Fresh Export Produce in Kenya: Linking Contract Farming, Farmer Health and Rural Poverty. PhD thesis, Development and Agricultural Economics, University of Hannover, Germany.

Charlotte, Y. and Fairman, R., (2003). Factors affecting food safety compliance within small and medium-sized enterprises: Implications for regulatory and enforcement strategies. Centre for Risk Management, King'sCollege London, London WC2 2LS, UK.

District Agricultural Officer (DAO), Kerugoya, (1996).

Discussion articles posted on "www.maison-de-stuff.net/archives" on Supermarkets FKAB feldt Consulting. (2001), "Sector Study of the Horticultural Export Sector in Kenya", A Study made on behalf of USAID, Kenya.

Dolan, C., Humprey, J. and Harris-Pascal, C. (2002). "Horticulture Commodity Chains: The Impact of the UK Market on the African Fresh Vegetable Industry". *IDS* Working Paper 96.

Dolan, C. and Humphrey, J., (2000). Governance and trade in fresh vegetables: The impact of UK supermarkets on the African horticultural industry. *Journal of Development Studies* 37 (2): 147-176

Dolan, C., and Sutherland, K., (2003), Gender and Employment in the Kenya Horticulture Value Chain. Discussion Paper 8. Department for International Development's Globalization and Poverty Research Programme. University of East Anglia, U.K**.**

Export Processing Zone Authority (EPZA) report on Horticulture Industry in Kenya, (2005).Report prepared by International Research Network(Nairobi, Kenya) and PKF Consulting Ltd (Nairobi, Kenya)

EUREPGAP –General Regulations Fruits and Vegetables. Version 1.1 and Version 2 .1 –Jan 2004. http://www.eurep.org. November 1, 2006

EUREPGAP Protocal for Fresh Fruit and Vegetables Version Sep 2001. http://www.eurep.org. November 1, 2006.

Feder, G., Slade, R., (1994). The acquisition of information and the adoption of new technology. American Journal of Agricultural Economics 66 (2):312-320.

Freidberg, S., (2004), French Beans and Food Scares: Culture and Commerce in an Anxious Age. New York: Oxford University Press.

FICCI (Federation of Indian Chambers of Commerce and Industry), (2006),Survey report on 'High Cost of Standard Compliance Making Exports to EU Difficult, NEW DELHI.

Giac,T.P, T., Thanh, G.L., and Thuc, T., (2006). Reflecting National Conditions and Development Priorities under the Benchmarking option – Results of country on Vietnam Nong Lam University – Vietnam.

Graffham, A., and Vorley, B., (2005), Standard Compliance, "Experience of impact of EU private and public sector standards, on fresh produce growers and exporters in Sub-Saharan Africa".Informal Seminar, EU-Brassels, December, 7th, 2005.

Graffham, A. (2006). "European Standards affect African growers". Developing country Initiative, Pesticide News 71 March 2006. Contributed paper for Fresh Insights on Small-scale producers and standards in agrifood supply chains.

Greene, H.W., (2004) Econometric Analysis 5th Edition. McGraw-Hill, New York University

Guenther, D., (2006). Building up an Internal Control System (ICS)for Certification to EUREPGAP Option 2 in the Horticultural Sector. Trade Standards Working Group Meeting March 2-3, 2006- Washington.

Gurajarati, D.N., (2004), Basic Econometrics, 4th Edition. McGraw-Hill, New York, U.K.

HCDA-Horticultural Crops Development Authority- "Export statistics in volumes and values for fresh fruits, flowers and vegetables for the year 2007 in Kenya.

HCDA - Horticultural Crops Development Authority - "Horticulture export performance, 2002." *Horticultural News*, Issue No. 28: p. 5-6 (2003).

Jaffee, S., (2003). From challenge to opportunity: "The transformation of the Kenyan fresh vegetable trade in the context of emerging food safety and other standards". PREM Trade Unit. Washington, D.C.: World Bank

Larcher, A., (2005). "Cost of Agro-food Safety and SPS compliance: United Republic of Tanzania, Mozambique and Guinea Tropical fruit". United Nations Conference on Trade and Development, Geneva, February, 2005.

Long, J. S. (1997), Regression Models for Categorical and Limited Dependent Variables. New Delhi: Sage Publications, Inc.

Lutz, C.H.M. (1994). The functioning of the maize market in Benin: spatial and temporal arbitrage on the market of a staple food crop, PhD Thesis, Amsterdam, University of Amsterdam.

McCulloch, N. and Ota, M., (2002). Export horticulture and poverty in Kenya. Working Paper 174. Sussex, U.K.: Institute for Development Studies.

Mutuku, M., Tschirley, D., and Michel, T.W., (2004). "Improving Kenya's Domestic Horticultural Production and Marketing Systems: Current Competitiveness, Forces of Change, and Challenges for the future." Volume II. Horticultural Marketing. Tegemeo Institute of Agrictural Policy and Development, Working Paper No. 08B/2004

Mausch. K, Dagmar, M., D., Asfaw, S. and Waibel, H., (2006). Impact of EurepGap Standard in Kenya: Comparing Smallholders to Large-scale Vegetable Producers . University of Bonn, October 11-13, 2006 Conference on International Agricultural Research for Development.

Minot, N., and Ngigi, M., (2004). "Are horticultural Exports a Replicable Success Story?" Evidence from Kenya and Cote'devoire'. EPTD Discussion Paper No. 120, and MTID Discussion Paper No. 73.International Food Policy Research Institute, U.S.A.

Mussa, Vossenaar, and Waniala, (2003). Strengthening Developing Countries' Capacities to Respond to Health, Sanitary and Environmental Requirements. The Experience of Kenya, Mozambique, Tanzania and Uganda. Paper No.4. United Nations Conference on Trade and Development.

Muaz, S., Jabarin, A., Assaf, L., Sahawneh, M., AL-Rwadan, O., Allam, H., Assi, N., Hamdam, M., and Al-Hindi, A., (2005), An Economic Analysis of Food Safety Standards and Its Implication on Agricultural Trade in the Context of EU-MED Partnership "The Case of SPS Standards and EUREPGAP Requirements" Femise Research Programme, Royal Scientific Society, Jordan.

Nassiuma, D.K. (2000). *Survey Sampling: Theory and Methods.* Nairobi: Nairobi University Press.

New Agriculturist, (2005). "Bridging the EurepGap" Contibution paper to reporting Agriculture for the 21st Centaury, January 2 2005. Available at: http://www.new-ag.nfo/05-1/develop/devol.html.

News S., KHDP (Kenya Horticultural Development Program), Monthly updates- February 2005 and March, 2006.

North, D.C., (1990). Institutions, Institutional Change and Economic Performance. Cambridge, Cambridge University Press.

Nyoro, J. and Jayne, T.S. (2005). Trends in regional agricultural productivity in Kenya. Kenya agricultural marketing and policy analysis project. Tegemeo institute of agricultural policy and development/ Egerton university, Kenya Agricultural Research Institute (KARI) and Michigan state university, Nairobi.

Ota, M., and Lenne, J.M., (2003). 'The Vegetable Export system- A role model of local Vegetable production in Kenya'. Outlook on AGRICULTURE Vol 34, No.4, 2005. pp 225-232.

Okello J. J., 2005. Compliance with International Food Safety Standards: The Case of Green Bean Production in Kenyan Family Farms. PhD Dissertation, Michigan State University.

PAPPA, (Policy Analysis for Participatory Poverty Alleviation), 2000 & 2001.Proceedings of a Seminar on Looking at Poverty through the PAPPA Approach. Egerton University

PAM. (1995). Proceeding on the Conference on Towards 2000: Improving Agricultural Performance. Nairobi, Tegemeo Institute of Agricultural Policy and Development.

Rogers, E.M., (1995). Diffusion of innovations, Fouth Edition, New York.

Salasya, B.S., (1989), Economic analysis of the major factors influencing exports of French beans from Kenya, MSc thesis in Agricultural Economics, University of Nairobi, Kenya.

Tatter, J., Harris, C., Hegarty, P. V., Kherallah, M. X., Mukindia, C. A., Ngige, J. A., and Aust Sterns,P., (2001). "The Impacts of Standards on the Food Sector of Kenya". Michigan State University and U.S. Agency for International Development. United Nations Conference on Trade and Development

Thiagargen, D., Bush, D.L., and Frahm. M., (2006), "The relationship of Third party certification (TPC) TO Sanitary and Phytosanitary (SPS) Measures and the International Agrifood Trade": Case study EurepGap: Raise SPS Project USAID.

Tineke,V. D. (2003). "Export Chain of French Beans from Kenya." Msc. Thesis, Wageningen University.

Wechter, K., and Grethe,H.G., (2006), "The adoption of the Eurepgap standards by mango exporters in Piura, Peru, Australia". University of Berlin Germany, Berlin

APPENDICES

Appendix 1: Cost of compliance with EurepGap Standards

	INVESTMENT COSTS(KHS)		RECURRING COSTS (KHS)	
COST COMPONENT	**UNITS**	**COST/HA/YEAR**	**UNITS**	**COST/HA/YEAR**
1. Buildings and facilities ❖ Storage room for pesticides ❖ Storage room for fertilizers ❖ Packing houses ❖ Toilet facilities ❖ Fertigation station				
2. Equipments ❖ For pesticide delivery ❖ Equipment for fertigation				
3. Needs assessment				
4. Technical assistance/services ❖ Laboratory analysis				
5. Training ❖ Initial ❖ Follow up training				
6. Current input use ❖ Sanitary equipments for workers (masks, clothes, gloves, shoes) ❖ Superior chemicals and fertilizer use				
7. Other cost of certification ❖ Initial auditing ❖ External/ certification auditing ❖ Record keeping and self-inspection				

Appendix 2. Correlation Matrices

	Location of hh (Nyangati / Kangai)	Age of household head (hh)	Household gender	Marital status of hh	Main economic activity	Farming experience (yrs)	Education of hh (yrs)	Education of others living with hh	Land owned (ha)	Total land owned (ha)	Household size	Access to off-farm income
Location of hh (Nyangati/ Kangai)	1.0000											
Age of household head	0.076	1.0000										
Household gender	0.0782	0.0496	1.0000									
Marital status of hh	-0.2319	0.046	-0.5815	1.0000								
Main economic activity	-0.0894	0.0803	-0.0923	0.0694	1.000							
Farming experience (yrs)	0.0253	0.7831	0.0042	-0.0495	-0.1295	1.0000						
Education of hh (yrs)	0.101	0.1297	-0.1189	0.0833	0.3184	-0.0611	1.000					
Education of others living with hh	0.1711	0.3159	-0.0136	0.0483	0.1895	0.1874	0.5653	1.0000				
Land owned (ha)	0.1936	0.5252	0.1844	-0.1824	-0.0655	0.4954	-0.0435	0.0933	1.0000			
Total land owned(ha)	0.2261	0.4328	0.1382	-0.2107	-0.0857	0.4415	0.0189	0.0665	0.8045	1.0000		
Household size	-0.1236	0.6828	-0.0648	0.2117	0.0564	0.5408	0.0363	0.2168	0.3269	0.2396	1.0000	
Access to off-farm income	0.0991	0.1539	-0.1098	0.1662	0.3125	-0.0457	0.1781	0.786	0.1592	0.1423	0.0694	1.0000
Area under french beans	0.2056	0.0849	0.0211	-0.1416	-0.0774	0.1564	0.1177	0.0523	0.1188	0.5114	0.056	-0.0327
Amount produced	0.1007	0.0702	0.0006	-0.1051	-0.0488	0.137	0.1105	0.0475	0.129	0.4047	0.0689	-0.0166
Average price (kshs/Kg)	0.1534	-0.0176	-0.0643	0.0169	0.0664	-0.0286	-0.0924	0.0063	0.2244	0.159	-0.0022	0.3795
Amount per acre	-0.2046	0.0048	-0.021	0.0307	0.045	0.0256	0.054	0.024	-0.1353	-0.2289	-0.0429	-0.1322
Years of french bean production	-0.1863	0.2408	0.0028	0.0267	-0.0925	0.4025	-0.1485	0.1288	0.1489	0.2113	0.2672	-0.0454
Water organization membership dummy	-0.0478	-0.102	0.1615	-0.1214	-0.1609	0.0523	-0.3841	0.2516	-0.1209	-0.1455	-0.2057	-0.2262
Years of group membership	-0.4502	0.0704	-0.0355	0.1665	0.1192	0.0977	0.0047	0.0272	-0.0401	-0.1068	0.1339	-0.1952
Contract farming dummy	-0.4662	0.0138	0.0253	0.004	-0.068	0.1236	-0.048	0.0335	0.032	0.1376	0.134	-0.2527
Contract farming experience (yrs)	-0.1721	0.1867	0.0568	0.0162	0.0775	0.1914	-0.0003	0.0217	0.2242	0.3577	0.1843	-0.179

	Location of hh (Nyangati / Kangai)	Age of household head (hh)	Household gender	Marital status of hh	Main economic activity	Farming experience (yrs)	Education of hh	Education of others living with hh	Land owned (ha)	Total land owned(ha)	Household size	Access to off-farm income
Support by contractor dummy	-0.5326	0.0961	-0.0146	0.1078	-0.0403	0.1738	0.0016	0.0339	0.037	0.1589	0.2285	-0.1617
Years export production	-0.014	0.2229	-0.1055	0.0751	-0.1414	0.3052	-0.0917	0.0526	0.1347	0.2525	0.2106	0.0405
Credit access dummy	-0.0744	0.0457	0.1278	-0.142	-0.0605	0.0345	-0.1036	0.0444	0.1417	0.1222	0.101	0.0019
Distance from farm to grading shed	-0.3827	-0.0606	-0.0562	0.1927	-0.0309	-0.0677	-0.0397	0.1132	-0.0117	-0.0386	-0.027	-0.1546
Distance from farm to market	0.0913	0.2058	-0.056	0.0559	-0.0227	0.0233	0.0059	0.0544	0.0936	0.0557	-0.0673	0.1667
Distance from farm to urban area	0.0913	0.2058	-0.056	0.0559	-0.0227	0.0233	0.0059	0.0544	0.0936	0.0557	-0.0673	0.1667
Access to extension services	-0.1676	0.0309	-0.1799	0.324	-0.1156	0.073	-0.0191	0.0253	-0.2502	-0.2588	-0.0056	-0.1569
EurepGap training	-0.4993	0.1297	0.0947	0.0109	-0.0102	0.2092	0.051	0.0582	0.1098	0.2005	0.1819	-0.1246
Gross income	0.1308	0.0773	0.0271	-0.1629	-0.0519	0.1559	0.0843	0.0669	0.1504	0.4662	0.0547	0.0046
Total cost of production	0.1745	0.0776	0.0065	-0.156	-0.0441	0.1295	0.1282	0.0578	0.0821	0.4865	0.0521	-0.0158
Net income	0.0005	0.0496	0.0573	-0.119	-0.0487	0.1521	-0.03	0.0607	0.2291	0.2634	0.0404	0.0423
Number of enterprises	-0.2832	0.0656	-0.029	0.1864	-0.1736	0.1322	-0.1779	0.1005	0.1956	0.1836	0.1099	0.0904
Buyer of produce	-0.483	0.0143	0.0335	-0.0026	-0.0606	0.1063	-0.0592	0.0314	0.0342	0.0848	0.1206	-0.2285
Area under french bean as a % of total land	0.0355	-0.1844	-0.0505	-0.0304	-0.0112	-0.0838	0.0229	0.0113	-0.1998	-0.1119	-0.0582	-0.1

	Area under french beans	Amount produced	Average price(ksh s/Kg)	Amount per acre	Years of french bean production	Water organization membership dummy	Years of group membership	Contract farming dummy	Contract farming experience (yrs)	Support by contractor dummy	Years export production
Area under french beans	1.0000										
Amount produced	0.8793	1.0000									
Average price/Kg	-0.1352	-0.1877	1.0000								
Amount per ha	-0.225	0.014	-0.2511	1.0000							
Years of french bean production	0.1259	0.1881	-0.0766	0.0761	1						
Water organization membership dummy	-0.172	-0.1395	-0.0758	0 .2381	-0.0615	1					
Years of group membership	0.0028	0.1032	-0.227	0 .1427	0.1772	0.0079	1				
Contract farming dummy	0.2076	0.1913	-0.2642	0 .0883	0.1236	-0.0199	0.3958	1			
Contract farming experience (yrs)	0.2504	0.1575	-0.0503	0.0199	0.1235	-0.0889	0.5143	0.4858	1		
Support by contractor dummy	0.1867	0.1877	-0.2102	0.0562	0.1965	0.0024	0.4219	0.8906	0.4619	1	
Years export production	0.1386	0.2023	0.0321	0.0212	0.6362	0.0438	0.0426	0.0751	0.1374	0.1559	1
Credit access dummy	0.0887	0.1633	-0.0133	0.0084	-0.0152	0.0199	0.174	0.241	0.0106	0.2706	0.0492
Distance from farm to grading shed	-0.0586	-0.0854	-0.0592	0.0554	-0.1326	-0.0705	0.2776	0.31	0.2622	0.3195	0.1262
Distance from farm to market	0.0703	0.1192	-0.09	0.08	0.0053	-0.0153	-0.0746	-0.1297	-0.0784	-0.1066	0.032
Distance from farm to urban area	0.0703	0.1192	-0.09	0.08	0.0053	-0.0153	-0.0746	-0.1297	-0.0784	-0.1066	0.032
Access to extension services	-0.1506	-0.1871	-0.1869	0.0131	0.0722	0.0874	0.1259	0.1634	0.0942	0.161	0.0633
EurepGap training	0.2353	0.2316	-0.1939	0.0118	0.2332	-0.0092	0.3834	0.779	0.4099	0.8629	0.1589
Gross income	0.9081	0.9604	-0.0247	0.0467	0.1685	-0.1202	0.0618	0.1773	0.1795	0.1842	0.1928
Total cost of production	0.9568	0.9059	-0.1129	0.1357	0.1166	-0.1372	0.0369	0.1993	0.2137	0.1987	0.1291
Net income	0.4951	0.7279	0.1541	0.1411	0.2094	-0.0453	0.0881	0.0726	0.0507	0.0915	0.2476
Total number of enterprises	0.0133	-0.0213	0.0187	0 .0000	0.2368	-0.0222	0.3042	0.2563	0.2997	0.321	0.2301
Buyer of produce	0.1269	0.1495	-0.2508	0.1138	0.1104	0.0347	0.408	0.97	0.3839	0.8611	0.0533
Area under french bean as a % of total land	0.5085	0.5414	-0.1205	0.052	0.0309	-0.1646	0.2258	0.0912	-0.0939	0.0307	0.099

	Credit access dummy	Distance from farm to grading shed	Distance from farm to market	Distance from farm to urban area	Access to extension services	EurepGap training	Gross income	Total cost of production	Net income	Number of enterprises	Buyer of produce	Area under french bean as a % of total land
Credit access dummy	1.0000											
Distance from farm to grading shed	-0.0612	1.0000										
Distance from farm to market	-0.0607	-0.0441	1.0000									
Distance from farm to urban area	-0.0607	-0.0441	1.0000	1.0000								
Access to extension services	-0.1634	0.1405	0.0777	0.0777	1.000							
EurepGap training	0.2335	0.2847	0.096	0.096	0.1797	1.0000						
Gross income	0.1479	-0.0849	0.103	0.103	-0.1872	0.2271	1.000					
Total cost of production	0.148	-0.0697	0.0728	0.0728	-0.1674	0.2246	0.9416	1.000				
Net income	0.0957	-0.0843	0.125	0.125	-0.1595	0.1522	0.7611	0.4982	1.0000			
Number of enterprises	0.0594	0.1962	0.0083	0.0083	-0.063	0.3147	-0.0122	0.0241	0.0151	1.0000		
Buyer of produce	0.2484	0.2746	-0.1316	-0.1316	0.1479	0.7534	0.1334	0.1384	0.0769	0.2778	1.0000	
Area under french bean as a % of total land	0.1214	-0.0355	0.0114	0.0114	0.0582	0.0211	0.5619	0.5207	0.4438	-0.132	0.0763	1.0000

Appendix 3: Research Survey Questionnaire

QUESTIONNARE NO: _____

1. Name of Enumerator_____
2. Name of respondent_____
3. Gender of the respondent _____
4. Division_____
5. Sub location_____
6. Subunit/Village_____
7. Date of Interview_____

Time start_____Time end _____

PART 1:

A. GENERAL INFORMATION ON FRENCH BEANS PRODUCTION AND ORGANIZATION PRACTICES (FOR THE LAST 12 MONTHS).

1. Please provide the following information regarding french beans production during the last main season under each grade

Area (acres)	***Amount produced (kg)***	***Amount sold***	***Grades (Kg)***		***Av. Price per Kg /grade***		***Buyer***
			Extra fine (EF)	Fine(F)	EF	F	

Buyer 1=Local consumer 2=Large trader 3=Exporter 4=Supermarkets
5=Agents/Broker 6=NGO 7=Hotels 8=others (specify)

2. When did you start producing french beans? Year _____

3. Are you a member of french bean producer marketing organizations (PMO) **1=Yes 0=No**
   If **Yes**, what is the name of the group _____

4. If **No** (question 3), Why haven't you joined any group?
   1._____ 3. _____
   2._____ 4 _____

5. If **Yes** (question 3), please provide the following information regarding group.

Year joined	***Reasons for joining***	***Activities participated in for the last one year***					
		Activity	*Transport time (min)*	*Transport cost (to and from)*	*Time taken in the activity*	*Money paid*	*Incidental cost (e.g. food and drink taken)*

Activities includes: meetings, conferences / seminars attended, etc

6. Are you growing french beans under contract? **1=Yes** **0=No (***go to question 11***)**

7. If **Yes** (question 6), under which company?
   1=Homegrown 4=Greenlands 7= Indu-farm exporters 9=supermarket (specify)
   2=Vegpro 5=East Africa Growers 8= KHE 10= other (specify)
   3=Sunripe 6=Sacco fresh

8. If **Yes**, (Question 6), when did you start producing under contract? Year_____

9. What are the reasons for producing under contract?
   1. _____ 3. _____ 5. _____
   2. _____ 4. _____ 6. _____

10. If **Yes**, provide the following information regarding activities participated during the contract during the last one year.

Activity	*Transport time (min)*	*Transport cost (to and from)*	*Time taken in the activity*	*Money paid*	*Incidental cost (e.g. food and drink taken)*

Activities includes: meetings, seminars, conferences etc

11. Are you aware of the EurepGap requirements? **1=Yes 0=No**

12. Is your farm certified with EurepGap requirement? **1=Yes 2=No 3=In the process of compliance**

13. Does the contractor offer any support in facilitating compliance with EurepGap requirements? **1=Yes 0=No***(go to question 15)*

14. If **Yes** (question 13), what are the support services provided?
   1. _____ 4. _____
   2. _____ 5. _____
   3. _____ 6. _____

15. What is the main system of watering do you use for french bean production?
    1= Rain fed 2=Irrigation

16. If irrigation, what type of irrigation do you use?
    1=Sprinkler 3=Flooding 5=Bucket
    2=Drip 4=Basin 6=Others (specify

17. Are you a member of water user organization? **1=Yes** **0=No***(go to question 21)*

18. If **Yes**, (question 17), when did you join?
    1=Irrigation water testing **2**=Soil testing **3**=others (specify)

19. What are the services provided by the water organization
    1. _____ 2._____ 3. _____

20. Use the table below to provide information regarding activities participated in the water organization during the last one year.

Activity	*Transport time (min)*	*Transport cost (to and from)*	*Time taken in the activity*	*Money paid*	*Incidental cost (e.g. food and drink taken)*

Activities includes: meetings, building and construction, etc

21. Provide the following information on input and technology use for the last main season's production of french bean

Input	***Input category***	***Type***	***Amount used***	***Price per unit***	***Source***	***Kms from source(tarmac and Earth)***	***Transport means***	***Transport cost /unit***
1.Seed	Certified							
	Sorted							
	Others(specify)							
2.Insecticide	Planting to 3-leaf formation							
	3-leaf to flowering							
	Flowering to harvesting							
	Start to end of harvesting							
3.Fungicides	Planting to 3-leaf formation							
	3-leaf to flowering							
	Flowering to harvesting							
	Start to end of harvesting							
4.Fertilizers	DSP							

	NPK							
	CAN							
	Other chemical fertilizers							
	Manure							
	Local organic materials							
	others(specify)							

Activity	***Technology***	***Labour Quantity(time,hrs)***	***Source of labour (1=Family 2=Hire)***	***Value/Expense(Kshs)***
a. Land preparation				
b. Planting				
c. Weeding				
d. Irrigation				
e. Spraying				
f. Harvesting				
g. Transportation				
h. Storage				

a. **1**=Tractor, **2**=ox-plough, **3**=Hand tools, **4**=2&3, **5**=others (specify)
b=**1**=human labour, **2**=others (specify)
c. **1**=human labour, **2**=others (specify)
d. **1**=splinker, **2**=drip, **3**=flooding, **4**=basin, **5**=others(specify)
e. **1**=knapsack, **2**=jerry can and twings, **3**=others (specify)
f. **1**=human labour, **2**=machine, **3**=others (specify)
g. **1**=ox-cart, **2**=motor vehicles, **3**=human labour, **4**=1&3, **5**=bicycle **6**=others (specify)
h. **1**=traditional barn, **2**=open shed, **3**=none, **4**=others (specify)

B. ACCESS TO MARKET

22. How did you know about production and marketing of french beans?
    1**=**buyer of the produce 3=NGO 5=farmer group
    2=friend/neighbor 4=agents 6=others (specify)

23. Where do you get information about supply and market prices?
    1**=**buyer of the produce 3=friend/neighbor 5=NGO
    2=farmer group 4=agents/brokers 6=others (specify)

24. **What did you do last year to improve the prices of french beans?**

Activity done	*Transport time (min)*	*Transport cost (to and from)*	*Time taken in the activity*	*Money paid*	*Incidental cost (e.g. food and drink taken)*

Activities includes*: Holding a negotiation meeting with contractor, change of contractor, etc*

25. Where do you deliver your french beans?

1=collected at farm gate
2=to a group's collection shed
3=to a town market center (specify the town)
4=other (specify)

26. Why do you sell to the selected buyer (in question 1)?
    1. _____ 3. _____ 5._____
    2. _____ 4. _____ 6. _____

27. If selling to an exporter, when did you start participating in export production? Year_____

28. What is done to your product once its delivered at the collection point?
    1. _____ 3. _____ 5. _____
    2. _____ 4. _____ 6. _____

29. Infrastructure: State the approximate distance of the farm from

	Walking time in minutes	*KM (Tarma c)*	*KM (Earth)*	*Transport per Kg of beans*	*Fare (Kshs)*
Bean collection shed					
Market center (specified in 25)					
Most important urban center/town					

30. Did you receive credit or grant to use in french beans in the last 12 months?
    1=Yes 0=No

31. If Yes (Question 30), please indicate the amount of credit (in Kshs) received and what you used it for.(In kind credits should be converted into money-value prices that prevailed when credit was received) **NOTE: CREDIT FOR FRENCH BEANS ONLY**

Source	***Borrowed 0-No 1-Yes***	***Credit type 1-Money In kind-2***	***Amount (Kshs/ unit***	***What was the cash used for?(use codes below)***
1.Commercial banks				
2.AFC				
3.SACCO(specify)				
4. Micro-Finance (specify)				
5.Local NGO				
6.Local trader (specify)				
7.Input-store				
8.Farmer group (PMOs)				
9. Money lenders				
10.Friends /family				
11..Product buyer				
12. Merry-go round				

13.Other sources(specify)				

Use of credit

1=Seasonal inputs
2=Building and construction
3=Training of the farmer/workers
4=Protective clothing
5=Farm equipments
6=Certification
7=Others (Specificy)

32. Did you receive extension contact on french bean production last year? **1=Yes** **0=No**

33. If Yes (question 32), who was the provider of the extension and what services were offers?

Source/ service providers	*Type of training/services*
1.	
2.	
3	
4.	

34. Did you receive any training on EurepGap requirements last year? **1=Yes** **0=No**

35. If **Yes**, (Question 30), please fill in the table below.

a) Initial training

Date (month)	*Source/ service providers*	*Type of training /services*	*Venue*	*Fees paid*	*Transport time*	*Transport cost (to and from)*	*Time taken in the training*	*Incidental cost (e.g. food and drink taken)*

b) Follow-up training (in the last 12 months)

Date (month)	*Source/ service providers*	*Type of training /services*	*Venue*	*Fees paid*	*Transport time*	*Transport cost (to and from)*	*Time taken in the training*	*Incidental cost (e.g. food and drink taken)*

Source/providers

1=Public extension agent
2=NGO agent
3=Trader/input dealers
4=Farmer group/cooperatives
5=field days/demonstrations
6=Exporters
7=others (specify)

Type of training/service

1=Product handling
2=Soil and water use
3=Record keeping
4=Field hygiene
6=Pest management
7=chemical handling
8= others (specify)

C. EUREPGAP REQUIREMENT

36. Is your farm certified with the EurepGap standards? **1=Yes** **0=No**

37. If Yes, are you aware of all the requirements contained in the EurepGap protocol? (Use the checklist below to answer this question)

EUREPGAP CHECKLIST

ITEM	TICK	*SOURCE OF INFORMATION*
1.***Traceability***		
2.***Record Keeping and internal Inspection***		
3.***Site Management (soil maps for the farm)***		
4.***Risk assessment***		
5.***Technical services***		
6.***Laboratory analysis***		
7.***Soil and substrate management*** (soil mapping, Cultivation, soil erosion, soil fumigation, substrate mgnt)		
8.***Fertilizer use***(quantity, type, storage, records and application machinery)		
9.***Crop protection*** (against pests, diseases and weeds, systems of protection, chemicals used, application machinery, disposal, storage and handling and records keeping.)		
10.***Irrigation /fertigation*** (predictions, methods, water quality, supply of water)		
11.***Harvesting*** (Hygiene, packing and packaging containers		
12.***Produce handling*** (Hygiene, post-harvest washing, post harvest treatments, on-farm storage)		
13.***Waste and pollution management, recycling and re-use*** (type of waste and pollutants, Action plan)		
14.***Worker health, safety and welfare*** (Training, protective clothing/equipments, product handling, risk assessments, and welfare)		
15.***Environment issues*** (Impact of farming on Environment, Wildlife and conservation policy)		
16.Certification		

Source of information

1. *Exporter*
2. *Government extension agent*
3. *Local trader*
4. *NGO (specify)*
5. *Farmer Group leaders*
6. *HCDA*
9. *Farmer's field days*
10. *Others (specify)*

38. If **Yes** (question 36), when was your farm certified? **Year**_____

39. **a**) If **Yes** (Question 36) , what were the major constraints encountered during certification process?

    a. _____ 3. _____

    b. _____ 4. _____

    b) What are main challenges/ constraints of maintenance of the EurepGap certificate?

    1. _____ 3. _____

    2. _____ 4. _____

40. If **No** (question 32), what are the **MAJOR** constraints?

    a. _____ 3. _____ 5. _____

    b. _____ 4. _____ 6. _____

41. What type of certification do you hold?
1=Individual certification **2**=Bench marking **3**=Group certification

42. If Yes (Question 36), what additional cost have you incurred as an individual in complying with these standards? (use the table below to guide you)

		Set-up cost (Kshs)		**Ongoing cots(Kshs)**
Cost category	***Cost component***	***Value/ cost of formerly used item/ input/ activity***	***Value/ cost of newly used item / input / activity***	***Value/ cost of newly used item /input /activity (maintenance cost)***
1.Building and facilities	Storage room for pesticides			
	Storage room for fertilizers			
	Packing houses			
	Toilet facilities			
	Irrigation station			
	Grading shed			
2.Equipments	For pesticide delivery			
	For irrigation			
	For water and soil analysis			
	Other Equipments			
3.Needs assessment				
4.Technical assistance / services	Water analysis			
	Soil , MRL/Plant tissue analysis			
5. Input use and protective clothes	Masks			
	Gloves			
	Other protective clothes			
	Insectides			
	Fungicides			
	Fertilizers			
	Other inputs			
6.other cost of certification	Initial auditing			
	Certification audit			
	Record keeping			
	Consultation			
	Other costs			

43. Is there a difference between average price of french beans before adoption of EurepGap standards?
1=Yes No = 0

44. If yes(question 38) state the average prices before and after
1=Average price before adoption_____
2=Average price after adoption _____

45. What has adoption of EurepGap standards contributed to?
    1. _____ 3._____
    2. _____ 4. _____
46. a) Have you complied with other Food safety standards? **1=Yes** **0=No**
    b) If **Yes**, which other standards
    1. _____ 2. _____ 3. _____

PART II: HOUSEHOLD DEMOGRAPHIC AND ENDOWMENT INFORMATION

1. Please provide the following demographic characteristics information concerning the household members living permanently in the compound.

ID Code	Name	Relation to HH head [*HH head=1, Father/Mother=2 Daughter/Son=3, Other relative=4 Non-relative=5*]	Sex [M=1 F=2]	Age (Yrs)	Formal Education [Yrs]	Marital Status of HHH [*Married/living together=1 Married but not living together=2 Divorced/separated=3 Widow/widower=4 Single=5*]	Main Occupation [*Farming = 1 Salaried worker =2 Self-employed=3 Student=4 Retired/not able to work=5*]	Farm Work Per Year [*100% = 1 75% = 2 50% = 3 25% = 4 0% = 0*]
1.(HHH)								
2								
3								
4								
5								
6								

2. Is the household head the farm owner? **1=Yes** **0=No.**
   If not, who is the farm owner?_____

3. Structure of landownership (acres)

Total size		Tenure systems (acres)				
		Owned	Rented in	Rented out	Communal	Land lease (Kshs/Acre)
Acres						

4. What other farm enterprise are you engaged in and average income from these enterprises last year?

Enterprise	*Cash received year 2006*	*Rank in order of importance(most important first)*
1.French beans		
2. Rice		
3. Tomatoes		
4. Maize		
5. Potatoes		
6. Livestock		

7.other cash crops		

5. Do you have extra income apart from farm enterprises? **1=Yes 2=No**

6. If yes (question 6), state the activity, income range and number of months worked last year

Activity	*Type*	*Income per month*	*No. months in the year 2006*

Type of employment
1=(Semi) permanent
2=Casual
3=Self employed
4=Domestic labour
5=others

Income per month
1=less than Kshs500
2=Kshs.500 to 1500
3=more than Kshs1500

Activities
1=Teaching
2=Tea plucking
3=Tomato weeding
4=Rice harvesting
5=Government job
6=NGO job
7=Salon
8=shop
9=other