FACTORS INFLUENCING ECONOMIC LIVELIHOODS OF THE SMALL SCALE HORTICULTURISTS FARMING ALONG THE DUNDORI-OLKALOU-NJAMBINI ROAD IN NYANDARUA COUNTY

BY

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DECLARATION

This research project is my original work and has not been presented for an award in any other University.

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DEDICATION

This study is dedicated to my mother, Elizabeth W. Miringu, who is a small scale horticulturist and to the many other small scale horticulturists, farming along the Dundori-Olkalou-Njabini highway, for their continuous effort and faith that one day, their horticulture production would be big enough to feed the Nation.

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LIST OF ACRONYMS AND ABBREVIATIONS

CAN	Calcium Ammonium Nitrate
CPA	Certified public accountant
CPS	Certified public secretary
DAP	Di-Ammonium Phosphate
DSP	Double Supper Phosphate
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
Gm	Grams
ILRI	International Livestock Research Institute
KEPHIS	Kenya plants health Inspectorate services
KFA	Kenya Farmers Association
Kg	Kilograms
KIHBS	Kenya Integrated household budget survey 2005/2006
Km	Kilometer
MOA	Ministry of Agriculture
NCPB	National Cereals and Produce Board
NPK:	Nitrates Phosphorous and Potassium
SRA	Strategic Revitalization of Agriculture

ABSTRACT

This study investigated factors that influence Economic livelihoods of the small-scale horticulturists farming along the Dundori-Olkalou-Njabini road in Nyandarua County. The small-scale horticulturalists form a major economic component in the economy the County and of Kenya. The Dundori-Olkalou-Njabini road tarmac was built in 2007. The objectives of this study were to investigate the influence of the: cost of seeds on the economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njabini road; cost of fertilizers on the economic livelihood of the small-scale horticulturists farming along Dundori-Olkalou-Njambini road; cost of labor on the economic livelihood of the small-scale horticulturists farming along Dundori-Olkalou-Njambini road; cost of lease on the economic livelihood of the small-scale horticulturists farming along Dundori-Olkalou-Njambini road and capital input on the economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road. The data for this study was collected from the small scale horticulturalists, the stockists and the district agricultural officers in the area of study.The research adopted both survey and explanatory designs. The total sample size for this study was 358 respondents. Descriptive and explanatory statistics were used. The study established that majority of farmers lease land for their farming, with most leasing a maximum of 3 acres. On cost of seeds, the study noted that the distribution and supply of the crop seeds such as cabbages, kales, couchettes, carrots and beetroots were good. The study also found that various fertilizer such as DAP, CAN and Urea, were available at varying costs. The study found out that most of small scale horticulturalists were charged interest for any credit advanced, ranging between 12% and 21%. Most of horticulturalist depended on farmers' cooperative Society and investment group for this financial assistance. The study concluded that land, greatly determines the economic livelihood of horticultural farmers along Dundori-Olkalou-Njambini road, as majority lease it. The researcher concluded that the costs of seeds and fertilizers determines to a great extent, the ability of farmers to produce the crops. The cost was seen to be relatively high. Further, financial support is necessary to enable the farmers' access the right quality and quantity of seeds and fertilizers. Availability of financial capital is a major hindrance in the effort to improve farmers' production and hence their economic livelihood. The study recommends that the stakeholders need to come up with policies on lowering of prices for seeds and fertilizers, and their distribution. Providing subsidies to the small scale horticulturists on the seeds, fertilizers and financial capital will directly improve the livelihood of the small-scale horticulturalist. The study recommended that the stakeholders explore the possibilities of farmers diversifying into other economic ventures such livestock to improve on their incomes.

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Horticulture in Kenya is an important source of revenue to the small horticultural growers and a significant contributor to the gross domestic product (GDP) and is ranked top five for several years (Ministry of Agriculture, 2010). It contributes to employment for the rural population and is regarded as a success story in the East African region. There has been dramatic growth over the years with several local and international players getting involved in local markets and export (Ministry of Agriculture, 2010).

Growth in the fresh fruits and vegetables has indeed contributed significantly to the success of the horticultural growth in Kenya. Fresh fruits and vegetables are produced by a large number of smallholder producers who are spread all over the country and who also depend on these commodities for incomes, food security and employment. The horticultural sub-sector is particularly important as it provides incomes to smallholder producers on regular basis (MOA, 2010).

In the country, horticultural crops are grown in several counties. These include, Kirinyaga, Nakuru and Nyandarua. This research study focused on Nyandarua County as a major horticulture County. A number of factors influence how horticulture is carried out in the county. These factors may be categorized as those that can be manipulated by man and those that are beyond his control. Those that are beyond man's control or the natural factors include rainfall patterns and temperatures. Factors that can be manipulated by man include the quality of seeds, the use of fertilizers, and supply of labour and availability of Capital on time. The factors of production that can be manipulated by man have an influence on the horticulture production and

in effect the economic livelihood of the small scale horticulturalists living along the Dundori-Olkalou-Njambini road. This road is important to the horticulture sector in the region as it is the County's major road link, traversing through the County (Ministry of Roads and Public Works, 2004).

Nyandarua County is located on the northwestern part of the Central Province, west of the Aberdare ranges. The County has a bimodal rainfall which decreases rapidly from east to west with annual rainfall varying from 1,400 mm in the Aberdare Ranges to about 700m in the lower areas bordering the rift valley. The temperatures are moderate but can get as low as 7.1^0 C in the cold seasons of July. This may result in frosts which adversely affect horticultural crop growing (Pouw, Braun, & Sombroek, 1982) These climatic conditions make the county an ideal place for horticultural crop production.

Horticultural farming in Nyandarua County is increasingly being embraced by the farmers due to the high returns from its local and export products (Ministry of Planning, National Development and Vision 2030 (MOPNDAV2030 2009). Existing flower farms in the district have proved to be a major source of employment for the large labour force. Due to the high capital requirements involved, local individuals and groups of farmers are supported to start horticultural ventures. Horticultural crops grown in the county include growing of Irish potatoes, carrots, vegetables and fruits. Vegetables include such crops as kales, onions, cabbages, leeks, and capsicum (MOPNDAV2030 , 2009)

The horticulture production in the County has been hampered by poor road network. In horticulture farming, better roads have been observed to lead to reduction in the cost of inputs such as fertilizers, seeds, and extension services (Hossain & Ahmed, 1990, Dercon, Hoddinott ,

& Woldehanna , 2007). The lowering of the costs directly affects the profitability of horticulture production and leads to an increase in the use of fertilizers, seeds, extension services and other technologies (Hossain & Ahmed, 1990). On the output side better roads increases direct on-farm investments which again raises agricultural production (Khandher, Rosenzweig, & Binswanger, 1993). This translates to a raise in economic livelihood and an improvement of rural incomes, lower food prices and reduction in dependence on food imports.

Before the year 2007, the county had about 197 kilometers of bitumen roads (Ministry of Roads and Public Works, 2004). The Gilgil-Olkalou-Nyahururu road was the only tarmac road traversing the county. The new 100 kilometers Dundori-Ol-Kalou-Njabini road was completed in December 2010. It has increased the bitumen road network in the county to 297 kilometers (Ministry of Roads and Public Works, 2004). This has greatly improved the County's road accessibility network. The road traverses through the heart of the agricultural activities of the county, passing through Dundori, Ol Kalou, and Njabini in South Kinangop. It connects to the old tarmac road that runs from Fly Over on the Nairobi-Nakuru Highway at Njambini (Ministry of Roads and Public Works, 2004).

The construction of the road started in March 2007 and was completed in December 2010 (Ministry of Roads and Public Works, 2004). In the two years of its existence, there is observable heightened horticultural and entrepreneurial activity along this highway that was hitherto not there.

1.2 Statement of the Problem

Nyandarua County's horticulture farming is mainly carried out by small scale horticulturalists (MOPNDAV2030, 2009). It forms the backbone of their economic livelihood. There are factors that limit the small scale horticulturalists, farming along Dundori-Olkalou-

Njambini road, from realizing their full economic livelihood potential. Production factors such as the prices of production inputs and their distribution have a significant influence on the production. Distribution of fertilizers, quality seeds, labour, land leases, and capital input, influence production and subsequently the economic livelihoods of the small scale horticulturalists (Motuma et al, 2010)

There has been a steady rise of the cost of lease of land. This implies that the small scale horticulturists, who depend on leased land for production, have to pay more for the same area of production. The construction of the Dundori-Olkalou-Njambini road has eased access to production factors such as fertilizers and seeds and has created opportunities for inflow of capital to the small scale horticulturalist. The availability or unavailability of these factors of production has had a direct influence on the production and subsequently the economic livelihood of the small scale horticulturalists.

This research sought to investigate, the factors that influence economic livelihoods of the small scale horticulturists, living along the Dundori-Olkalou-Njambini Road in Nyandarua County. The study aimed at investigating the use and distribution of quality seed, fertilizers, labour, costs of lease of land and Capital input as factors that influence economic livelihoods of the small scale horticulturalists.

1.3 Purpose of the Study

The purpose of this study was to investigate the factors influencing the economic livelihoods of the small scale horticulturists farming 20 kilometers on both sides of the Dundori-Olkalou-Njambini Road in Nyandarua County.

1.4 Objectives of the study

The objectives of this study were to;

1. Examine the influence of cost of seeds on economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road.
2. Examine the influence of cost of fertilizers on the economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road.
3. Investigate the influence of cost of labour on the economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road.
4. Examine the influence of cost of land lease on the economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road
5. Investigate the influence of capital input on the economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road.

1.5 Research Questions

1. What is the influence of cost of seeds on economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road?
2. What influence does cost of fertilizers have on economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road?
3. What is the influence of cost of labour on economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road?
4. What influence does cost of land lease have on economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road?
5. What is the influence of Capital input on economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road?

1.6 Significance of the Study

Kenya has adopted a new constitution, which devolves focus on development from central government to county level. Every County is required to identify and support growth stimulators in their counties. This study sought to investigate the factors that have influenced the economic livelihood of the horticulture growers served by the Dundori-Olkalou-Njambini highway. In understanding these factors and their influence, Nyandarua County government can draw appropriate intervening policies to support these growers. Such policies may include policies on infrastructure development such as road network and market outlets improvement and horticulture extension services.

(Kapila & Kapila, 2002) observed that Infrastructure plays a catalytic role in the process of development and its services are essential. Physical infrastructure directly affects production activities and covers wide range of activities such as transportation (roads, railways, and airways) (Pradhan & Gupta, 2011). A number of studies have argued that generalized access to infrastructure services plays a key role in helping reduce income inequality **(**Lederman, Maloney, & Servén, 2005).

The research study results will inform support service institutions both in the public and in the private sector. The demand for production inputs such as seeds and fertilizers increases during the production period. To put in place logistics that support this demand, support service providers need to be properly informed for planning purposes. Seeds and fertilizers must be available on time. Horticultural input suppliers would therefore find this study very significant in that they would be able to organize on time, the deliveries of the right quantities and qualities of inputs.

Institutions such as banks provide capital to the sector. Capital is a key input in horticulture production. Accessibility of capital leads to improvement in the performance of the

horticulture sector. Banks and other financial institutions will find this study important in informing their expansion strategy. A fast growing small holder growers sector leads to capital demand. This demand can be filled by supply of banking services to the growers.

Ndung'u, Adam, & Collier (2011) explains that one of the Kenya's vision 2030 aims' is to transform agriculture from its current mixed crop farming to become more commercially oriented. In view of the significant 25% that agriculture contributes to the gross domestic production (GDP), it is in the interest of the stakeholders to raise agriculture productivity to match international benchmarks. The study will provide information to the government on the intervention areas, to increase the competitiveness of the small horticulture growers in the County and Country.

1.7 Assumptions of the study

The study assumed that the small scale horticulturalist is a rational economic person who engages in the horticultural activity for the purpose of financial gain. It further assumed that the small scale horticulturalist decides to grow crops based on the available information, and that every increase in knowledge lead to better decision in growing.

Another assumption of this study was that government policies' that affect the development of the small scale horticultural growing remained constant and where they could have changed the effect is spread uniformly across the sector in the Country.

1.8 Limitations of the study

This research study confined itself to five factors of production that influence economic livelihood of the small scale horticulturalists. There are others such as changes in the weather that can influence the economic livelihood of small scale horticulturalists. The influence of such

variables on production will need to be studied to be able to generalize the research findings on to the population.

Another limitation to this study was budgetary and time constraint. A longer time would have been required to gather sufficient data that was more reflective on the trends. This was a constraint both in the time available for this study and the available funds. To compliment these limitations, secondary sources of data from the Ministry of State for Planning, National Development and Vision 2030, were used. Secondary data is more affordable and less time consuming. Also, a budget was drawn, to guide the researcher on the resources that were required for the study.

1.9 Delimitation of the study

The study was carried out in Nyandarua County; in particular Olkalou, Kipipiri and South Kinangop regions where the Dundori-Olkalou-Njambini road passes. The study targeted the small scale horticulturists farming along the Dundori-Olkalou-Njambini road. The Dundori-Olkalou-Njambini road creates accessibility to most of the small scale horticulturalists, making it easy to reach them. The study also covered other players in the sector, such as suppliers of fertilizers, seeds, and agricultural officers in the county, to get data on the availability of the factors under study. Though the small scale horticulturalists in Nyandarua County also engage in other activities such as livestock and mixed crop farming, this study confined itself to horticulture.

1.10 Definition of Significant Terms

Capital Input: Money or property employed by the small scale horticulturist in his land for production purposes

Cost of land lease: The price payable to a land owner, to allow the land to be used for purposes of production for a specified period of time.

Cost of Seeds: Refers to the price payable in order to obtain the seeds used for production of crops

Cost of Labor: The sum of all wages paid to employees, as well as the *cost* of employee benefits and payroll taxes paid by an employer.

Cost of fertilizer: Refers to the price payable in order to obtain the fertilizer used in production of crops.

Economic livelihood: Means through which households improve on themselves economically. Production activity carried out by the small scale horticulturalist as a means to earn incomes.

Farm gate prices: Prices offered to growers at their gates, that at the place of production of the produce

Factors of production: A collection of various resources which contribute to production of goods or services. In this study, cost of seeds, cost of fertilizer, cost of labour, land lease and capital input.

Farming system: A population of individual with a similar resource base, enterprise pattern, household livelihood and constraint

Household: A basic social economic unit into which people are organized. They derive their income by working in the same economic firm (farm).

Household Income: is a measure of the combined incomes of all people sharing a particular household or place of residence

Horticultural land: Agricultural land; land under horticultural cultivation.

Imperfect market: Is a market where information is not quickly and fully disclosed to all participants in it.

Lease of land: The act of acquiring land for specified period at an agreeable rate for the purpose of production over the agreed period.

Rational economic firm: Assumption that the small horticulture grower who engages in an enterprise operates as a firm with an aim of maximizing profits.

Small scale horticulturists: Growers engaging in small scale horticultural farming with acreages of 10 acres and below.

1.11 Organization of the Study

Chapter one of the study covered, background of the study, statement of the problem, purpose of the study, objectives, research questions, significance, limitations, delimitation and definition of significant terms used in the study. Chapter two of this study reviewed what other researchers have investigated on economic livelihood with an inclination to the small scale horticulturalist. The chapter also reviewed various research works on factors of production in horticulture and how these factor in this study influence horticulture production. Chapter three of this study covered research methodology this research study followed. It covered on the research design applied in this study, target population of the study, sample and sampling design, research instruments, instrument reliability, instrument validity, data collection procedure, data analysis techniques and operationalization of variables in this study. Chapter four presented data analysis and its interpretation and Chapter five presented a summary of findings, conclusions and recommendations.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter sought to explore the literature on how factors of production influence economic livelihoods, and what other researchers have observed. The chapter included an introduction of what researchers have investigated on economic livelihood with an inclination on the small scale horticulturalist. The chapter also reviewed various research work on factors of production in horticulture and how each of the factor in this study influence horticulture production. Factors of production in this study included, cost of quality seeds, cost of fertilizer, cost of lease of land, capital input and labour. Research work covering cost component of these factors of production, and their availability was reviewed. The last part of this chapter was a summary of the literature review.

2.2 Influence of Cost of labour on economic livelihood of small scale horticulturalists

Labour is one of the factors of production and it is the ability to work. This factor of production is perishable as it cannot be stored. It includes both physical and mental labour. Labour is a primary or human factor of production. It indicates human resource. Small scale horticulture production is a labour intensive venture. According to Humphrey, (2006), some horticultural products are attractive to small horticulturists because they are labour intensive. The small scale horticulture producers call upon family labour, making labour as a factor of production less costly. Proponents of small scale farm development as a strategy to poverty reduction (Lipton, 2005) argue that the labour advantages of smallholder farms can continue to give them the competitive edge over larger farms if there exists effective and efficient services to assist them to raise labour and land productivity as well as intermediaries to link them to

remunerative output market opportunities. Opponents of small scale farms view (e.g. Maxwell, 2004) suggest that smallholder agricultural growth will depend on competitive engagement with very demanding produce markets, and that small farms face transaction costs in these markets that are too high to be overcome even with the assistance of intermediaries. This may mean that even though in most cases, the households provide the labour, overall gain in labour savings may not be sufficient gain to make the small horticulturist competitive against large scale horticulturalist. However, the labour gain is an important factor in influencing the small scale horticulturist economic livelihood.

During the production phase, there are instances when production is high. Labour demand spikes and there is need to hire from outside the family. Sources for this hired labour, is from neighboring households or immigrants from other geographical areas. When the demand for labour is high, the cost is usually high. Most of horticulture production follows the rainfall trend as it is rainfall dependent. This usually means that, most of the produce matures at the same time causing the demand for labour to spike. (Christopher, 1977) observes three aspects of the labour market which are important in determining the labour demand trend. These are the,

(1) Impact of organized union activities,

(2) Factors influencing variations in the rate of outward migration of agriculture labour,

(3) Persistence of a substantial gap between the average earnings of farm workers and the average earnings of workers in other occupations.

In the case of the small scale growers under study, the aspect of union activities is not prevalent. However, the other two aspects have a great impact on labour availability. Household's opportunity costs are important in determining which jobs to undertake and which not to undertake (Kerr & Pender, 1998) compare the experience of two villages in India where

the local government offers employment schemes. In one village, most of the people are involved in migratory wage labour during the dry season, when conservation measures such as stone drains are established. In the other village, members are less likely to migrate. With lower opportunity costs for their time, they invest more in constructing bunds and terraces in their fields. Crowley & Carter, (2000) observes that the rural immigrants from western Kenya have too little time or cash to invest, in improving their farms and end up working for others or migrating in search of employment. The small scale horticulture grower's households are constantly faced with choice, to work in the farm or off farm. Christopher, (1977) observes that the earnings for agriculture labour continue to be lower than for other sectors. Where there is competition for labour between horticulture production and other sectors, there is a high likelihood of horticulture labour to suffer.

2.3 Influence of cost of seeds on economic livelihood of small scale horticulturalists

(Tschirley & Ayieko, 2008) assert that Seed and planting materials are the most important inputs in agricultural production. However much of other productive inputs (land, fertilizer, labor etc) a farmer applies, seed still determines whether an output will be realized or not. In comparison to other factors of production in agriculture and in horticulture, seed has been shown to have the greatest potential to increase farm productivity (Muyanga, Ayieko M, Gem, 2005). The government of Kenya has been pursuing strategies aimed at increasing agricultural productivity as this has been seen to be central to accelerating economic growth and improving the economic livelihood of both rural and urban people in Kenya (Tschirley & Ayieko, 2008). Seed has been recognized as a core component to realizing this strategy.

Horticulture growers depend on two seed systems to get their seeds. The formal seed production system, which is controlled through government regulatory authority, Kenya plants health inspectorate services, (KEPHIS), and the informal seed systems. While the formal seed system is an important source of high quality certified seed, it is not able to meet the farmers' demand. Majority of farmers therefore rely on the informal seed system for seed and planting material for most agricultural commodities. So important is this aspect that one of the six activities for Kenya's Strategy for Revitalization of Agriculture (SRA) is the improvement of access to quality inputs (seeds and fertilizers), and financial services (Republic of Kenya, 2004) to the farmers.

Key issues in analyzing the contribution of seeds to horticulture production are the availability, price and quality. Seed has to be available, at the right time and should be affordable to enhance quality horticulture production. High cost of seed relative to other purchased inputs, coupled with the inability of the formal seed system to meet the demand by farmers have been cited as bottlenecks to the seed industry (Nyoro and Ariga, 2004) and to horticulture production Quality seeds should also maintain the genetic stability and varietal purity (Utoh, 1994) and therefore ensure consistency in the produce the horticulture growers produce. Local and international seed companies have not made the equivalent investment required to provide the industry with quantity, quality and variety of seed needed to support an expanding horticulture base.

Tschirley & Ayieko, (2008) observe that poor legislative and regulatory framework in the seed industry has adversely affected access to improved seed and planting materials by farmers. The seed industry was liberalization 1996, bringing in private sector participation to reduce the monopoly that the Kenya Seed Company enjoyed for a long time. This was expected to improve

accessibility to quality seed to farmers and hence increased efficiency. However agricultural productivity has generally been low especially among the small scale growers. In addition, mechanisms to protect farmers against malpractices by the seed producers and traders have not been adequately put in place. Farmers, therefore have no fallback position when faced with seed crisis. Kimenye, 1995 also notes that poor accessibility to information regarding demand, supply and general performance in seed market, are also major constraints in the seed industry in Kenya. Since the liberalization of the seed industry in Kenya in 1996, several varieties of crops have been released to the market. Many, however, have not been fully exploited by farmers because they lack information about them or do not know where to obtain them.

2.4 Influence of cost of fertilizers on economic livelihood of small scale horticulturalist

Fertilizers are natural or artificial substance containing chemical elements that improve growth and productiveness of plants. They enhance the natural fertility of the soil or replace the chemical elements taken from the soil by previous crops (Encyclopedia Britannica 2012).

Fertilizer is one of the secondary factors of production. In 1993, the Kenya government pulled out of the fertilizer distribution. Since then, the private sector and the cooperatives have been involved in the distribution process to meet the fertilizer needs for farmers (Wanzala, Jayne, Staatz, Mugera, Kirimi, & Awour, 2001). Approximately 95% of the fertilizer consumed in Kenya is imported and distributed by the private sector. The remaining 5% is donor-sourced by the Ministry of Agriculture-KRII program, which imports fertilizers, and sells to private traders via an open tendering system. After the revival of Kenya Farmers Association (KFA), it also joined the market. In the 2001/2 financial year, National Cereals and Produce Board (NCPB) also entered the market to supply fertilizers to farmers. Hence, Kenya's fertilizer and agrochemical industry is quite competitive (Muendo & Tschirley, 2004).

The use of inputs such as fertilizers and agrochemicals contribute significantly to increased horticultural output. The cost of these inputs makes up a sizable component of the cost of horticultural production. In a study by the ministry of agriculture in Kenya, (Ministry of Agriculture, 2010), the fertilizer and agrochemical stockists cited high costs of these inputs as one of the constraints leading to low stock levels. High internal transport costs occasioned by poor infrastructure were also mentioned as constraints. Poor regulatory framework governing the players, have lead to many unscrupulous traders (Ministry of Agriculture, 2010) Framers and Stockists agree on the need for effective monitoring of quality standards of fertilizer inputs.

2.5 Influence of land lease cost on economic livelihood of small scale horticulturalists

Land is a resource used in farming, like other inputs like labour and capital. (Clark , (1973) identifies some of the characteristics of land as a factor of production as follows, The total supply of land available for all uses is more or less fixed in supply; in all economies, there are some set of laws and customs regulating the control and use of land in agriculture and; land is peculiar as a factor of production in that every unit of it is different from the other, that is, every unit of it is locationally unique.

Cowling, Metcalf, & Rayner (1970) observes that land as factor of production is fixed in supply. Using labour and Capital, virgin land is converted into suitable agricultural land. However Agricultural land is in constant competition with ventures such as urban development, continuous deterioration of agricultural land due to climate change, and poor farming systems. (Clark , 1973) notes that there is a relationship between agricultural land population and land values. Growth in population may lead to an increase in the number of people who want to control agricultural land. This raises the demand for land and essentially leads to a rise in land

value. (Christopher, 1977) adds that where transport costs are significant, there is an increase in the demand for food associated with rising population leading to high land rents.

2.6 Influence of capital input on economic livelihood of small scale horticulturalists

Often capital especially in cash is a limiting factor in the horticulture farming process. This makes investment in new technology difficult or unattainable by most farmers. Furthermore, smallholders suffer from economies of scale and are unable to benefit from low prices occasioned by bulk purchases (and vice versa for sales), (Ashley & Maxwell, 2002).

Low availability of capital and limited access to affordable credit hampers development of the small scale horticulture. One of the main causes of low productivity in horticulture is inadequate credit to finance purchase of inputs and capital investment. High interest rates make it impossible for small scale horticultural farmers to access the credit.

Christopher, (1977) describes two ways in which a nation would increase the average income levels. These are (1) the accumulation of its stock of capital resource, example by increasing use of capital items in farming, and (2) the introduction of new, more productive, methods of concerting resources into products. However, Carter and Barham,(1996), and (Carletto & Lombaert, 2009) observes that the adoption of capital-intensive, high-risk, high-reward crop technologies among smallholders is constrained due to their limited risk-bearing ability, access to credit, asset position, and level of human capital and management skills.

Easterly and Levine (2001) provide a survey of some facts that revealed that together with tangible capital, other forms of capital are equally important in the production purpose. This has led some to conjecture that certain forms of intangible capital, most notably human capital in the form of education, may play an important role in production. Early empirical work by authors such as Barro (1991) and Mankiw, Romer and Weil (1992) demonstrated that accounting

for levels of education goes a long way toward explaining observable cross sectional disparities in per capita income. Other researchers explored on the human capital and whether alone it may not be enough to explain the income disparity. They have looked toward more pervasive forms of intangible capital for explanations, such as “social capital” which is the intangible forms of capital such as social and political institutions, or even the presence of social norms and morals Hall and Jones (1999) and Temple and Johnson (1998). The need for small scale horticulture growers in Kenya and in Nyandarua County therefore, to adapt innovative and more efficient production methods is a key in making horticulture production cheaper capital input is the driving factor.

2.7 Conceptual Framework

The study was guided by the following conceptual framework as shown in Figure 1. The independent variables are cost of seeds, costs of fertilizer, cost of labour, cost of land lease and capital input. These were measured against the households incomes earned from the sales of the horticultural produce sold. The household income in turn measures the economic livelihood of the small scale horticulturalists.

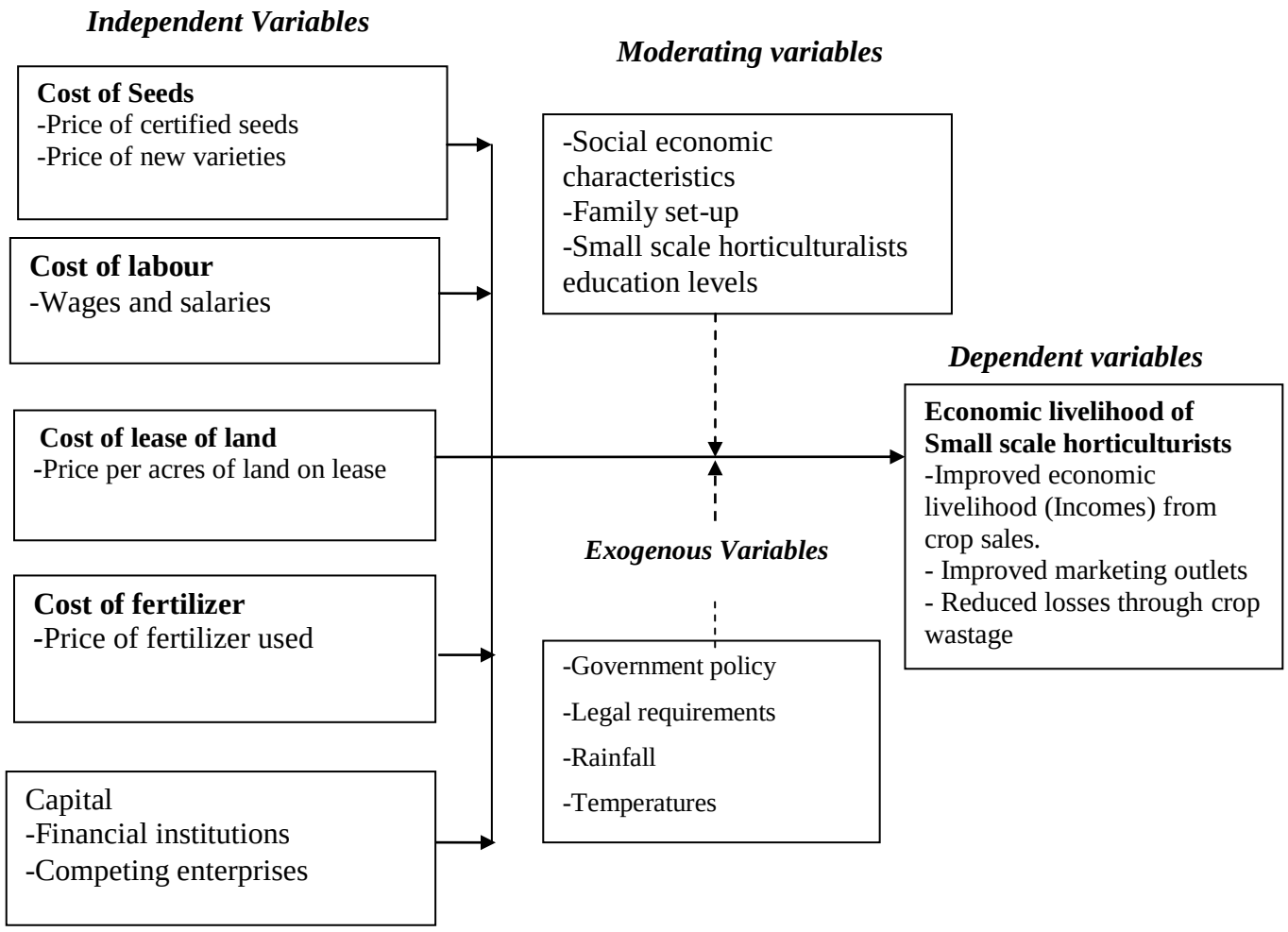

Figure 1: Conceptual Framework

2.8 Summary of literature review

This chapter reviewed literature on horticulture in general, narrowing it down to Kenya and to Nyandarua County. It also reviewed literature on economic livelihood of the small scale horticulturist in Kenya. The literature showed that horticulture takes a sizable contribution to the household incomes of these small scale horticulturalists. The literature on accessibility and affordability of these factors of production was also reviewed and how accessibility and affordability affect the costs of production by influencing production factors.

The chapter has highlighted the role that is played by smallholder farmers in an economy, including their potential contributions. Such contributions include rural employment, improving household incomes, poverty alleviation and linkages for economic growth. Literature on rural employment was reviewed and the potential it has in influencing economic livelihoods of small scale horticulturists. It was observed that small scale horticulture is rain dependent and labour demand follows the same trend.

The chapter looked at literature on land and land leases. It showed that the cost of lease increases with demand for land. Literature on Capital was also reviewed and its showed that cost of capital is a key factor influencing the economic livelihoods of the small scale horticulturalists. Literature on the importance of secondary factors of production, namely fertilizers and seeds were also reviewed. Seed industry in particular showed revealed the existence of a two seed production system, one being formal and the other inform. The cause of the informal seed sector was observed to unavailability. Literature on Fertilizers availability to the farmers was reviewed and it was observed that due to few players in the sector the market is imperfect and this has a negative effect on price setting. The small scale horticulturists are price takers. The discussion on the factors of production has led to the conclusion that these factors determine opportunities for small scale horticulturalists to change their economic livelihoods. Road infrastructure was also seen as affecting the accessibility of these factors of production and essentially affecting their prices.

In this literature review, some research gaps were identified. The main one is lack of proper documentation at the County level. The secondary data available is at the National level. This data is not County specific and loses critical details that are County specific. Another

missing gap is the limitation of available data on factors that influencing the economic livelihood of the small scale horticulturalists. More study need to be done in this area.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1. Introduction

This chapter outlines the methodology used to explore the factors influencing production and hence economic livelihoods of the small scale horticulturalists. The fundamental aim of this chapter is to study the existing relationship between these variables. The chapter covers, research design, target population, sampling design, data collection methods, data analysis, and operationalization of variables.

3.2. Research Design

Kothari (2004) defines research design as the arrangement of conditions for collecting and analyzing of data in a manner that aims at combining relevance to the research purpose with the economy in procedure. It constitutes the blueprint of the collection, measurement, and analysis of data.

The research was both survey design and explanatory. The use of survey design allowed collection of substantial amount of data economically, in view of the constraint of the budget. The survey design also allowed for ease of data standardization, allowing easy analysis and comparison. Survey design is also easy to understand. Explanatory design studies establish casual relationship between variables (Saunders, Lewis & Thornhill, 2003). Generally they seek to explain 'cause and effect' relationships and make use of qualitative data. This helped in analysis of the qualitative data collected.

3.3 Target Population

The target population in this study was the small scale horticulturists in Nyandarua County whose farms are located 20 kilometers on both sides of the Dundori-Olkalou-Njambini

highway. The Dundori-Olkalou-Njambini road traverses through the county, passing through three regions of the County. These are Nyandarua south (Kinangop), Nyandarua central (Ol Kalou) and Kipipiri. These are the areas between Njambini, Olkalou and Dundori. The Kenya Integrated household budget survey (KIHBS) (2005/2006) showed that the average household size in Nyandarua district is 4.7 giving the total number of households in the area of study to be 107,021. The households are the units of study. Many engage in small scale horticulture production. To be able to generalize results of the study, the study also targeted the suppliers and stockists of seeds and fertilizers, who include the cooperative societies who provide such inputs in the same area of study. There are 34 registered fertilizer and seeds distributors and stockists in the study region (MOA 2010). The main player in fertilizer distribution is the National Cereals and Produce Boards (NCPB). NCPB distributes the fertilizers through farmer's cooperatives and is one of the main importers. Others players are Devji and Megji limited, Mea limited, Athi River mining among others (MOA 2010).

Ministry of agriculture officers who provide services to the small horticulture growers in the area of study were also targeted. There are three administrative districts that are in the area of study. The district agriculture officer (DAO) is the senior most agricultural officer in the district. These three officers were part of the target population. They helped also in identifying and sampling the seeds and fertilizer stockists.

3.4 Sample and Sampling design

Based on the Kenya Integrated household budget survey (KIHBS) (2005/2006) and the Kenya County fact sheets (2011) the area under study has about 107,021 households. In carrying out this study, the unit of analysis was the household. Data was collected from the household head, as the household head makes most of the decisions in the house and exercise authority in

resource allocation. In the household head absence, the spouse or a responsible adult member of the household responded. The sampling design involved sampling from a population of the households of small horticulturists along the road. The agro-climatic conditions in the area of study are similar and therefore a sample taken from the population can be generalized to the larger population of the study area.

Mugenda and Mugenda (2003) say that the rule of the thumb should be to obtain as big a sample as possible. However, resources and time were a major constraint in this research study. To get the sample size to be used in this study the following formula by Watson (2001) was used. $n = \frac{\left[\frac{P(1-P)}{\frac{A^2}{Z^2}+\frac{P(1-P)}{N}}\right]}{R}$ The population size of N is 107,021 N=107,021

Estimated variance P of 70-30 where	P=0.3
Precision or margin of error of 5%	A=0.05
Confidence level Z of 95%	Z=1.96
Expected response rate R of 90%	R=0.9

(Adopted from (Watson & Jeff , 2001))

The calculated sample size is 358 households.

As the population was scattered over a large geographical area, multistage cluster sampling was used. The population of these areas was, Kinangop 192,000, Olkalou 216,000 and Kipipiri 95,000. (Kenya County Fact sheet (2011). The population ratios in the order of Olkalou: Kinangop: Kipipiri is 2.27:2.02:1.00. The sample size in these areas followed the population ratios. The sample size in each area based on this ratio was 153:137:68 households. Samples of 153 households were taken from Olkalou, 137 from Kinangop and 68 from Kipipiri. In

determining which part of each area sampled, cluster sampling was applied. One division from each area was randomly selected for each and the area sample size taken from the selected division.

A random sample of the distributors and stockists of seeds and fertilizers calculated based on the above formula was 34. The number of the agricultural officers was three, as these constitute the population and therefore no need for sampling.

3.5 Research Instruments

The research instruments used for this study were three questionnaires. One questionnaire was administered to the small-scale horticulturalists, another to the suppliers and stockists of fertilizers and seeds, and another to the Agricultural officers. The questionnaires had a mixture of open and closed-ended questions, and were structured. The questions were simple and clear. This enabled collection of large amount of data economically, with ease to standardize, analysis and compare. To answer the questions, the respondents checked in boxes in response to some questions, and gave short answers in others, giving clear views in their own words.

Secondary data was also collected from government offices, from books, journals, theses, government publications and periodicals in the library, and from the internet.

3.6 Instrument Reliability

Mugenda and Mugenda (2003) give four methods of assessing reliability. These are test-retest, equivalent form, split half, and internal consistency. In this research study, test-retest method was applied on the research instrument to assess its reliability. It involved administering the same instrument twice to the same group of subjects. There was a two-week time lapse

between the first and second test. Gay (1992) indicated a two-week time lapse is pertinent assessment of test-retest reliability.

Coefficients of reliability of 0.882, 0.858, 0.853, 0.899 and 0.878 for cost of seeds, cost of fertilizers, labour cost, land lease cost and capital input respectively were obtained implying that the items had a strong relationship to the latent construct. From the findings, the Cronbach alpha values of 0.732, 0.716, 0.614, 0.665 and 0.646 were obtained for cost of seeds, cost of fertilizers, labour cost, land lease cost and capital input respectively. Gable and Wolf (1993) suggested that Cronbach's coefficient of above 0.50 is acceptable as an internally consistent scale so that further analysis can be applied.

3.7 Instrument Validity

There are three types of validity test on an instrument. These are, Construct validity, content validity, and criterion-related validity (Mugenda and Mugenda 2003). In this study, content validity type was applied on the instrument. To ensure that the research instrument is valid, the questions on the factors of production were formulated to capture all variables as identified in the conceptual framework and ensure that the content logically addressed the intended variables. Content validity was used to ensure that the instrument questions reflected the content of the concept. The researcher went through the instruments and compared them with the set objectives of the research. The researcher also ensured that the instruments included all the information that answers the research questions and addresses the research objectives.

The researcher also consulted an expert (my supervisor) to scrutinize the relevance of the instruments items against the set objectives of the study. The experts' advice on the appropriateness of the instrument was taken and incorporated accordingly. The instruments were then adjusted accordingly incorporating all the views to improve its validity.

3.8 Data collection procedure

After the approval of the proposal, the researcher sought an Authority letter to conduct research from the University. During the actual data collection, the questionnaires were administered to the respondents by the researcher and the assistants. The primary data was collected and entered. All the questionnaires were collected immediately and grouped according to the cluster. The completed questionnaires were edited for completeness and consistency. The questionnaires were then taken to the office for organizing and in readiness for the analysis process. The data in the questionnaires was systematically organized to facilitate analysis.

3.9 Data Analysis techniques

Levine, (1997) defined data analysis as a process of inspecting, cleaning, transforming, and modeling data with the goal of highlighting useful information, suggesting conclusions, and supporting decision making. The collected data was sorted and organized to make it easy to analyze. Analysis of data presented essential features and relationships in the data to observe emerging patterns and particular outcomes. The researcher used descriptive, regression and correlation in analyzing the data collected. Descriptive statistics analysis helped to probe the underlying issues and phenomena that are not apparent from frequencies and percentages. The data was then processed, coded and analyzed using Statistical Package for Social Sciences (SPSS). The data results were presented in tables.

3.10 Operationalization of variables

Table 3.1: Table of Operationalization of variables

Objectives	Variables **(Independent)**	Indicators	Measurement scale	Tools of Analysis	Specific Tool
Examine the influence of cost of seeds on the economic livelihood of the small scale horticulturalists	Cost of Seed	- Seeds Prices - Availability - Seed types - Seeds variety - Quantity of seeds	-Nominal -Nominal -Interval	Causal relationship	Frequencies, percentage regression and Correlation analysis
Examine the influence of cost of fertilizer on the economic livelihood of the small scale horticulturalists	Cost of Fertilizer	-Fertilizer prices -Availability -Types of fertilizers -Quantity of fertilizer	-Interval -Nominal -Nominal -Interval	Central Tendency Dispersion, and Causal relationship	Mean, standard deviation, regression and Correlation analysis
Investigate the influence of cost of labour on the economic livelihood of the small scale horticulturalists	Cost of labour	-unit Cost of labour -Availability -Skilled	-Interval -Nominal -Nominal	Causal relationship	Frequencies, percentage regression and Correlation analysis
Examine the influence of land lease on the economic livelihood of the small scale horticulturalists	Land leases	-Acreage -Cost of lease -Cost of buying -Duration of lease	-Interval -Interval -Interval	Causal relationship	Frequencies, percentage Regression and Correlation analysis
Investigate the influence of cost capital input on the economic livelihood of the small scale horticulturalists	Capital input	-Cost of capital input -Availability -Ability to pay	-Interval -Interval -Nominal	Causal relationship	Frequencies, percentage Regression and Correlation analysis
Investigate the influence of independent variables on the economic livelihood of the small scale horticulturalists	**Dependent Variables** Economic livelihood	-Produce in Kg or g -Household income -Reduced losses through wastage	-Interval -Interval	Causal relationship	Frequencies, percentage Regression and Correlation analysis

CHAPTER FOUR
DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter contains data analysis, presentation and interpretation. Data gathered from the small scale horticulturalists, the Agricultural officers and the fertilizer and seeds stockists was analyzed to establish the existing relationships.

4.2 Response Rate

The study targeted 395 respondents consisting of 358 small-scale horticulturists, 34 distributors and stockists of seed and fertilizers, and 3 agricultural officers. Out of 395 questionnaires distributed only 297 were fully filled and returned. This was a 75% response. The distribution of the response was as follows, small-scale horticulturists, 273 (92%), distributors and stockists of seed and fertilizers, 21 (61.8 %) while agricultural officers, 3 (100%). This response rate was realized as a result of the researcher personal engagement in the data collection process together with the research assistants. He also kept on encouraging the respondents to fill-in the questionnaires as well as explaining the importance of their participation in this study. The researcher picked the questionnaires once they were fully filled. This response rate was good and representative and conforms to Mugenda and Mugenda (2003) stipulation that a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent.

4.3 Background Information of the Respondents

In carrying out the study, the researcher sought to establish the respondents' background information. This information helped in assessment of the respondent's suitability in answering the research questions.

4.3.1 Respondents' Language

Table 4.2 shows the results of the analysis of the language that the respondents were familiar with.

Table 4.2: Respondents Language

	Frequency	Percentage (%)
English	178	65
Kiswahili	208	76
Kikuyu	241	88
All 3 languages	192	70

According to the findings, majority 241 (88%) of the respondents were able to communicate in kikuyu well, 208 (76%) were able to communicate in Kiswahili, while 178 (65%) were able to communicate in English. The study also noted that quite a number of the residents 192(70%) were able to communicate in the three languages (Kikuyu, Kiswahili and English)

4.3.2 Age of Respondents

This section presents the age bracket of the respondents. Table 4.3 shows a summary of the findings.

Table 4.3: Age of the Respondents

Ages in years	**Frequency**	**Percentage**
<18	31	11
18-27	48	18
28-37	76	28
38-47	52	19
48-57	43	16
≥58	23	8
Total	**273**	**100**

From the analysis the age 27-37 was the most frequent, with 76 (28%) of the small-horticulturists, 52 (19%) were aged between 38-47 years, 48 (18%) were aged between 18-27 years, 43 (16%) between 48-57 years, 31 (11%) were aged below 18 years and 23 (8%) were more than 58 years. This shows that most of the small scale horticulturists are in the age bracket between 18 to 57 years (81%). This is the most productive age bracket to engage in gainful economic activities.

4.3.3 Marital status

Table 4.4 illustrates the findings of the study on the marital status of the respondents.

Table 4.4: Marital Status

Marital Status	Frequency	Percentage
Single	58	21
Married	215	79
Total	**273**	**100**

According to the findings, majority 215 (79%) of the respondents were married while 58 (21%) were single. This shows that horticulture farming activity in the area is mainly practiced by the married but a sizable 58 (21%) is not married.

4.3.4 Household Size

The researcher also inquired about the household size of the respondents. The household size was meant to ascertain labour availability as well as the economic needs of the families in the area. The results of the finding are as shown in Table 4.5.

Table 4.5: Household Size

Household Size	Frequency	Percentage (%)
≤10	213	78
11 to 15	60	22
Total	**273**	**100**

The findings show that 213 (78%) of the respondents had less than 10 members in the household, 60 (22%) had a household size of 11 to 15 family members.

4.3.5 Respondents highest level of Academic qualifications

The researcher also sought to establish the highest level of academic qualifications that the respondents held. This was in an aim to establish the knowledge and skills levels of the farmers in the area. Table 4.6 presents respondents highest level of academic qualifications.

Table 4.6: Respondents Highest Level of Academic Qualifications

Education level	Frequency	Percentage (%)
Primary school	34	12
Secondary school	164	60
Tertiary education	67	25
Others	8	3
Total	**273**	**100**

Table 4.6 shows that 164 (60%) of the small scale horticulturists had attained secondary education certificate as their highest level of education, 67 (25%) had tertiary education, 34 (12%) had attained primary education while the rest 8 (3%) had other professional qualifications such as CPA, and CPS. The results show that the small scale horticulturalists in this area have high levels of education and literacy 239 (88%), which leads to greater awareness. This however does not necessarily translate into skills in horticulture production.

4.3.6 Usage of Fertilizer and Seeds

The study required the distributors and stockists to rate the small scale horticulturalists in terms of certified seeds and fertilizer usage within the area. The rating was based on a scale of 1–3 (where, 3=Very good, 2=good, 1=bad). In this case mean scores of between 2 and 3 would be deemed very high, between 1.5 and 2 as average and below 1.5 as bad. Mean scores and standard deviation were computed and presented as shown in Table 4.7;

Table 4.7: Usage of fertilizers and seeds

Usage	Mean	STD
Use of certified seeds	2.08	0.593
Use of Fertilizers	2.69	0.218

From the findings, the respondents indicated that use of fertilizer within the area of study was very good as indicated by a mean score of 2.69. The study also established that the use of certified seeds by small-scale horticulturalists as indicated by mean score of 2.08 is very high. In addition, the standard deviation scores were below 0 and ranged between 0.2 and 0.5; indicating that most of the responses were not highly dispersed within the scale. The results show that fertilizer and certified seeds usage by the small scale horticulturist's is high.

4.4 Influence of Cost of Labour on the Economic Livelihood of the Small Scale Horticulturists

The study also investigated the influence of cost of labour on the economic livelihood of the small scale horticulturists.

4.4.1 Number of Employees

The study analyzed the number of employees assisting small scale horticulturalist in farm activities. The respondents were required to indicate whether they hired two, five, more than seven employees or family members. The results are tabulated in Table 4.8.

Table 4.8: Number of Employees

No. of Employees	Frequency	Percentage (%)
2	131	48
5	87	32
>7	33	12
Family Members	22	8
Total	**273**	**100**

From the results in Table 4.9, 131 (48%) of the respondent had 2 employees, 87 (32%) had 5 employees, 33 (12%) had more than 7 employees while 22 (8%) were assisted by their family members. The table also shows that hiring of two employees 131 (48%) was the most frequent. The table also shows that most 219 (80%), of the small scale horticulturalists hired between 2 to 5 employees. This size of labour could be due to the small sizes of the land in the area.

4.4.2 Respondents' income bracket

The study investigated the small scale horticulturalists' income bracket. The respondents provided the amount in Kenya shillings earned from the horticulture farming activities. The respondents were asked to give the total amount they earned from horticultural crops they sold in the previous year after deducting all costs they had incurred. The findings are as illustrated in Table 4.9.

Table 4.9: Total Earning from Horticultural Production

Amount in (shillings)	Frequency (Number of respondents)	Percentage (%)
< 5,000	44	16
5,000-10,000	134	49
11,000-15,000	87	32
16,000-20,000	8	3
Total	**273**	**100**

From Table 4.9, 134 (49%) of the small scale horticulturalist indicated that earned an income ranging from shillings 5,000 to 10,000. In addition, 87 (32%) indicated an income of between shillings 11,000 to 15,000; 44 (16%) indicated an income of less than shillings 5000 while the remaining 8 (14%) indicated earnings of between shillings 16,000 to 20,000. The results thus show that most of the small scale horticulturalists in the area earned between 5,000 and 10,000 from their horticultural farming.

4.4.3 Revenues per each horticultural crop produced

The study also investigated to find out the revenues obtained per each horticultural crop produced in the area. This was a multi-response question where the farmers would tick more than once, thus the response on each crop was out of 273. Findings on revenues per each horticultural crop produced are presented in Table 4.10.

Table 4.10: Revenues per each horticultural crop produced

crop	Earning per acre	Frequency	Percentage (%)
Irish Potato	1,200	120	43.96
Cabbage	900	90	32.97
Carrot	700	101	37.00
Kales	600	89	32.60
Spinach	400	96	35.16

Regarding revenues, 120 (43.96%) respondents indicated that they earned an average of Ksh 1200 from Irish Potato, 900 (37.97%) from cabbage, 700 (37%) from carrot and an average of 600 (32.6%) from kales and 400 (35.16%) from spinach. These earnings were calculated on the basis of 1/8 of an acre. The findings mean that Irish potato and carrot were the most frequently grown in the area of study. Cabbages, though the third in the list of most frequent crops was also the second crop, 3in earnings per acres generate a great part of the small scale horticulturalists.

4.4.3 Number of Employees Required in Months

The study further investigated the demand for labour by the small scale horticulturalists. From the findings the demand for labour was found to be high during the months of March, April and May which is the main planting seasons. In these months, the small scale horticulturalists required two more employees. A few small scale horticulturalists required six to ten employees during these months. Most of the employees who were hired during the planting season (March,

April and May) were from the neighboring villages which are about 2 kilometers away or even from 3 to 8 Kilometers away. The results showed that the highest demand for labour is in March.

4.4.4 Numbers of Employees Used for the Last Three Years

The study sought to find out the demand and trend for labour in the study area. An investigation of the number of employees hired in the last three years was done. Summary of the findings is as shown in Table 4.11.

Table 4.11: Numbers of Employees hired for the Last Three Years

Numbers of Employees	2010		2011		2012	
	F	(%)	F	(%)	F	(%))
less than one	0	0	3	1	11	4
1 to 3	11	4	55	20	126	46
3 to 5	41	15	60	22	96	35
6 to 9	85	31	87	32	112	41
9 to 11	3	1	3	1	134	49

The findings show that in the year 2010, 85 (31%) of the small scale horticulturalist employed between 6-9 employees, in the year 2011 87 (32%) of the small scale horticulturalist employed between 6-9 employees. In the year 2012, 134 (49%) of the small scale horticulturalist employed between 9-11 employees, while 126 (46%), employed between 1-3 employees. This shows a general increase in the trend for labour demand. Each New Year's labour demand is higher than the previous one in terms of numbers. A possible reason for this general increase in demand for labour is increase in the area under horticulture production.

4.5 Influence of Land on the Economic Livelihood of the Small Scale Horticulturists

Land as a factor of production is limited. Every small scale horticulturalists works towards getting maximum output from the available land. Where need for more land arises, the small scale horticulturalists leases the land from those who are not immediately using it. This part of the study investigated the influence of land on the economic livelihood of the small scale horticulturists.

4.5.1 Leasing of land

This section of study investigated how land used for horticulture production by the small scale horticulturalists, had been acquired. Horticulture production was on the rise in the area. The respondents were asked if they leased land or Not, for horticultural production in the course of their growing season. From the findings, 196 (71.8%) of farmers lease land for horticultural crops production while 75 (27.2%) indicated that they didn't in 2010. In 2011, 221 (80.9%) leased land as opposed to 52 (19.05%) who did not. These results indicate that there were more small scale horticulturalists who leased land in 2011 than in 2010. This increase in the demand for leased land is an indication of an increase in horticultural production in the area.

4.5.2 Size of Land used by the small scale horticulturalists in the last three Years

The study also required to find out the acreage used by the small scale horticulturalist for horticulture production in the last three years. Table 4.12 shows summary of the findings.

Table 4.12: Size of land used by the small scale horticulturalists in the Last Three Years

	2010		2011		2012	
	Respondents	**%**	**Respondents**	**%**	**Respondents**	**%**
< 1 acre	126	46	112	41	90	33
2 acres	84	31	95	35	115	42
3 to 5 acres	60	22	55	20	49	18
> 5 acres	3	1	11	4	19	7
Totals	**273**	**100**	**273**	**100**	**273**	**100**

In 2010, 126 (46%) of the small scale horticulturalist indicated that they leased 1 acre for horticulture production, 84 (31%) leased 2 acres, 60 (22%) leased 3 to 5 acres, while 3 (1%) leased more than 5 acres. In year 2011, 112 (41%) of the small scale horticulturalists leased less than 1 acres, 95 (35%) leased two acres, 55 (20%) leased 3 to 5 acres, and 11 (4%) leased more than 5 acres. In the years 2012, 90 (33%) leased less than 1 acre 115 (42%) leased 2 acres, 49 (18%) leased 3 to 5 acres while the remaining 19 (7%) had leased more than 5 acres. This shows an increase in the acreage leased for horticulture farming, over the period of study. A combined size of less than 1 acre and two acres shows a decreasing number of respondents from year 2010 to 2012, changing from 210 (77%), 207 (76%) and 205 (75%). In the same period, the acreage leased for sizes 2 to 5 acres combined changed from 144 (53%), 150 (55%) to 164 (60%) which is a 7% overall change. This shows that the demand for larger size of leased land was on the increase. However, the demand for 3 to 5 acres land shows a decline in the trend, 60 (22%), 55 (20%), and 49 (18%) in years 2010, 2011 and 2012 respectively. This is a 4% overall decline. Larger sizes of land are more expensive to lease for the small scale horticulturalists. This may

explain the reason for the decline in the number of small scale horticulturalists leasing more than 3 acres of land. However, a new category of small scale horticulturalists who can lease more than 5 acres emerges. The trend shows that demand for more than 5 increased from 3 (1%) in 2010, 11 (4%) in 2011, and 19 (7%) in 2012.

4.5.3 Cost of Land Leasing

The study showed that the cost of land lease ranges between 7,000 to 10,000 shillings per acre per year. One year has two seasons. The demand for land for lease seems to increase with time. In 2010 an acre of land would cost the small scale horticulturalists between shillings 4000 to 6000 to lease in a year. In year 2012, the cost of lease for the same acre of land was found to be between shillings 7,000 to 10,000.

In terms of land for purchase, which is an alternative to leasing, it was found that land for purchase was scarce. It was difficult to get land to buy. Where available, the cost ranges between shillings 500,000 to 800,000 per acre. The price ranges was also found to vary with the location of the land, with respect to infrastructures such as road and the market. The nearer the land was to the road and nearby market, the higher the selling prices.

4.6 Influence of cost of Seeds on the Economic Livelihood of the Small Scale Horticulturists

Acquiring quality variety of seeds for horticultural produce ensures good production. Good land preparation, seedling establishment management, pest and disease control, all complement the quality seed factor. This study sought to examine the influence of cost seeds on the economic livelihood of the small scale horticulturists.

4.6.1 Horticultural Crops Grown

Several horticultural crops were grown in the area of study. According to the study, cabbages, kales, courgette, corianders, carrots, beetroots, cabbages, potatoes, tomatoes, french beans and peas were some of the horticultural crops grown in the area of study.

4.6.2 Commonly Demanded Horticulture Crops

The study also investigated the demand for the most commonly grown horticulture crops. From the findings, the respondents indicated that carrots, courgette, beetroots and kales were on high demand.

4.6.3 Average Amount Paid for Seed

Further, the results showed that 109 (40%) of the small scale horticulturalists paid a total of shillings 1,500 for a 110 Kg of potatoes seed, 82 (30%) paid shillings 200 per kilogram of garden peas, 76 (28%) paid 3200 shillings per kilogram of cabbage seeds, 60 (22%) paid shillings 3300 per a kilogram of carrot seeds while 49 (18%) paid a total of 50 shillings for a bunch of 10 green house tomato seedlings. This response was corroborated by the District Agricultural officer who gave similar results on the prices for the horticultural crops seeds and seedlings. The District Agricultural Officer also indicated that the average price of the seeds sold to the small scale horticulturalists were high which in many cases led to use of uncertified seeds.

4.7 Influence of cost of Fertilizer on the Economic Livelihood of the Small Scale Horticulturists

This study aimed at investigating the influence of cost of fertilizer on the economic livelihood of the small scale horticulturists.

4.7.1 Fertilizer types and usage

In the study, respondents were requested to indicate the type of fertilizer commonly used in growing horticultural crops in their area. The study noted that CAN, DAP and urea were the most common fertilizers used. Foliar sprays such as 20:20:0, 17:17:17, 23:23:0 and organic fertilizer were also used to grow horticultural crop to a moderate extent. The researcher requested the respondents (stockiest) to indicate the usage of different fertilizer types. According to the findings, 24 (70%) of the respondents indicate that DAP is the most frequently used fertilizer in the area, 22 (66%) indicated that CAN is the second most common fertilizer and 19 (56%) pointed out that urea and foliar sprays are also used. Foliar sprays that were noted as common were NPK 20:20:0 and NPK 23:23:0 while NPK 17:17:17 was noted as the least used.

4.7.2 Demand for Fertilizer

The small scale horticulturalists on the other hand indicated that the demand for various fertilizers varied with different fertilizer types. From the findings, a majority of the respondents 164 (60%) indicated that they used DAP fertilizer making it the most demanded, 123 (45%) indicated that CAN was second in demand and 104 (38%) pointed that they used foliar sprays. However it is worth noting that 218 (80%) said that urea was least demanded. Worth noting also is that fertilizer was packed into quantities of 50kg which makes it easy to transport to the farming sites.

4.7.3 Average Price of Fertilizer

The study also showed the average price of the fertilizer per unit distributed to small scale horticulturalists. From the findings, average price of the DAP was found to be shillings 3600 per 50kg, CAN had an average price of 2400 shillings per 50kg while average price of urea was 3000 shillings for a 50kg unit.

4.7.4 Average Price of Fertilizer for the Three Years

The study also inquired about the average price of fertilizer sold to the small scale horticulturalist for a three year period. The findings are presented in Table 4.13.

Table 4.13: Average Price of Fertilizer for the Three Years (2010 – 2012)

Fertilizer	Quantity	Average Price. (Ksh)
DAP	50kg	3500
CAN (20:20:0)	50Kg	2200
Foliar sprays (23:23:0)	20lts	3300
Foliar sprays (17:17:17)	20lts	2700

According to the findings, the average price for DAP was 3500 for 50kg, CAN was 2200, Foliar sprays 23:23:0 was shillings 3300, Foliar sprays 17:17:17 was shillings 2700.

4.8 Influence of Capital Input on the Economic Livelihood of the Small Scale Horticulturists

The study sought to examine the influence of capital input on the economic livelihood of the small scale horticulturists.

4.8.1 Providing the Small Scale Horticulturalists Seeds on Credit

The study sought to investigate whether stockists and distributor offered the small-scale horticulturalists seeds on credit. The respondents were asked questions that needed a YES or NO response. Table 4.14 shows the responses.

Table 4.14: Providing the Small Scale Horticulturalists Seeds on Credit

Response	Frequency	Percentage
No	273	91.9
Yes	24	8.1
Total	297	100.0

The results shows that 273 (92%) of the small scale horticulturalists do not get seeds on credit from the stockists and distributors while 24 (8%) do. This means that for the small scale horticulturalists to use seeds, they must either buy from the stockists and distributors on cash basis or make alternative credit arrangements for themselves. This affects the availability of seeds and fertilizers, since the small scale horticulturalists who cannot afford, will most likely not use quality certified seeds.

4.8.2 Providing the Small Scale Horticulturalists Fertilizer on Credit

The study also sought to investigate whether stockists and distributors offered the small scale horticulturalists fertilizer on credit. The findings of the study are as shown in Table 4.15

Table 4.15: Providing the Small Scale Horticulturalists fertilizer on Credit

	Frequency	Percentage
No	248	83.5
Yes	49	16.5
Total	**297**	**100.0**

The study showed that 248 (84%) of the respondents said that stockists do not sell seeds and fertilizers to the small scale horticulturalists on credit, while the rest 49 (17%) said they do.

4.8.3 Working with Financial Institutions

The study sought to establish if the stockists and distributors work with any specific financial institution to supply goods to the small scale horticulturalists on credit. From the findings, all the stockists and distributors of seeds and fertilizers work with financial institutions to give the small scale horticulturalists some form of credit facility.

4.8.4 Financial Institution working with Stockists and Distributors to provide credit lines to the small scale horticulturalists.

Table 4.16 shows the summary of the findings on the preferred financial institutions working with stockists and distributors to provide credit lines to small scale horticulturalists.

Table 4.16: Preferred Financial Institution working with Stockists and Distributors to provide credit lines to the small scale horticulturalists

Institution	Frequency	Percentage (%)
Commercial Banks	12	57.1
Farmer's Cooperative Society	6	28.6
Investment group	3	14.3
Total	21	100.0

The study shows that Commercial Banks were the most popular financial institutions among the stockists and distributors. The study also showed that of the 21 respondents, 12 (57.1%) of the Stockists and Distributors provided credit lines to the small scale horticulturalists through commercial banks, 6 (28.6%) through farmers' cooperative societies while, 3 (14.3%) through investment groups. The high preference by the stockists and distributors to commercial banks is

due to their formal structures and reduced risk in cases of default from the small scale horticulturalists. This is however expensive on the small scale horticulturalists as they have to pay the credit at the prevailing interest rates.

4.9 Challenges in Securing Production Inputs

The study requested the respondent to indicate some of the problem that small scale horticulturalists face in securing production inputs. The respondents cited high cost of seeds and poor quality of seeds, inadequate supply of fertilizer on time during planting, high cost of fertilizer and high cost of Capital, as some of the problems faced by the small scale horticulturalists. The small scale horticulturalists cited cost of capital as a major hindrance in their effort to improve their production and hence the economic livelihood. Land leasing and labour costs have also become more expensive and hence reducing their income.

4.10: Inferential statistics

The study applied inferential statistics (regression analysis). The application of regression analysis identifies the relationship between the quantitative variables; that is the dependent variable, whose value is to be predicted, and the independent or explanatory variables about which knowledge is available. The technique can show what proportion of variance between variables is due to the dependent variable, and what proportion is due to the independent variables. The relation between the variables can be illustrated graphically, or more usually using an equation. The study adopted multiple regression guided by the following model:

Regression model

$$Y= \beta_0 + \beta_1X_1+ \beta_2X_2+ \beta_3 X_3+ \beta_4X_4 + \beta_5X_5$$

Where;

Y= Economic livelihoods

β_0 = Constant Term (when $\beta_1 \ldots \beta_5 = 0$)

$\beta_1 \ldots\ldots \beta_5$ (Beta coefficients)

X_1- cost of seeds

X_2- cost of fertilizers

X_3- labour cost

X_4 – land lease cost

X_5 - capital input

4.10.1 Regression Results

In this part, Economic livelihood variable was regressed against the five variables (cost of seeds, cost of fertilizers, labour cost, land lease cost and capital input). The results are presented in Tables 4.17

Table 4.17: Model Summary

Model	R	R^2	Adjusted R Square	Std. Error of the Estimate
1	0.918[a]	0.843	0.805	0.51038

a. Predictors: (Constant), cost of seeds, cost of fertilizers, labour cost, land lease cost and capital input

R-square is the proportion of variance in Y related to differences between the groups. In this case, the coefficient of determination (the percentage variation in the dependent variable being explained by the changes in the independent variables) R_2 equals 84.3%, that is, cost of seeds,

cost of fertilizers, labour cost, land lease cost and capital input explain 84.3 percent of the variance in Economic livelihood.

Table 4.18: ANOVA of the Regression

Model		Sum of Squares	Degree of freedom	Mean Square	F	Sig.
1	Regression	2.113	23	0.528	10.012	.000
	Residual	15.554	250	0.522		
	Total	16.667	273			

a. Predictors: (Constant), cost of seeds, cost of fertilizers, labour cost, land lease cost and capital input

b. Dependent Variable: Economic livelihood

In this case, the significance value of the F statistic is 0.000 indicating that all the independent variables (cost of seeds, cost of fertilizers, labour cost, land lease cost and capital input) explain variation in economic livelihood.

Table 4.19: Regression Coefficients Results

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	T	Sig.
1	(Constant)	.260	0.046001		5.6521	.000
	Cost of seeds	0.875	0.074601	.254	11.729	.000
	Cost of fertilizers	0.823	0.21784	.300	3.778	.000
	Labour cost	0.551	0.248534	.113	2.217	.000
	Land lease cost	0.631	0.074	.056	8.527	.000
	Capital input	0.670	0.088007	-.167	7.613	.000

a. Dependent Variable: economic livelihood

Regression equation

Based on regression coefficients results the regression equation can be written as follows;

$Y = .260 + 0.875X_1 + 0.823X_2 + 0.551 X_3 + 0. 631X_4 + 0.670 X_5$

The multiple linear regression models indicate that all the independent variables have positive coefficients. The regression results above reveal that there is a positive relationship between dependent variable (economic livelihood) and independent variables (cost of seeds, cost of fertilizers, labour cost, land lease cost and capital input).

From the findings the order of significance of the factors influencing economic livelihoods of the small-scale horticulturists farming starting with the most significant to the least is; cost of seeds, cost of fertilizers, capital input, land lease cost and labour cost respectively.

4.11 Variable analysis

The results of regression analysis were interpreted based on the following;

β = A measure of how strongly each independent variable influences the dependent variable.

t= statistic is the *coefficient* divided by its *standard error*

p = determined by t statistic, is the probability of getting a result as extreme as the one you are getting in a collection of random data in which the variable had no effect.

4.11.1 Cost of labour and its influence on economic livelihoods of the small scale horticulturists farming along the Dundori-Olkalou-Njambini road in Nyandarua County

The analysis of Cost of labour was done through descriptive and regression analysis. The findings indicated that 219 (80%) of the small scale horticulturalists hire 2 to 5 employees. The

regression analysis showed that cost of labor had a positive and significant effect on economic livelihood of the small scale horticulturalists. The findings were supported by these statistics which gave, β= 0.551, t= 2.217, and p=<000.

4.11.2 Cost of leasing land and its influence on economic livelihoods of the small scale horticulturists farming along the Dundori-Olkalou-Njambini road in Nyandarua County

The analysis on this variable was conducted through descriptive and regression analysis. From the findings, 196 (71.8%) of the small scale horticulturalists lease land for horticulture crop production. The regression analysis showed that the cost of leasing land influence economic livelihood of the small scale horticulturalists. This was supported by the statistics from the regression analysis, β=0.631, t=8.527, and p=<000.

4.11.3 Cost of seeds and its influence on economic livelihoods of the small scale horticulturists farming along the Dundori-Olkalou-Njambini road in Nyandarua County

The analysis on this variable was conducted through descriptive and regression analysis. The District Agricultural Officer indicated that the average price of the seed sold to the small scale horticulturalists were high which in many cases led to use of uncertified seeds. These finds were supported by regression analysis results which showed that cost of seeds influence economic livelihood of the small scale horticulturalists. The findings were supported by these statistics showing that, β= 0.8751, t= 11.729, and p=<000.

4.11.4 Cost of fertilizers and its influence on economic livelihoods of the small scale horticulturists farming along the Dundori-Olkalou-Njambini road in Nyandarua County

From the findings, a majority of the respondents 164 (60%) indicated that they used DAP fertilizer making it the most demanded, 123 (45%) indicated that CAN was second in demand and 104 (38%) pointed that they used foliar sprays.

In addition regression results indicated that cost of fertilizers influences economic livelihood of the small scale horticulturalists. The findings were supported by statistics, $\beta = 0.823$, $t = 3.778$, and $p = <000$.

4.11.5 Capital input and its influence on economic livelihoods of the small scale horticulturists farming along the Dundori-Olkalou-Njambini road in Nyandarua County

The findings indicated that 273 (92%) of the small scale horticulturalists do not get seeds on credit from the stockists and distributors. This means that for the small scale horticulturalists to use seeds, they must either buy from the stockists and distributors on cash basis or make alternative credit arrangements for themselves. This has an effect on the availability of seeds, as those who cannot afford, will most likely not use quality certified seeds. The regression results indicated that Capital input influences economic livelihood of the small scale horticulturalists. The findings were supported by the statistics results, $\beta = 0.670$, $t = 7.613$, and $p = <000$.

CHAPTER FIVE
SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter presents summary of findings, discussion, conclusions, recommendations and areas for further research.

5.2 Summary of Findings

Results from a regression of cost of labour on economic livelihood of the small scale horticulturists gave a strong positive relationship of 0.551 or 55.1%. This result implies that a positive change in the cost of labour results in a positive influence in the economic livelihood of the small scale horticulturalists. This influence was however observed to be lower than that of cost of seeds and fertilizers. Some small scale horticulturalists would prefer to use family labour as opposed to hiring. However, overall cost of labour influences economic livelihood of the small scale horticulturalists.

From the findings, a regression of cost of land lease on economic livelihood of the small scale horticulturists indicated a strong positive relationship of 0.631 (63.1 %). These inferential statistics showed that cost of land leasing positively influenced the economic livelihoods of the small scale horticulturalists. Though leasing eats into the small scale horticulturalists disposable income, the overall increase in land under production increases production and sales. This positively influences the Economic livelihood. Thus the cost of land lease affects economic livelihood of the small scale horticulturists.

Regression results of cost of seeds on economic livelihood of the small scale horticulturists showed a strongest positive relationship of 0.875 (87.5%). Use of quality seeds leads to increase in production. High production leads to increase in sales. Increase in sales influences the

economic livelihood of the small scale horticulturalists. Increase in production means an increase in the sales volume which positively influencing the economic livelihoods of the small scale horticulturists.

From the findings, regression results of cost of fertilizers on economic livelihood of the small scale horticulturists also indicated a very strong positive relationship of 0.823 (82.3%). An increase in the use of fertilizer positively influences the economic livelihood. Fertilizers usage improves plants nutrition and thus enhancing soil fertility. As a result this influences the production and hence an increase in sales of the produce. This positively influences the economic livelihood of the small scale horticulturalists.

Results from a regression of capital input on economic livelihood of the small scale horticulturists showed a strong positive relationship of 0.67 or 67. %. Thus, indicating that the relationship between capital and economic livelihood was positive. The use of capital leads to an overall increase in the use of other factors of production. In turn this leads to an increase in production. An increase in production leads to increase in sales volume which positively influences the economic livelihoods of the small scale horticulturalists.

5.3 Discussion of findings

Inferential statistics gave strong indications of the existing relationship between the five factors under study and the economic livelihood of the small scale horticulturalists. This section discusses the findings for each factor at a time.

5.3.1 Influence of cost of labour on the economic livelihood of the small-scale horticulturists farming along Dundori-Olkalou-Njambini road.

Labour is one of the factors of production and it is the ability to work. According to Humphrey, (2006), some horticulture crops are attractive to small scale horticulturists because they are labour intensive. Results from the inferential statistics showed that labour has a strong influence on the economic livelihood of the small scale horticulturalists. A unit positive change in labour leads to a 55.1% positive change in the economic livelihood of the small scale horticulturalists. The study also established that the small scale horticulturalists apply both hired and family labour. Family labour has the advantage of reducing the overall cost of labour in that most of the members do not receive a wage or a salary. The study also established that full time employees' were paid between shillings 5,000 to 5,500 per month, while part time employees were paid between 250 to 300 shillings per day. Part time labour is only hired when needed making the use of part time labour more preferred although more expensive. It was also noted that labour demand increases during planting and harvesting seasons. Clark (1973), notes that there is a relationship between agricultural land population, that is, the population around agricultural areas, and land values. Prime agricultural land attracts more population seeking employment in the sector. This explains the availability of labour in peak periods in the area of study.

5.3.2 Influence of cost of leasing land on the economic livelihood of the small-scale horticulturists farming along Dundori-Olkalou-Njambini road.

On cost of leasing, the study established that there is a positive change over the years in the area of horticultural production under lease. Many small scale horticulturalists are increasingly leasing land for horticulture production. 67% lease a maximum of 3 acres at a cost ranging between 7,000 to 10,000 shillings per acres per year. A regression of the cost of leasing land on

economic livelihood of the small scale horticulturists resulted in a strong positive relationship of 0.631 (63.1 %). This means that a unit change in the cost of lease of land leads to a 0.631 corresponding change in the economic livelihood. This is an important observation as land available for production comes from two sources, owning or leasing. Since land is a fixed factor of production, once it is committed to horticulture production, it is unavailable for any other activity. For the small scale horticulturalist to lease land, it must make economic sense. Leasing land eats into the small scale horticulturalists income denying the use of the same income onto other gainful activities. The increase in the cost of leasing land shows that the small scale horticulturalists is making economic gains. In doing so the small scale horticulturalists improves on the economic livelihood. The study also found that it was difficult to buy land. Where land was available for purchase, the cost ranges between 500,000 to 800,000 per acre. This means that owning land is an expensive option for the small scale horticulturists.

5.3.3 Influence of cost of seeds on the economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road.

On seeds and planting materials, Tschirley & Ayieko, 2008 asserted that these are the most important inputs in agricultural production. Quality seeds and planting materials provide the small scale horticulturalists the opportunity to exploit the full production potential of the crop to be grown. Poor quality seeds and planting materials will result in crops failing to attain their full production potential regardless of the other inputs in production. Utoh, (1994) argues that quality seeds maintain genetic stability and varietal purity and therefore ensure consistency in the produce the small scale horticulturists produce. The study noted that cost of seed ranged between shillings 1500 to 3300, depending on the variety of seed and the quantity. The small scale horticulturalists also noted that these prices were high. Results from a regression of cost of seeds

on economic livelihood of the small scale horticulturists showed a very strong positive relationship of 0.875 (87.5%). This means that a unit change in the cost of seeds strongly influences the economic livelihood of the small scale horticulturalists. This coupled with the observation that there is a high usage of certified seeds means that the small scale horticulturalists attach the importance of using quality seeds to the production results. Though expensive, the gain in the output far outweighs the costs. On the same, the study found distribution and supply of the crop seeds such as cabbages, kales, couchettes, carrots and beetroots good. The study also established that most of the seeds grown were certified seeds hence of high quality. On quantity, most of the small scale horticulturalists could access sufficient seeds as required.

5.3.4 Influence of cost of fertilizers on the economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road.

The study found that there were various varieties of fertilizer available with varying cost. The average price of the DAP, CAN, and Urea was shillings 3600, 2400, and 3000 per 50kg bag. Regression results of cost of fertilizers against economic livelihood of the small scale horticulturists indicated strong positive relationship of 0.823 (82.3%). This was despite an indication from the small scale horticulturalists that the prices of fertilizers were high. Fertilizers usage improves plants nutrition and thus enhancing soil fertility. Fertile soils increase crop production. An increase in the use of fertilizer positively influences the economic livelihood. The study established that the fertilizers are well distributed throughout the study area.

5.3.5 Influence of capital input on the economic livelihood of the small scale horticulturists farming along Dundori-Olkalou-Njambini road.

Low availability of capital and limited access to affordable credit hampers development of the small scale horticulture. One of the main causes of low productivity in horticulture is inadequate credit to finance purchase of inputs and capital investment (Ashley & Maxwell, 2002). The study also found that small scale horticulturalist spend amounts between shillings 8,000 to 120,000 per acre per year for horticulture production. This is a high opportunity cost, as in choosing to undertake horticultural production; they forego any other activity that would otherwise be a source of gainful employment. The study also indicated that small scale horticulturalists sought financial support from different financial institution with the farmers' cooperative Society and investment group as the most preferred. However, this comes at a cost of between 12% and 25%. Results of this study also showed that capital and economic livelihood are strongly related. A unit change in the capital input has the potential of influencing economic livelihood by a 0.67 (67%). This means therefore that capital input has a strong influence the economic livelihood.

5.4 Conclusions

Based on the findings, the study concludes that cost of labour, cost of seeds, cost of fertilizer, cost of lease of land and cost of capital, influences the economic livelihood of the small scale horticulturalists in the area of study.

The study also concludes that factors of production studied have varying influence on the economic livelihood. Cost of seeds and cost of fertilizers was found to have the strongest influence of 0.875 and 0.823 respectively, based on regression inferential statistics. Cost of capital and cost of lease of land gave 0.67 and 0.631 respectively and cost of labour gave a

0.551. This study therefore concludes that changes in the costs of seeds and fertilizers are very sensitive in influencing the economic livelihood of the small scale horticulturalists. The regression results for Cost of labour against the economic livelihood of the small scale horticulturalists resulted in 0.551. The conclusion is that labour is the least significant in influencing the economic livelihood of the small scale horticulturalists. Comparing regression coefficients cost of labour and that of cost of seeds shows that cost of seeds elicits 1.6 times more influence on economic livelihood than that of cost of labour. Comparing regression coefficients cost of labour and that of cost of fertilizer shows that cost of fertilizers elicits 1.5 times more influence on economic livelihood than that of cost of labour.

In conclusion an increase in cost of the factors of production under study, though depleting the earnings of the small scale horticulturalists, has the overall effect of positively influencing their economic livelihood.

5.5 Recommendations

From the findings, the quality certified seeds distributed to the small scale horticulturalists had a high potential to influence the economic livelihoods of the small scale horticulturalists. Certified seeds are disease and pests resistance, which also reduces the cost incurred by the small scale horticulturalists in disease and pests eradication. The researcher recommends that stakeholders, like the Ministry of Agriculture, should carefully consider policies in pricing and distribution of seeds to the small scale horticulturalists. Improving availability and affordability would increase the production and hence improvement of their economic livelihoods.

Hired labour was shown to be a significant component of costs of horticultural crop production. The small scale horticulturalists and other stakeholders need to explore on mechanization of their operations where possible, to reduce reliance on hired labour.

The study found that there is increasing pressure on available land for horticulture production. As a result, more small horticulturalists are leasing land for production. The stakeholders in small scale horticultural sectors should use a deliberate and practical approach, to identify and train the small scale horticulturalists on optimal land use methods on the available land. In land use, the small scale horticulturalists need to look at production per square unit of the available land. This will prompt them to think and work efficiently. Crops to be produced need be those that give the highest benefit per square unit to the small scale horticulturalists.

Regarding fertilizer, the study recommended that the stakeholders engage to ensure that each player gets the full benefit. The seeds and fertilizer stockists and distributor are part of the network that ensures food security. Creating good distribution networks and good credit terms, the small scale horticulturalists will be able to access the two ingredients, fertilizers and seeds, on time and affordably. Subsidies on fertilizer price need be reviewed to make it more affordable to the small scale horticulturalists. On packaging, it was observed that the packages of fertilizer are big and expensive. Repackaging into small packets will make it more accessible to the small scale horticulturalists.

The study found that the interest charged on short term loans ranges from 12% to 25%. This is very expensive given that a small scale horticulturist may need to borrow twice in a year to be able to effectively produce. This means when one looks at the interest rates charged per year, they are high. This study recommends that the small scale horticulturalists be encouraged to

join the farmers' cooperative societies to be able to access loans that are more affordable. The government can also come in to subsidize on such loans advanced to the small scale horticulturalists through farmer's cooperatives.

5.6 Suggestions for Further Research

From the findings, cost of seeds, cost of fertilizers, cost of labour, cost of land lease and capital input, contribute significantly in the economic livelihood of the small scale horticulturalists, farming along the Dundori-Olkalou-Njambini highway, in Nyandarua County. However, there are other factors which influence farmers' economic livelihood. The study recommends other scholars to conduct further study to explore what these factors are.

The Ministry of Agriculture also needs to conduct a research to find out what the influence of these factors of production would be like, at optimal level of production. This will help in designing and implementation of strategic policies in regard to horticultural farming.

In addition, further research should be conducted in other horticulture growing areas such as Mwea, Meru, and Kisii to enhance the validity of the research findings.

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Appendix i : University Introduction Letter

UNIVERSITY OF NAIROBI
COLLEGE OF EDUCATION AND EXTERNAL STUDIES
SCHOOL OF CONTINUING AND DISTANCE EDUCATION
DEPARTMENT OF EXTRA-MURAL STUDIES
NAIROBI EXTRA-MURAL CENTRE

Your Ref:

Our Ref:

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Main Campus
Gandhi Wing, Ground Floor
P.O. Box 30197
N A I R O B I

29th October 2012

REF: UON/CEES/NEMC/13/386

TO WHOM IT MAY CONCERN

RE: FRANCIS N. MIRINGU- REG NO L50/64168/2010

This is to confirm that the above named is a student at the University of Nairobi College of Education and External Studies, School of Continuing and Distance Education, Department of Extra-Mural Studies pursuing Master of Arts in Project Planning and Management.

He is proceeding for research entitled **"factors influencing economic livelihood of horticulturalists along Dundori-olkalou-Njambini road".**

Any assistance given to him will be appreciated.

UNIVERSITY OF NAIROBI P. O. Box 30197 NAIROBI NAIROBI EXTRA-MURAL CENTRE

CAREN AWILLY
CENTRE ORGANIZER
NAIROBI EXTRA-MURAL CENTRE

Appendix ii: Letter of Transmittal

RE: Introduction

Dear Sir/Madam,

I am a post graduate student from the School of Continuing and Distance Education, University of Nairobi. I am carrying out a study for my research paper titled, "Factors influencing Economic livelihood of the small scale horticulturalists farming along the Dundori-Olkalou-Njambini road in Nyandarua County"

In order to achieve this objective, I have designed a questionnaire for collecting information. You have been selected to participate in this study. I kindly therefore request you to provide answers to the questions asked. Your response will be treated with strict confidentiality and will be used for research purpose only.

Thank you and Kind regards

Yours faithfully,

_____

FRANCIS NJOROGE MIRINGU
UNIVERSITY OF NAIROBI

Appendix iii: Questionnaire for the District Agricultural Officers

INTRODUCTION

This Questionnaire is a research instrument to collect data that will be used to investigate the factors that influence economic livelihoods of the small-scale horticulturalists living along Dundori-Olkalou-Njambini road, in Nyandarua County.

1. :BACKGROUND INFORMATION (Please fill in the spaces provided as appropriate)

   Questionnaire No [ ] Date [/ /]

   Name of Region……..……..

   Interviewer……..

   Name of respondent (optional)…….…….…..

   Title of respondent…….…….……

2. Background Information of region

   a. On a scale of 1 – 3 as Very good, and bad how would you rate small scale horticulturalists in your region of service in terms of the following (Tick accordingly (√))

Activity	3=Very good	2=Good	1=Bad
Use of certified seeds			
Use of Fertilizers			
Hired labour use			
Use of Machinery (Capital)			
Application Experts advice from MOA			

b. How would you rate the level of the small scale horticulturalists in terms of the following, on a level of 1-3, Tick accordingly (√)

Activity	3=Good	2=Fair	1=Bad
Level of exposure to Agriculture information			
Willingness to disclose information			

LABOUR

3. How would you describe the Labour availability for the small scale horticulturalists in your region on a scale of 1-3 (Tick as appropriate)

Type of employee / Availability	Full-time employees	Part-time employees	Unpaid family members
3=Very good			
2=good			
1=Bad			

4. What monthly earnings range would best represent the following categories of labour in your region? (Mark with √)

Employment Status	Income class (Ksh per Month in '000)					
	<5	5-10	11-15	16-20	21-25	>25
Full time farmer						
Part time farmer						
Full time hired labour						
Part time hired labour						
Full time family labour						

LAND

5. Do the small scale horticulturalists in this lease land for horticultural crop production (Tick where appropriate √). Yes……No……..
6. On a scale of 1-3, how would you rate the use of leased land by small scale horticulturalists (Tick as appropriate). (3=Very common, happens to over 20% of small horticulturalists; 2=Normal, Happen for about 20%; 1=Not common, happens to < than 20%)

	Occurrence	
1	3=Very common	
2	2=Normal	
3	1=Not Common	

7. On a scale of 1-3, as 3=Most common, 2=Common, 1=Least common, what is the most common small scale horticulturalists land size in your area?

Land under horticulture	Prevalence
>6 acres	
3-6 acres	
<3 acres	

SEEDS

8. What horticulture crops are grown in your region? Fill in the spaces provided

   1. ……
   2. ……
   3. ……
   4. ……
   5. ……

9. On a scale of 1- 3 (3=Very common, 2=Common, 1=Not common), indicate how common the above crops in VIII are in your region.

No.	Horticultural Crops grown in this region	How common		
		3	2	1
1				
2				
3				
4				
5				

10. How would you describe the supply and distribution of seeds of the crops mentioned in VIII above, in your region to the small scale horticulturalists, on a scale of 1-3 (3=very good, 2=good, 1=Poor) (Tick (√) as appropriate)

No.	Horticultural crops	Supply/Distribution to the small scale horticulturalists		
		3	2	1
1				
2				
3				
4				
5				

11. What is the average price of seeds (of the crops mentioned in VIII above) per unit in your region?

No.	Horticultural crops	Price per unit (Ksh)
1		
2		
3		
4		
5		

12. What were the average prices of seeds (of the crops mentioned in VIII above), in your region last year (2011)? (Fill in the gaps)

No.	Horticultural crops	Price per unit (Ksh) in 2011
1		
2		
3		
4		
5		

13. What were the average prices of seeds (of the crops mentioned in VIII above) in your region two years ago (2010)? (Fill in the gaps)

No.	Horticultural crops	Average Cost of seeds in 2010 (Ksh)
1		
2		
3		
4		
5		

FERTILIZERS

14. What fertilizers are used by the small scale horticulturalists in your region? Fill in the spaces provided

1……

2……

3……

4……

5……

6……

15. On a scale of 1- 3 (3=Very common, 2=Common, 1=Not common), indicate how common the above fertilizers (given in XIV above) are in your region.

No.	Fertilizers in this region	How common		
		3	2	1
1				
2				
3				
4				
5				
6				

16. How would you describe the supply and distribution of fertilizer (given in XIV above) to the small scale horticulturalists in your region on a scale of on a scale of 1-3 (3=very good, 2=good, 1=Poor)

No.	Fertilizers in this region	Fertilizer supply and distribution		
		3	2	1
1				
2				
3				
4				
5				
6				

17. What is the average price of fertilizer (given in XIV above) per unit in your region?

No.	Fertilizer type	Unit price in Ksh per unit (2012)
1		
2		
3		
4		
5		
6		

18. What were the average prices of fertilizer (given in XIV above) in your region last year (2011)? (Fill in the gaps)

No.	Fertilizer type	Unit price in Ksh per unit (2011)
1		
2		
3		
4		
5		
6		

19. What were the average prices of fertilizer (given in XIV above) in your region two years ago (2010)? (Fill in the gaps)

No.	Fertilizer type	Unit price in Ksh per unit (2010)
1		
2		
3		
4		
5		
6		

CAPITAL INPUT

20. How would you rate the source of capital input for the small scale horticulturalists in your area on a scale of 1-3 as follows (3= Most common source, 2= Common source, 1=Least common source)

Institutions	Common Source of capital		
	3	2	1
Commercial Bank			
Farmers Cooperative Society			
Investment group			
Family			
Friends			
Others(Specify)			

GENERAL INFORMATION

21. List what you consider to be the major problem the small scale horticulturalists face in securing the production inputs

Seeds…….

Fertilizer……

Labour……..

Capital…….

Land……

22. Suggest ways in which such problems can be addressed

Seeds…….

Fertilizer……

Labour……..

Capital…….

Land……

Appendix iv: Questionnaire for the Small Scale Horticulturalists

INTRODUCTION

This Questionnaire is a research instrument to collect data that will be used to investigate the factors that influence economic livelihoods of the small scale horticulturalists living along Dundori-Olkalou-Njambini road, in Nyandarua County.

1. :BACKGROUND INFORMATION (Please fill in the spaces provided as appropriate)

Questionnaire No [ ] Date [/ /]

Name of village……..……..

Interviewer……..

Name of respondent (optional)…….…….…..

Relation to household head…….……

DEMOGRAPHIC DETAILS

2. Indicate if you can speak and write the following Languages. Mark with a ✓

LANGUAGE	YES	NO
English		
Kiswahili		
Kikuyu		

Fill in the relevant information in the table below and tick √ where possible

3. GENDER		4. AGES(Years)						5. MARITAL STATUS		6. HOUSEHOLD SIZE			
M	F	<18	18-27	28-37	38-47	48-57	≥58	SINGLE	MARRIED	≤10	11-15	16-20	≥21

7. What is the highest education level the head of household has completed? Mark with √

No formal education	Primary School	Secondary/High school	Tertiary education	Others (specify)

LABOUR

8. Indicate with a tick (√) the number of employees who assist with farm work

Type of employee	Full-time employees	Part-time employees	Unpaid family members	TOTAL
Number				
Payment (Ksh)/per day				

9. What is your employment status (Mark with √ as appropriate)

   1) Full time…….Part time farmer……..

10. Under which income bracket do you fall in? Example if you are a farmer and earns an income of Ksh 5000, mark ONLY ONCE as appropriate)

income bracket	Income class (Ksh per Month) ('000)					
	<5	5-10	11-15	16-20	21-25	>25
Response						

11. Out of this income what part came from the production of the following horticultural crops per acre

Crop	**Earning per acre**
Irish potato	
Cabbage	
Carrot	
Kales	
Spinash	

12. In which months do you need most labour? Mark with √

Labor Type / Month	Full-time employees	Part-time employees	Unpaid family members	TOTAL
January				
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				
December				

13. How many employees do you need in each month?

Labor Type / Month	Full-time employees	Part-time employees	Unpaid family members	TOTAL
January				
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				
December				

14. From where does the above labour come from? Mark with ✓

Labor Type / Month	Full-time employees	Part-time employees	Unpaid family members	TOTAL
From neighbors' (<2 Kilometers)				
From Next Village (3-8 Kilometers)				
From far (> 9 Kilometers)				
Others (Immigrants)				

15. How many people did you use for labour in the past years?

Year	Number of workers
2010	…….
2011	…….
2012	…….

LAND

16. Please fill in the gaps to answer the following questions on Land use.

		2010	2011	2012
1	What is the total land that you own? (Acres)			
2	How many acres are under horticulture production?			
3	How many acres have you leased for horticulture production?			
4	What is the cost of lease per acres in Kenya shillings?			

SEEDS

17. What horticulture crops do you grow? Fill in the spaces provided

……

……

……

18. Where did you get your seeds this year (Supplier/Stockists)? (Fill in the gap)

Crops (As in XVI above)	Stockists
1.	
2.	
3.	
4.	
5.	

19. How much did you pay for the seeds this year (2012)? (Fill in the gap)

Crops (As in XVI above)	Cost of seeds in 2012 (Ksh) per unit
1.	
2.	
3.	
4.	
5.	

20. How much did you pay to transport your seeds this year (2012)? (Fill in the gaps)

Crops (As in XVI above)	Cost of Transport (2012) (Ksh) per unit
1.	
2.	
3.	
4.	
5.	

21. How much did you pay for the seeds last year (2011)? (Fill in the gaps)

Crops (As in XVI above)	Cost of seeds 2011 (Ksh) per unit
1.	
2.	
3.	
4.	
5.	

22. How much did you pay for the seeds 2 years ago (2010)? (Fill in the gaps)

Crops (As in XVI above)	Cost of seeds in 2010 (Ksh) per unit
1.	
2.	
3.	
4.	
5.	

FERTILIZERS

23. What fertilizers do you use?

……

……

……

……

24. Where did you get your Fertilizers from this year (2012)? (Fill in the gap)

Fertilizer type (As in XXII above)	Supplier/Stockists you got it from
1.	
2.	
3.	
4.	
5.	
6.	

25. How much did you pay for the fertilizers this year (2012)? (Fill in the gap)

Fertilizer type (As in XXII above)	Amount (in Ksh) per unit
1.	
2.	
3.	
4.	
5.	
6.	

26. How much did you pay to transport your fertilizer this year (2012)? (Fill in the gaps)

Fertilizer type (As in XXII above)	Transport Cost (in Ksh) per unit
1.	
2.	
3.	
4.	
5.	
6.	

27. How much did you pay for the fertilizers last year (2011)? (Fill in the gaps)

Fertilizer type (As in XXII above)	Price (in Ksh) per unit
1.	

2.	
3.	
4.	
5.	
6.	

28. How much did you pay for the fertilizer 2 years ago (2010)? (Fill in the gaps)

Fertilizer type (As in XXII above)	Amount (in Ksh) per unit
1.	
2.	
3.	
4.	
5.	
6.	

CAPITAL INPUT

29. Are you a Member/Customer of any of the following institutions? Mark with ✓

	YES	NO
Commercial Bank		
Farmers Cooperative Society		
Investment group		
Others (Specify)		

30. How much money in Shillings did you spend in the farm in horticulture production in the years shown below, to do the following activities? (Fill in the gaps)

	2010	2011	2012
Land preparation			
Land lease			

31. Indicate the source of your Capital input on the activities in XXIX above?

Source	Mark with ✓
Commercial Bank	
Farmers Cooperative Society	
Investment group	
Borrowing from Friends	
Borrowing from Family	
Others (Specify)	

32. How much Capital in Shillings did you get from these institutions?

Source	Amount (Ksh)
Commercial Bank	
Farmers Cooperative Society	
Investment group	
Borrowing from Friends	
Borrowing from Family	
Others (Specify)	

GENERAL INFORMATION

33. List what you consider to be the major problem you face in securing the following:

Seeds…….

Fertilizer……

Labour……..

Capital…….

Land……

34. Suggest ways in which such problems can be addressed

Seeds…….

Fertilizer……

Labour……..

Capital…….

Land……

Appendix v: Questionnaire for the Stockists and Distributors of Seeds and Fertilizer

Introduction

This Questionnaire is a research instrument to collect data that will be used to investigate the factors that influence economic livelihoods of the small-scale horticulturalists living along Dundori-Olkalou-Njambini road, in Nyandarua County.

1. :BACKGROUND INFORMATION (Please fill in the spaces provided as appropriate)

   Questionnaire No [ ] Date [/ /]

   Name of Region……..……..

   Interviewer……..

   Name of respondent/ (optional)…….…….…..

   Name of respondent business..…….…….……

2. Background Information of region

   On a scale of 1–3 as (3=Very good, 2=good, 1=bad), how would you rate the small scale horticulturalists in your region of service, in terms of the following (Tick accordingly (√))

Activity	3=Very good	2=Good	1=Bad
Use of certified seeds			
Use of Fertilizers			

SEEDS

3. What horticulture crops seeds do you stock for the small scale horticulturalists in this area? Fill in the spaces provided

   1. ……
   2. ……
   3. ……

4. ……

5. ……

4. On a scale of 1- 3 (3=Most demanded, 2=Normal, 1=Least demanded), indicate the demand of the seeds of the crops in III above based on your sales.

No.	Horticultural seeds sold in this region	Demand		
		3	2	1
1				
2				
3				
4				
5				

5. How would you describe the supply and distribution of seeds to the small scale horticulturalists in the region you serve on a scale of 1-3 (3=very good, 2=good, 1=bad)

No.	Horticultural seeds sold in this region (As listed in III above)	Supply/Distribution to the small scale horticulturalists(Tick (√) as appropriate)		
		3	2	1
1				
2				
3				
4				
5				

6. What is your average price of seeds per unit to the small scale horticulturalists?

No.	Horticultural seeds sold in this region ((As listed in III above)	Price per unit (Ksh)
1		
2		
3		
4		
5		

7. What were the average prices of seeds that you offered the small scale horticulturalists last year (2011)? (Fill in the gaps)

No.	Horticultural seeds sold in this region (As listed in III above)	Average prices of seeds 2011 (Ksh) per unit
1		
2		
3		
4		
5		

8. What were the average prices of seeds that you offered to the small scale horticulturalists in year 2010? (Fill in the gaps)

No.	Horticultural seeds sold in this region(As listed in III above)	Average prices of seeds 2010 (Ksh) per unit
1		
2		

3		
4		
5		

FERTILIZER

9. What fertilizers did you stock and distribute to the small scale horticulturalists in this area? Fill in the spaces provided

    1. ……
    2. ……
    3. ……
    4. ……
    5. ……
    6. ……

10. On a scale of 1- 3 (3=Most demanded (Above the average of the total units sold), 2=Normal (Average for the units sold), 1=Least demanded (Below the average for the units sold)), indicate the demand for the fertilizers indicated in IX above based on your sales.

No.	Fertilizers sold in this region (As listed in IX above)	Demand (Tick (√) as appropriate)		
		3	2	1
1				
2				
3				
4				
5				

11. How would you describe the supply and distribution of fertilizers to the small scale horticulturalists in the region you serve on a scale of 1-3 (3=very good, 2=good, 1=bad)

No.	Fertilizers sold in this region (As listed in IX above)	Supply/Distribution to the small scale horticulturalists (Tick (√) as appropriate)		
		3	2	1
1				
2				
3				
4				
5				

12. What is your average price of fertilizer per unit to the small scale horticulturalists?

No.	Fertilizers sold in this region (As listed in IX above)	Price per unit (Ksh)
1		
2		
3		
4		
5		

13. What were the average prices of fertilizers that you offered the small scale horticulturalists last year (2011)? (Fill in the gaps)

No.	Fertilizers sold in this region (As listed in IX above)	Average prices of fertilizers in 2011 (Ksh) per unit
1		
2		
3		
4		
5		
6		

14. What were the average prices of fertilizer that you offered the small scale horticulturalists in year 2010? (Fill in the gaps)

No.	Fertilizers sold in this region (As listed in IX above)	Average prices of fertilizers in 2010 (Ksh) per unit
1		
2		
3		
4		
5		
6		

CAPITAL INPUT

15. Do you offer the small scale horticulturalists seeds on credit? (Tick (√) as appropriate)

    Yes……No……

16. Do you offer the small scale horticulturalists fertilizers on credit? (Tick (√) as appropriate)

    Yes…….No……..

17. If yes (In XV above), what do you charge on the credit

    Charge for Seeds credit……..

18. If yes (In XVI above), what do you charge on the credit

    Charge for fertilizer credit……..

19. Do you work with any financial institution to access this credit to the small scale horticulturalists? (Tick (√) as appropriate)

    Yes……..No…….

20. If yes in XIX above, which of these institutions do you work with. (Tick (√) as appropriate)

Institutions	Avenue for credit facility
Commercial Bank	
Farmers Cooperative Society	
Investment group	
Family	
Direct credit line	
Others(Specify)	

21. Do you provide transport to the small scale horticulturalists that purchase seeds from you? (Tick (√) as appropriate)

Yes……No……

22. If yes in XXI above, what are your charges per unit per Kilometer

Seeds as listed in III above	Average Cost of transport of seeds (Ksh/per unit)
1.	
2.	
3.	
4.	
5.	

23. Do you provide transport to the small scale horticulturalists that purchase fertilizers from you? (Tick (√) as appropriate)

Yes……No……

24. If yes in XXIII above, what are your charges per unit per Kilometer

Fertilizers as listed in IX above	Average Cost of transport of fertilizers (Ksh/per unit)
1.	
2.	
3.	
4.	
5.	

GENERAL INFORMATION

25. List what you consider to be the major problem the stockists and distributors of seeds and fertilizers face to effectively secure stock and distribute seeds and fertilizers to the small scale horticulturalists.

    Seeds…….

    Fertilizer……

    Labour……..

    Capital…….

    Land……

26. Suggest ways in which such problems can be addressed

    Seeds…….

    Fertilizer……

    Labour……..

    Capital…….

    Land……

THANK YOU FOR YOUR TIME

Appendix vi: Reliability Results

	Cronbach's Alpha	Pearson Correlation
Cost of seeds	0.732	0.882**
Cost of fertilizers	0.716	0.858**
Labour cost	0.614	0.853**
Land lease cost	0.665	0.899**
Capital input	0.646	0.878**