A FRAMEWORK FOR INVESTIGATING THE POTENTIAL TO EXPLORE NEW MARKETS IN SMALLHOLDER FARMERS IN KENYA’S KIAMBU WEST DISTRICT

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School of Agriculture and Food Sciences
Abstract
For decades, developing countries have depended on foreign aid to carry out their development programmes. Initially, they used this aid to fund physical infrastructure to spur economic growth, but later extended it to fund recurrent expenditure such as paying salaries for government employees and maintaining existing operations. Foreign aid “dependency” has, therefore, taken root in many developing countries and made it impossible for them to function without external assistance in terms of finances and expertise. For example, Kenya, being one of the developing countries in Sub-Saharan Africa, has been receiving aid since it attained independence from Britain in 1963.

In recent times, however, the Kenyan Government with the support of the donor community has embarked on some ambitious strategies to support the agriculture sector as an engine for economic growth and poverty reduction (especially in rural areas) by promoting commercialisation’s benefits to smallholder farmers. In particular, the National Agriculture and Livestock Extension Programme (NALEP) initiative, implemented in the country since 2000, has the short-term objective to move away from handouts given to smallholder farmers as a way of reducing their dependency levels on handouts, and to encourage them to develop from subsistence to commercially oriented farming. The long-term objective is to empower farmers by providing them with the tools and knowledge to explore new and sophisticated markets for their produce.

With this in mind, this study asks: is it possible to develop a framework that reflects the dynamics of commercialisation taking place in a region by providing key elements driving the potential of smallholder vegetable farmers in Kenya’s Kiambu West District to explore new markets?

This study initially examined how smallholder farmers in Kenya’s Kiambu West District, who were already participating in two vegetable agrifood chains (kale and coriander), sold their produce to markets, to which markets they sold them, and what affected their market accessibility. The results from this study led to an examination of the key determinants that affected smallholder farmers’ ability to explore new and sophisticated markets for their produce.

The study’s key findings are:
(1) While kale and coriander were high-value horticultural crops, smallholder farmers did not often sell their produce at anything other than the local market and, in the main, were not commercially orientated. In fact, many had only small land sizes (less than 0.5 acres), which made it difficult for them to grow commercial quantities. Additionally, there were inadequate
infrastructural services such as cooled transportation and storage facilities that the farmers needed to develop the economies of scale necessary for them to expand into new and more sophisticated markets.

(2) It is possible to develop a robust and evidence-based framework to examine the key determinants that affected smallholder farmers’ ability to explore new and sophisticated markets for their produce. Such a framework was created with components that are important, with a set of key determinants developed for use in other studies of commercialisation in subsistence based societies.

(3) The study has enabled a number of recommendations to be made regarding policy development to aid smallholder farmers’ commercialisation.
Declaration by author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly-authored works that I have included in my thesis.

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**Publications during candidature**


Publications included in this thesis
None
Contributions by others to the thesis
None

Statement of parts of the thesis submitted to qualify for the award of another degree
None
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Above all, I give all honour and glory to the almighty God for strengthening me as He has promised in His word: “but those who hope in the Lord will renew their strength. They will soar on wings like eagles; they will run and not grow weary; they will walk and not be faint” (ISAIAH 40:31).
Keywords
smallholder farmers, poverty, poverty reduction, value chain approach, vegetables, subsistence farming, commercialisation, food security, markets, Sub-Saharan Africa

Australian and New Zealand Standard Research Classifications (ANZSRC)
ANZSRC code: 070105, Agricultural Systems Analysis and Modelling, 50%
ANZSRC code: 070106, Farm Management, Rural Management and Agribusiness, 50%

Fields of Research (FoR) Classification
FoR code: 0701, Agriculture, Land and Farm Management, 90%
FoR code: 0706, Horticultural Production 10%
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<td>AAK</td>
<td>Agrochemical Association of Kenya</td>
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<tr>
<td>AIC</td>
<td>Akaike information criterion</td>
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<tr>
<td>ANCOVA</td>
<td>Analysis of covariance</td>
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<tr>
<td>ANOVA</td>
<td>Analysis of variance</td>
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<tr>
<td>DCED</td>
<td>Donor Committee for Enterprise Development</td>
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<tr>
<td>DFID</td>
<td>Department for International Development</td>
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<tr>
<td>ERS</td>
<td>“Economic Recovery Strategy”</td>
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<td>EPC</td>
<td>Export Promotion Council</td>
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<td>FCI</td>
<td>Farm Capitalisation Index</td>
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<td>FFS</td>
<td>Farmer field school</td>
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<td>FAO</td>
<td>Food and Agriculture Organization</td>
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<td>FDI</td>
<td>Foreign direct investment</td>
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<td>FPEAK</td>
<td>Fresh Produce Exporters Association of Kenya</td>
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<td>GLM</td>
<td>General linear model</td>
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<tr>
<td>GDP</td>
<td>Gross domestic product</td>
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<tr>
<td>HCDA</td>
<td>Horticultural Crops Development Authority</td>
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<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
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<tr>
<td>IFAD</td>
<td>International Fund for Agricultural Development</td>
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<tr>
<td>IMF</td>
<td>International Monetary Fund</td>
</tr>
<tr>
<td>KARI</td>
<td>Kenya Agricultural Research Institute</td>
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<tr>
<td>KEBS</td>
<td>Kenya Bureau of Statistics</td>
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<tr>
<td>KFA</td>
<td>Kenya Farmers Association</td>
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<tr>
<td>KHCP</td>
<td>Kenya Horticulture Competitiveness Project</td>
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<tr>
<td>KIRDI</td>
<td>Kenya Industrial Research &amp; Development Institute</td>
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<td>KENFAP</td>
<td>Kenya National Federation of Agricultural Producers</td>
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<td>KEPHIS</td>
<td>Kenya Plant Health Inspectorate Services</td>
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<td>KShs</td>
<td>Kenya Shillings</td>
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<td>LFI</td>
<td>Land fragmentation index</td>
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<td>MO</td>
<td>Market orientation</td>
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<td>MP</td>
<td>Market participation</td>
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<td>MDGs</td>
<td>Millennium development goals</td>
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<tr>
<td>MOA</td>
<td>Ministry of Agriculture</td>
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<td>MoLD</td>
<td>Ministry of Livestock Development</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>NALEP</td>
<td>National Agriculture and Livestock Extension Programme</td>
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<td>NGOs</td>
<td>Non-governmental organisations</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<td>PCPB</td>
<td>Pest Control Products Board</td>
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<td>STAK</td>
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<td>SI</td>
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<td>SMEs</td>
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<td>SRA</td>
<td>Strategy for revitalising agriculture</td>
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<td>SC</td>
<td>Supply chain</td>
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<td>Training and visits</td>
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<td>United Nations Conference on Trade and Development</td>
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<td>UNIDO</td>
<td>United Nations Industrial Development Organization</td>
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<tr>
<td>USAID</td>
<td>United States Agency for International Development</td>
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<tr>
<td>US$</td>
<td>United States Dollar</td>
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<tr>
<td>USA</td>
<td>United States of America</td>
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<tr>
<td>VC</td>
<td>Value chain</td>
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<td>WB</td>
<td>World Bank</td>
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<td>WHO</td>
<td>World Health Organization</td>
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Chapter 1. Introduction

1.1 Background

This research project examines alternate ways and means of improving the livelihoods of small and medium-sized enterprise (SME) farmers in Kenya. This focus was prompted by the need to facilitate new development opportunities in this country, which, despite being one of the better-performing economies in Eastern Africa region, is still regarded as a developing country.

Since the end of World War II, there has been a worldwide initiative to improve living standards in developing countries. Initially, developed countries drove these efforts, but they often ignored specific historical causes of underdevelopment such as: (1) hostile tropical climates that support diseases such as malaria, (2) a lack of investment in agricultural production, which resulted in archaic production technology and practices, (3) demographic factors characterised by high population growth rates, (4) colonisation (except for some countries such as Ethiopia), and (5) political instability (Kuhnen, 1987; Bhattacharyya, 2009).

Similarly, over the last 60-70 years, the world economy has been expanding; however, the benefits of this growth have not reached impoverished regions at the pace required for economic and social development. This is despite globalisation’s potent role played in accelerating economic growth in many developing countries through their greater integration into the world economy. Further, despite the high economic growth rates and remarkable trade performance in developed countries in recent times, a large proportion of their populations still live in poverty (United Nations Conference on Trade and Development (UNCTAD), 2014). According to Shah (2013), over three billion people—or almost half the world’s population—live on less than US$2.50 a day, while, in developing countries, the World Bank estimates that 1.4 billion people (approximately one in every four people) lived on less than US$1.25 a day in 2005.

Due to industrialised countries’ dominance in making decisions in international organisations such as the International Monetary Fund (IMF), the World Bank, and the United Nations (UN), developing countries have for decades received foreign aid to support their development programmes, which have, to a greater or lesser degree, been aimed at reducing poverty. This aid’s initial purpose was to enable developing countries to fund development programmes that, for example, helped establish physical and social infrastructure. The concept behind this was similar to the aid given to some Western European countries for
reconstruction after World War II through the Marshall Plan and its legacy, the World Bank. The Marshall Plan was highly successful in creating working economies across Western Europe along with political and social development (Schain, 2001; Schwartz, 2001). It was hoped by the proponents of the Marshall Plan that similar success could be achieved for developing countries, but unfortunately, the same results did not eventuate in Africa, Asia, and the Pacific regions because the existing conditions in these regions at that time were different from the conditions in Western Europe.

According to Sorel and Padoan (2008), the Western European countries succeeded because, prior to receiving aid, they already had a developed education system, skilled labour force, and infrastructure and institutions in place that could ensure sound governance. Developing countries lacked these attributes because, coming out of colonisation, they operated in different social, economic, and historical contexts from countries in Europe. What transpired was that developing countries gradually began to experience difficulties in performing core governmental functions, such as maintaining existing infrastructure and delivering basic public services without foreign aid and expertise from donors. Therefore, a culture of dependency arose (Kelly, 2005).

Dependence is a condition where a country or individual is unable to perform many of their core functions in the absence of external assistance (Lancaster & Wangwe 2000), and dependence is a characteristic of many developing countries (Brautigam & Knack, 2004). Acknowledging this issue, developed countries have begun to search for strategies to reduce dependency by reducing poverty, while at the same time, there has been a paradigm shift whereby developing countries increasingly self-determine which strategies, policies, and/or programmes are in line with their specific development goals.

One such strategy is to provide support to developing countries’ agricultural sectors as the engine for their economic growth. In these countries, the majority of farmers are small and medium sized (SME) (i.e., they employ less than 10 people and their income does not exceed more than €2 million a year—(EU, 2003), and are subsistence based (i.e., they practice a type of farming in which the farmer and their family consume most of the produce, which leaves little or nothing to be sold for profit). In Kenya, SME farmers or smallholder farmers usually hire only one or two employees if the enterprise involved is labour intensive such as dairy production. When dealing with a less labour-intensive enterprise, labour is only hired on a casual basis during the peak seasons (i.e., planting and harvesting).
The Study Site and Research Setting

The study's objectives dictated the study site: it needed to be in an area where the NALEP programme (as discussed in Chapters 1 and 2) had been implemented and where smallholder farmers focusing on horticultural production were the main participants of the programme. As a result, Kenya’s Kiambu West district was selected (see Figure 3.3).

Kenya is geographically located in Eastern Africa (Ojany & Ogendo, 1988). The study was conducted in Kiambu West district, which is one of the districts in Kiambu County. The district was selected mainly because of its proximity to the capital city, Nairobi, where there is a large and lucrative urban market for horticultural commodities. Food production systems in Kiambu West district are generally more commercialised due to its advantageous physical infrastructure (e.g., roads, water, electricity) as compared to other parts of the country (Ministry of State for Planning, 2009).

Figure 1.1 Map of Africa showing the location of Kenya and Kiambu West district (The World Factbook, n.d.)

Kiambu West district borders Nairobi City and Kajiado district to the south, Kiambu East district to the east, Naivasha district to the west, and Nyandarua district to the north.

The district covers an area of 958.2 km² and it’s divided into four administrative units. The district has a population of 493,158 with a density of 515 people per km².
The district lies between 1,500 and 2,550 metres above sea level with soils of varying fertility essentially delineated by geographical locality: thus, in the uplands, the soil is fertile and supports horticultural crops. Soils on the plateau are sandy or clay and support drought-resistant crops such as soya beans and sunflowers. The volcanic footbridges’ soils are well drained with moderate fertility, and supports cash crops such as coffee, tea, and pyrethrum.

The district experiences bimodal rainfall, with the highest altitude area receiving 2,000mm and the lowest altitude areas receiving 600mm per annum. The average temperature in the district is 26°C, but ranges from 7.1°C in the upper highlands to 34°C in lower midland areas.

Agriculture is the district’s main economic activity and highest income earner, and comprises both crops and livestock enterprises. The key food crops grown are maize, beans, Irish potatoes, and a variety of vegetables, while the major cash crops are coffee, tea, pyrethrum, and horticultural crops such as flowers and tomatoes. The main livestock enterprises include dairy cattle, poultry, pigs, and sheep (Ministry of State for Planning, 2009).

The district’s geographical characteristics are important for understanding how agricultural development programmes may be facilitated: for example, the type of soils found in different areas of the district is important for determining the type of agricultural production that can or cannot be sustainably developed. Rain patterns are critical to food production in this area because agricultural production is predominantly rain fed. Therefore, it is important for farmers to source farm inputs early and practice timely planting to take full advantage of the rainy season.

While land and water are the district’s two most important resources, agricultural land in the area is declining as the population increases, which threatens the development of long-term sustainable agrifood production. Therefore, to use the diminishing land efficiently, the region needs to consider changing from producing low-value food to high-value food (the “specialisation of production” of Smith (1776) and Coase (1936)).

To foster Africa’s and especially Kenya’s social and economic development, researchers have suggested developing the region’s agricultural sectors because agriculture is the most important sector in developing countries in terms of trade (regional and global) and food production. Recently, the donor community has expressed renewed interest in focusing on agriculture because growth in gross domestic product (GDP) that originates from agriculture
is about four times more effective in raising the incomes of a country’s poorest people as opposed to GDP growth derived from other sectors such as manufacturing (Fan et al., 2013).

However, to improve opportunities for trade—especially at a global level—Webber and Labaste (2009) note that farmers from developing countries, especially in Sub-Saharan Africa (SSA), need to continuously improve the competitiveness of their export commodities. They also need to improve their business environment or risk being trapped in producing low-skill, low-value products and services, which will exacerbate people’s ongoing struggle to obtain a reasonable share of the global market.

To design and drive high-impact and sustainable initiatives focused on improving farmers’ value, productivity, competitiveness, and growth, new frameworks for designing and evaluating agricultural development programmes and projects, most of which are donor funded, are being trialled in developing countries. Two such frameworks are relevant to this study: the value chain and the commercialisation approaches.

The value chain approach is one of the key frameworks being used. Value chain (a term first referred to by Michael Porter in his seminal work on competitive advantage in 1985) are more complex and include the full range of activities that are required to bring a product from raw materials through the different phases of production to delivery to consumers; that is, a value chain exists when all of the actors in the chain operate in a way that maximises the generation of value along the chain (Porter, 1985).

Value chain can also provide an important way of understanding business-to-business (B2B) relationships that connect commodity chains and mechanisms for increasing efficiency, which enables businesses to increase productivity and add value. The value chain approach can also be a reference point for supporting services and the business environment, thereby contributing to pro-poor initiatives and better linkages between farmers and existing or potential markets. Of importance to this study is the recent interest governments and donors have shown toward the value chain approach on realising that upgrading individual farmers’ performance can best be achieved in the context of market-based rewards, which can only occur if supply is linked to the demands of consumers through markets (Webber & Labaste, 2009). Unfortunately, the Organisation of Economic Development (OECD) has indicated that development efforts using the value chain approach in many developing countries will fail, even if they are supported with increased funding, if development of sustainable capacity
does not receive greater and more-careful attention (Christopher & Peck, 2004; OECD, 2006).

The commercialisation approach to farming builds on the value chain approach. Agricultural commercialisation is the process of increasing the proportion of agricultural products that farmers sell which increases their market participation and provides benefits such as improved income and living standards (Pradhan et al., 2010; Jayne et al., 2011). It’s about changing smallholder farmers’ mindset from viewing agriculture as a subsistence activity to perceiving farming as a business that makes profit (Pingali & Rosegrant, 1995)-in other words commercialisation in this sense is about increasing engagement with markets (Wiggins et al., 2011). Commercial transformation of subsistence agriculture is a necessary ingredient in developing countries as they seek to achieve economic growth and development, especially given the base of most economies is agricultural (The World Bank, 2008; Pingali & Rosegrant, 1995; Timmer, 1997; von Baun, 1994). The key benefits of commercial agricultural production are socio-economic gains via achieving comparative advantages, economies of scale, and institutional, organisational, and dynamic technological change caused by the flow of ideas arising from exchange-based interactions (Romer, 1993, 1994; Wiggins et al., 2011; Chirwa & Matita, 2012).

Commercialising smallholder subsistence farmers involves two components: the first is “market orientation”, a business approach or propensity for identifying and meeting customer needs and making agricultural production decisions as a result (Gebremedhin & Jaleta, 2010). The second is “market participation”, which is how much smallholder farmers actually participate in a market, including how much produce they sell as a proportion of their overall production capability (Wickramasinghe & Weinberger, 2013).

Most studies on the commercialisation of smallholders consider market orientation and market participation to be synonymous, while others make limited distinctions between the two (Otieno et al., 2009; von Braun et al., 1994; Jaleta et al., 2009). Nevertheless, there is a major difference between the propensity towards a market orientation (that is the likelihood of a person having certain individual characteristics such as the ability to act autonomously, or willingness to take risks in order to adopt a consumer focused approach similar to that described by Lumpkin & Dess 1996 in terms of entrepreneurial orientation), and the actuality of market participation in societies where smallholder farmers dominate which is about farmers physically taking part in a market and selling produce.
As a result, policy implications aimed at transforming smallholders that are derived from analyses of household market participation alone are insufficient since the determinants of market orientation and market participation differ.

Aspects of both the Value Chain and Commercialisation approaches at least partly explain the policies that have been implemented in Kenya in the last two decades. The Kenyan Government with the support of the donor community has embarked on some ambitious strategies to address poverty levels in rural areas by providing support to the agriculture sector as the engine for economic growth and poverty reduction. In particular, the Value Chain Approach has been focused on programme development with the Kenyan Government introducing the National Agriculture and Livestock Extension Programme (NALEP) in 2000 with a short-term objective to reduce the country’s dependence on aid by transforming farmers from subsistence-based to commercially based farming. NALEP employed the value chain approach as a tool to reduce poverty by building the capacity to assist farmers to effectively participate in suitable value chains to increase their income. The programme’s long-term objective is to empower farmers by providing them with the tools and know-how to explore new and sophisticated markets for their produce.

As it stands, 14 years into the scheme, the implementation of the programme faces challenges such as a lack of ownership of grassroots projects, which are still perceived as government led rather than community controlled (Ministry of Agriculture and Ministry of Livestock Development, 2008). This situation has developed because farmers have not adopted farming as a business: the majority still farm at subsistence level, which means that their socio-economic standards have not improved that much and economies of scale still do not exist. Additionally, the Ministry of Agriculture (2009) has shown that enablers, necessary to spur growth in rural areas (such as efficient physical infrastructure and credit facilities) are also not readily available to the majority of farmers.

The NALEP was originally targeted at a small number of districts in the country, but it was later implemented across the country, during which time it focused on both livestock and crop farmers, including horticultural crop farmers. Given that vegetables are considered a high-value food group and can be a valuable source of income for smallholder farmers (Food and Agriculture Organization, (2010); World Health Organization, (2011)), increasing vegetable production for sale in markets and thus increasing economies of scale is a key goal in providing economic advantage for smallholder farmers in Kenya.
Indeed, in developing countries, vegetable production, trade, and consumption has greatly increased over the past 30 years, but there still exists much untapped production potential in many developing countries. This is mainly because improving the quantity, quality and marketing of fresh produce is beset with major challenges that have not been well addressed, such as the capital requirements for improved seeds, hired labour, and equipment (Silva Dias 2010). Post–harvest losses in particular are often caused by a lack of infrastructure for product transport and processing, which contributes to preventing many farmers from participating in local and international markets and, thus, from meeting development objectives (Thow & Priyadarshi, 2012).

After initial examination of whether a value chain approach is useful for facilitating a more-viable economic model for smallholder farmers in Kabuku in Kenya’s Kiambu West district, where vegetable growing predominates, evidence showed that this approach is beset with limitations (see Chapter 4). As such, from these results, the emphasis of the study shifted to commercialisation as a potentially more-successful strategy to facilitate subsistence-based SME farmers in the region in reducing poverty and creating a sustainable livelihood (see Chapter 5).

1.2 Research problem and rationale

The Kenyan Government has recognised farmers’ poverty and dependence on aid and is trying to develop a more market-driven economy by implementing a “whole-of-value chain approach” to agricultural extension services, which involves commercialisation. However, as the country’s agricultural production shifts from subsistence-based to commercially oriented production, marketing issues related to agricultural produce have emerged because the capacities farmers require to achieve sustainable domestic values chains are inadequate, let alone those required to participate in international markets.

This is particularly so in Kenya’s horticultural industry, which is the fastest growing industry in the agricultural sector in the country: it has recorded an average growth of 15% to 20% per annum. This industry contributes positively to creating wealth, reducing poverty, and enhancing gender equity, especially in rural areas. According to the Ministry of Agriculture’s (MOA) statistics, it is the leading foreign exchange earner in the country (Ministry of Agriculture, 2012).

However, for smallholder producers to sustain sufficient product availability, they have to overcome various constraints, such as poor access to superior quality seeds, limited
knowledge of effective production practices (e.g., efficiently using available water resources, which is critical for vegetable production and ensuring that soil fertility is not compromised by over-cultivation and of excessive use of fertilizer). Additionally, ineffective pest and disease management practices threaten not only farmers’ profitability when their produce is rejected (particularly by export markets), but also the health of farming households, consumers, and the environment (Ministry of Agriculture, 2009). This is because directions for correctly using chemical pesticides (especially when farmers have low literacy levels) may not be adhered to.

These challenges are exacerbated by climate uncertainties (such as unpredictable and harsh weather events of recurring droughts and floods). Most vegetables are susceptible to drought, which leads to severe crop losses, especially where irrigation is not available or in other cases of unexpected lack of water. Diminishing land sizes observed in high-potential agricultural areas such as Kiambu West District hinder smallholders’ ability to rotate crops. Continuously producing vegetables on the same plot without practising crop rotation leads to pests and diseases to constantly reoccur, which reduces yields (Ministry of Agriculture, 2009). Therefore, the numerous challenges facing smallholder farmers in the horticulture industry in Kenya reduces the likelihood of farmers transforming from subsistence-based to commercial farming systems.

The research discussed in this thesis initially examined how smallholder farmers in Kabuku Location of Kiambu West District in Kenya, already participating in two horticultural chains; kale (*Brassica oleracea*) and coriander (*Coriandrum sativum*) also known as cilantro, Chinese parsley or dhania, sold their produce to market, and to which market-as well as what affected market accessibility for them. The results from this study led into an examination of what were the key determinants of smallholder farmers in exhibiting the potential for exploring new and sophisticated markets (identified for this study as supermarkets and or export) for their produce. The purpose of the research was to obtain an understanding of the challenges facing SME/smallholder farmers in Kenya, and how their access to different markets could be improved. The development of specific Research Questions and the Research Propositions that drove the data collection and analysis are discussed in Chapter 2.
1.3 Study’s justification

Poverty, reducing it, and developing sustainable livelihoods is crucially important in developing countries. Understanding the drivers of value-adding activities and the benefits of accessing more-sophisticated markets by SME farmers is a critically important activity for developing strategies that reduce dependence on foreign aid and create a self-reliant growth pattern out of poverty.

As indicated previously, the Kenyan Government has employed both the value chains and commercialisation approaches to reduce poverty and the country’s dependency on international aid handouts; however, much previous research has been conducted on the livestock and grains industries, mainly through the NALEP (Ardjosoediro & Neven, 2008; Karimi et al., 2010; Okello et al., 2010; United States Agency for International Development, 2010).

In recent years, researchers have paid much closer attention to the horticultural industry of developing countries such as Kenya, yet only a modest amount of research has been conducted on the horticultural sector especially from the more commercialised perspective to attain a comprehensive analysis of commercialisation of vegetables. One explanation for why few researchers have performed such studies is the limited range of and access to available data (Segre, 1999).

This study adds to the subsistence/commercialisation conversion literature by developing a robust and evidence-based framework to identify the key determinants for smallholder subsistence-based farmers to explore new and sophisticated markets for their produce. The results offer opportunities for other researchers to use these key determinants for similar studies. Policymakers can also use the results when making decisions about the most effective strategies to enact to support smallholder farmers in commercialising their produce.

1.4 Study’s methodology and research approach

Chapter 3 discusses the comprehensive methodology and research approach and design used in this study; however, to summarise, a two-stage study was conducted using a mixed-methods multilevel research approach: that is, both qualitative and quantitative data was collected and analysed using inferential statistics to test the research propositions. Figure 1 outlines the research approach for this study.
This chapter overviews the entire study and lays the foundation for investigating the identified research problem.

Chapter 2 explores issues of foreign aid to developing countries, poverty’s socio-economic drivers and maintainers in developing countries, agricultural development in Kenya, and agriculture’s role in creating economic growth and reducing poverty in rural Kenya. The study focuses on the horticulture industry and the role of the horticulture industry in Kenya’s economy and reviews the literature on the key institutions that support the horticulture industry in Kenya. Lastly, the chapter presents the research questions and propositions that guided this study.

Chapter 3 discusses the research paradigm, the research design, the study site, the mixed-methods approach used, and the sampling procedures used. The chapter concludes by addressing issues related to reliability, validity, and ethics.

Chapter 4 presents the details and results of the value chain approach study that investigated the linkage of SME farmers producing vegetables to different markets.

1.5 Summary and Thesis structure

Figure 1.2 Study’s methodology
Chapter 5 presents the details and results of the commercialisation approach study that investigated what key determinants smallholder farmers need to explore new and sophisticated markets for their produce.

Chapter 6 discusses the two studies’ findings and addresses the key research questions outlined in Chapter 2 and concludes the study. More specifically, the chapter answers the research questions and discusses the study’s implications for policy development and extension and its implications for research.
Chapter 2. Literature review

2.1 Introduction
This chapter explores issues of foreign aid to developing countries, poverty’s socio-economic drivers and maintainers in developing countries, agricultural development in Kenya, and agriculture’s role in creating economic growth and reducing poverty in rural Kenya. Related to this are the emerging challenges facing smallholder farmers in developing countries, the role of agrifood chains, the value chain and commercialisation approaches in agriculture, and the determinants of market orientation, market participation, and choice of market outlets. The study focuses on the horticulture industry and the role of the horticulture industry in Kenya’s economy and reviews the literature on the key institutions that support the horticulture industry in Kenya as well as the importance of market participation by the horticultural sector. Lastly, the chapter presents the research questions and propositions that guided this study.

2.2 Foreign aid in developing countries
The genesis of foreign aid to developing countries can be traced to the post-War period of 1944-1946 when the International Monetary Fund (IMF), and the World Bank, and the United Nations (UN) were founded (Bordo, 1993). The IMF was charged with monitoring international exchange rates, while the World Bank was to provide underdeveloped nations with needed capital, such as in raising capital for reconstructing Western Europe (Bordo, 1993; Rudel, 2005).

Western European countries received aid for reconstruction and recovery after World War II through the Marshall Plan that was launched in 1947 (Catterson & Lindahl, 1999). This plan was highly successful in creating working economies across Western Europe along with political and social development (Hogan, 1989). The funding was extended to developing countries to create similar results, but such efforts were not successful primarily because Western Europe already had a skilled labour force, infrastructure, and governing institutions in place, whereas countries in Africa, Asia, and the Pacific regions did not because most had just become independent states and their social, economic, and historical contexts were different from those in Europe (Schwartz, 2001).

According to Boone (1996), foreign aid programmes were launched before any compelling theory was developed that confirmed whether they could or could not work in developing
countries. Alleviating poverty and promoting growth were the main goals stated to justify these programmes. Subsequently, since the 1960s, developed countries have given a total of US$2.7 Trillion in foreign aid to developing countries, with the Sub-Saharan Africa (SSA) region receiving a total of US$1 Trillion (Riddell, 2007).

The impact of aid to developing countries has been double-edged. On the positive side, aid has helped to release governments from binding revenue constraints. Indeed, in many developing countries, aid-agency or aid-funded personnel manage important government programmes. This combination of resources and technical assistance provides an important boost to the efficiency and effectiveness of developing countries’ governance (Kuhn, 1987; Williamson, 1999; Brautigam & Knack, 2004).

However, there are arguments that foreign aid has had negative effects on recipient countries, which raises the critical question of whether foreign aid has achieved its intended purpose. For example, large amounts of aid, if continued over long periods of time, may make it more difficult for good governance to develop, especially in weak states (Brautigam & Knack, 2004) because aid transfers are highly variable, fungible, and politically motivated. As such, they can potentially lead to corruption (Hughes, 2003). Development problems also go beyond savings or foreign exchange constraints, which suggests that, without indigenous efforts, even foreign aid resources are not used efficiently, which leads to the retardation of economic development and aid dependency (Kelly, 2005).

Those who support foreign aid disbursement argue that foreign aid provides additional finance, policy advice, and technical assistance to poor countries and, thus, leads to economic and social development (Rist, 1997; Sachs, 2005; Djankov et al., 2008; Abuzeid, 2009; Sireau, 2009). A foreign aid expert such as Sachs (2005) finds no problem with foreign aid disbursement to developing countries and calls for more aid, and argues that absolute poverty can be eliminated by 2025 with massive aid transfers coupled with widespread reforms. Sachs claims that reforms can tackle multiple socio-economic constraints that undermine transparency in aid management (Sachs, 2005). He also argues that there is little to show in developing countries, especially in Africa, in terms of development because actual aid (in dollars) per capita given to the continent is small in practical terms. For example, in 2002, each person in SSA received a total of US$30 of aid from the entire world. Out of the total amount, US$5 was used to pay for consultancy services by donor countries, US$3 was used for food aid and other emergencies, US$5 was channelled to servicing Africa’s debt, and
US$5 was used on debt-relief operations. The remaining US$12 is what finally reached SSA designated as aid per capita. In the same year, the United States gave each Sub-Saharan African US$3. When components for the U.S consultants, food and other emergency aid, administrative duties and debt relief were subtracted, each Sub-Saharan African received a total of six cents.

However, some experts feel that poor economic performance in developing countries (especially in the SSA) has been caused by these countries’ unwillingness to formulate and implement policy reforms that can stimulate economic growth (Svensson, 2000; Moyo, 2009). This results in aid being used more on consumption, such as operating and maintaining government activities, than on development activities such as improving infrastructure.

While those against foreign aid disbursement to developing countries have valid reasons, such as corruption, nepotism, and a general lack of a saving culture in recipient countries, foreign aid is still regarded as relevant to these countries because widespread poverty still exists, and, if accompanied by reforms and policies to ensure that it is used for development purposes, it can spur economic growth (Alesina & Weder, 2002; Kelly, 2005; Organization for Economic Cooperation and Development, 2005).

In Kenya, policy makers have argued that continued financial support to Kenya is necessary because transforming societies economically from being poor to wealthy is a long-time goal that is best captured by economic historians rather than development specialists. For example, it took the United Kingdom (UK) and the United States of America (USA) three centuries to undergo structural transformation, and this process is still continuing in these nations, while Japan took about one century (Timmer, 2009). Most of the developing countries, especially those in Africa, only started the process of modernisation in the 1950s after coming out of colonisation.

Although each country may be at its own stage of economic and demographic transition, they each operate in the same world. Therefore, they have different comparative advantages due to their specific development paths and sequences of integration into the global economy (Birdsall, 2006). However, competitive advantages are not deterministic, and late developers such as the African states can benefit from the technological progress and past experiences of early developers to help build their own skills and asset bases. They can also seize new opportunities to access growing global markets. However, such advantages are constrained
by the fact that late-developing countries must compete in a tumultuous environment where their productivity is challenged by firms from major emerging countries, and, at the same time, deal with the instability of the world’s economic environment and the increasing consequences of global change (Birdsall 2006).

The challenges limiting late-developing countries from transforming their economy and society has generated a growing debate in the development community and academia about the best options for transition under these circumstances (Heady et al., 2010). In this debate, views are usually divided between the industrialists (urbanists) and agriculturalists (ruralists). The former believe that manufacturing is the only real driver of development in Africa. The urbanists believe that, while agricultural productivity is low, the challenges are great and expected economic growth is slow. Although manufacturing is a narrow sector in the SSA region, the current conditions present new opportunities for industrialisation. Some of the reasons supporting this view are the improved business climate in many developing countries, the growth of Asian industrial costs related to increasing wages, and new opportunities in light manufacturing. Another reason concerns specialisation in certain segments of the value chain (United Nations Industrial Development Organization, 2009).

On the other hand, the agriculturalists point out that poverty is above all a rural issue, with the rural poor being heavily involved in agriculture. Therefore, agriculture can be a major tool for reducing poverty, especially with the current rapidly rising demand for food. Agricultural development also creates opportunities for diversification through processing of products and an increase in rural demand arising from increased rural incomes (Heady et al., 2010). Therefore, rural issues must be addressed to reduce poverty and manage economic and demographic transitions (The World Bank, 2009). Accordingly, due to the growing demand for food that has resulted from an increasing population and urbanisation throughout the world, agricultural growth is likely to be steady for decades to come.

Late-developing countries face choosing whether to encourage the urbanist or agriculturalist growth model, a choice that will determine (among other things) agriculture’s labour absorptive capacity and the overall sustainability of its development. For example, adopting labour-intensive practices will not have the same consequences on labour absorption as favouring large-scale managerial and enterprises and capital-intensive production techniques. Promoting multiple functions for agriculture with a specific focus on resource management
will also have a different effect on absorption and sustainability than promoting intensification based on industrial inputs (Alexandratos, 2005).

2.3 Socio-economic drivers of poverty and income inequity in developing countries

Despite major poverty-reducing strategies that have been implemented around the world, poverty remains an enormous problem worldwide. According to the World Bank (2008a), the proportion of people living in extreme poverty worldwide declined from 43.1% in 1990 to 22.2% in 2008, but the challenge remains, especially in developing countries. The decline is attributed to the worldwide adoption of the first Millennium Development Goal (MDG) worldwide, which was to halve poverty by 2015.

Undoubtedly, poverty is a complex social problem with variant roots, (Ropers, 1991; Shaw, 1996; Blank, 1997; Epstein, 1997; Egendorf, 1999). In this study, poverty is defined in two ways: the first is absolute poverty, which is associated with households that cannot meet their basic needs. People in such households are chronically hungry, cannot access adequate health care, and lack safe drinking water and sanitation. They also cannot afford education for some or all of their children and lack other basic essentials such as shelter and clothing (Sen, 1999; Ravallion & Chen, 2007).

The second is relative poverty, which means that household income level is below a given average national income. For example, the poor in developed countries lack access to cultural goods, entertainment, recreation, quality healthcare, education, and other perks associated with upward social mobility (Flick & Van Praag 1991; Loewen 2009). Relative poverty is found worldwide; however, absolute poverty is mainly found in developing countries (Sagar & Najam, 1998; Speth, 1998; Johnson, 2002; Laderchi et al., 2010).

2.4 Poverty in Kenya

Poverty has largely been understood in terms of lack of income until recently, when it has come to be understood as more than simply insufficient income, and, in fact, as encompassing a denial of opportunities and choices necessary to lead a long, healthy, and creative life (Handley et al., 2009). In Kenya specifically, the Kenyan Government, with support from donors, has put in place measures to address poverty. The agriculture sector has been identified as one of the key areas for support because the sector has the potential to increase production to attain food security and have surplus to market and earn income for farmers and the entire country (Ministry of Agriculture, 2009).
However, under the new constitution adopted in Kenya in 2010, the Government is addressing the situation where poverty is caused by geographical disparities. From 2013, the structure of Government operations has ceased being concentrated at the central Government and has been devolved to regions. The devolution of operations and funds to the regions is expected to address regional disparities where some regions endowed with favourable climatic conditions have been developing faster than the arid and semi-arid regions. However, it’s still early to tell if the new structure is working.

One of the justifications for continually disbursing aid to developing countries is to reduce high levels of poverty found in these countries. Comments by anti-aid crusaders such as Svensson (2000) and Moyo (2009) that that foreign aid resources are not used efficiently without indigenous efforts is relevant to Kenya. For example, one of the challenges affecting the implementation of donor-funded programmes similar to Kenya’s National Agriculture and Livestock Extension Programme (NALEP) (see Section 2.9.1 for more detail) is lack of community ownership: that is, communities continue to view aid programmes as belonging to the implementers. In this regard, the majority of farmers perceive the value chain approach that NALEP promotes as not appropriate (see Section 4.4.1).

There is no doubt that poverty in developing countries is complex and can best be described as cyclic i.e., it leads poverty traps where individuals or communities are caught in a spiral of problems and a lack of capacity to deal with those problems, a combination which leads to further problems with few opportunities to extract themselves.

2.5  Agriculture and reducing poverty

Most studies on reducing poverty conclude that growth in a country’s agricultural sector makes a significant difference to reducing poverty, but its importance diminishes as economies grow and become diversified in other sectors such as manufacturing. The significance of agriculture in reducing poverty is drawn from two explanations (International Fund for Agricultural Development, 2010). The first is that the incidences of poverty are high in developing countries, which still heavily rely on agriculture for producing food and employment creation. The second is that the poorest households also have fewer assets and minimal skills, which causes them to face difficulties in connecting with the non-agricultural economy for income and employment. Therefore, by extending employment to the poor and the unskilled labour force, agriculture contributes significantly to economic growth focusing on the poor (International Fund for Agricultural Development, 2010).
Furthermore, poverty’s rural concentration in developing countries highlights the significance of managing agriculture as a component of poverty-reducing strategies in these countries. According to the International Fund for Agricultural Development (2010), poverty in developing countries is primarily rural: approximately 72% of the poor live in rural areas. These figures are higher in Sub-Saharan Africa and South Asia (75% and over 80%, respectively) (International Fund for Agricultural Development, 2011).

Several studies provide empirical evidence to support the view that agricultural growth has been primary contributor for reducing poverty in developing countries. For example, Thirtle, et al.(2001) review literature on the role of agricultural productivity in reducing poverty in developing countries and report that agriculture had a greater impact on reducing poverty than other sectors. They report that, on average, every 1% increase in agricultural productivity reduces the percentage of people living on less than a dollar per day by between 0.6% and 1.2%. In a related study in India, Ravallion and Datt (2002) found that, although other factors such as state developmental spending, non-farm output and lower inflation rates all reduce poverty, the growth rates related to farm output were the most important factor benefiting the rural poor in India. Still, in India, Virmani (2007) found that every 1% increase in agricultural growth reduced the rate of poverty by 0.45%, in addition to its effect on average per capita gross domestic product (GDP).

Agricultural growth reduces poverty in four key ways: (1) the direct and relatively immediate effect of improved agricultural performance on rural incomes, (2) the benefits of cheaper food for both the urban and rural poor, (3) the sector’s contribution to generation of economic opportunities in the non-farm sectors, and (4) the sector’s fundamental role in stimulating and sustaining economic transition as countries transform from being primarily agricultural to having economies based on manufacturing and services.

Apart from providing employment to unskilled workers, the sector also contributes to reducing poverty by stimulating growth in the secondary and tertiary sectors, such as small food processing industries, which increase labour mobility from rural to urban areas (Warr, 2002; Pack, 2009). However, in many developing countries, agriculture contributes more to reducing poverty than do manufacturing industries. For example, in China, over the period from 1980 to 2001, Ravallion and Chen (2007) and Montalvo and Ravallion (2010) found that 1% of growth originating in the agriculture sector resulted in a 7.85% reduction in
poverty, while the same magnitude of growth originating in non-agriculture sectors resulted in a 2.25% reduction in poverty.

A study on the relationship between agricultural output and poverty in more than 50 developing countries found that sectors that are more labour intensive have stronger effects on reducing poverty because unskilled labour is the primary input that the poor can offer to the production process. In this regard, agriculture remains the sector with the highest potential to reduce poverty in developing countries, followed by construction and manufacturing (De Janvry & Sadoulet, 2010; Loayza & Raddatz, 2010).

2.6 Agriculture in Kenya

2.6.1 Pre-independence era

Before the Europeans developed an interest in settling in Kenya, the indigenous population undertook agriculture entirely to sustain themselves. However, this situation changed in 1885 when the Great Britain declared a protectorate over Kenya (then called the East Africa Protectorate), under the administration of the Imperial British East Africa Company. In the same year, the British Government provided funds to the British East Africa Company for constructing a railway line from the Port of Mombasa in Kenya to the neighbouring country of Uganda, which was completed in 1901 (Hill, 1956).

The effect of the railway line on the agricultural sector in Kenya was dramatic because it was possible to export produce to provide revenue to maintain the railway. However, traditional subsistence agriculture could not meet the surplus needed for export. Therefore, settlers with capital to develop commercial farming were invited mainly from Britain, and the country was declared the “Kenya colony” by Great Britain in 1920 (Silk, 1985). Agriculture expanded as cash crops such as coffee, tea, sugar, and pyrethrum were developed with significant investment from overseas. The post-war period from 1946 was characterised by a boom in agricultural investment, which corresponded to the high demand for agricultural produce during the war and the years that followed.

However, although the crop yields realised from commercial farming showed that, with proper land use, the country’s growing population could be supported, indigenous Kenyans still practiced subsistence farming using traditional methods. The continued use of traditional methods resulted in the rise of rural poverty and serious land degradation due to over-
cultivation and overgrazing, which eroded soil and created poor soil fertility (Pereira & Jones, 1954).

By the 1950s, the British Government was not able to continue supporting the Kenyan colony as a result of emerging issues due to World War II’s effect on Britain’s financial status and indigenous Kenyans’ push for self-rule. As a result, Britain withdrew from Kenya, and the country attained internal self-rule in 1963 and became an independent Republic in 1964 (Thurston, 1984).

The political changes resulting from the withdrawal of the United Kingdom adversely affected agricultural development. Agricultural investment from overseas ceased immediately, leading to a large increase in unemployment among African farm workers. However, the British Government, together with the World Bank, supported indigenous Kenyans to resettle on land formerly owned by overseas settlers (Thurston, 1984). Unfortunately, as a result of European-oriented farming systems ceasing to exist after Kenya’s independence, the country began the post-independence era with a major setback in agricultural market confidence as a result of a significant reduction in volume of product available for sale.

2.6.2 Post-independence era

A transformation in the structure of agriculture in Kenya occurred from large-scale dominated production systems just before and immediately after independence to a situation where small-scale production almost dominated the production systems. By 1990, majority of farm holdings had a national average farm size of about 2.5 hectares. As a result, the role of smallholders in Kenya’s agriculture increased in importance to the point where they accounted for about 60% of the country’s marketed products in the 1990s (Ministry of Agriculture and Ministry of Livestock and Fisheries Development, 2004). Furthermore, in the 2000s, this percentage rose to 70%. In contrast, large-scale farming (farming practiced on farms averaging 50 hectares) contributed 30% of marketed agricultural produce in the 2000s (Ministry of Agriculture and Ministry of Livestock and Fisheries Development, 2004). This means that the small-scale production systems now dominate both the cash-crop and food-crop production (Nyor, 2002; Diao, 2007). Small-scale production systems largely handle coffee, tea, horticulture, maize, and dairy products, while large-scale production systems handle wheat products due to the highly mechanised nature of producing them (Purell & Anderson, 1997).
However, the agricultural sector’s major concern today is related to poverty in rural areas, where the majority of the country’s population live and a large proportion of agricultural produce destined for domestic and export market is produced.

2.6.3 Agriculture’s role in growing the economy and reducing poverty in rural Kenya

The main characteristic of Kenya’s agriculture is the dominance of primary production with minimal on-farm and off-farm processing of raw agricultural produce. Losses through poor storage are substantial, which translates to low income for farmers (Ministry of Agriculture, 2009). Apart from domestic markets, the export market focuses on exporting raw commodities, while importing processed commodities into the country. This results in an imbalance of trade because strict conditions exist for raw commodities in the export markets which the smallholder farmers have to meet (e.g., traceability, food safety standards and minimum pesticide residue). SMEs from developing countries such as Kenya with a low mechanisation capacity have to compete with other farmers from developed economies who use highly mechanised and farming on a large scale and who benefit from being able to achieve economies of scale and, thus, who offer lower prices than developing countries for the same produce. Economies of scale refer to a production process in which an increase in the number of units produced leads to a decrease in average cost per unit (Morgane & Ravry, 2005).

As discussed previously, rural development has significant revitalising effects on developing countries’ overall economic development. For example, according to the World Bank (2005) and Birdsall (2006), agricultural growth is responsible for reducing poverty in some countries by 40-70%. In Kenya, empirical evidence show that a 1% increase in agricultural GDP results in 1.6% increase in national GDP (Kimenyi, 2001). In view of this, stakeholders and collaborators in the agricultural sector on poverty-reducing strategies place agriculture and rural development at the top of the country’s priorities (Republic of Kenya, 2007). To improve the effectiveness of poverty-reducing efforts, some researchers also suggest policies that support the adoption of new/improved farming technologies, such as high-yield seed varieties should be implemented (Kydd & Dorward, 2004).

Importantly, Kenya’s manufacturing industry sector is inadequately developed, and, as a result, agriculture remains the mainstay of economic growth and employment creation (Yeager, 1994; The World Bank, 2007). Furthermore, sustainable industrial development is unlikely to be achieved unless there is sufficient domestic demand, which calls for raising the
incomes of rural people through agricultural development. In addition, the possibility that industrialisation will reach its highest potential is determined by the level of investments in agricultural based industries such as food processing of both crops and livestock products. This is due to the fact that although industrialisation can play a significant role in reducing poverty, agriculture as a source of raw materials still supports it (Ministry of Agriculture and Ministry of Livestock and Fisheries Development, 2004).

2.6.4 Agricultural extension and development in fighting poverty

The importance of agricultural extension in relation to the fight against poverty and in the development of a commercialised agriculture industry has been recognized in the Kenya Government’s policy documents; Strategy to Revitalize Agriculture (SRA) and Vision 2030 strategy which aims to transform the Kenya’s economy into a middle level economy by the year 2030 (Ministry of Agriculture and Ministry of Livestock Development 2008). In these two policy documents, extension which means the application of scientific research and new knowledge to agricultural practices through farmer education is identified as a critical area that requires immediate intervention.

Traditionally, Kenya’s smallholder farmers have received extension services through two main avenues:

(1) A focus on food crops systems where profit is not a motivating factor, and which includes extension approaches such as the progressive or model farm, an integrated agricultural rural development, better farm management, training and visits (T&V), attachment of agricultural officers to organisations supporting agriculture in the country (e.g., Food and Agriculture Organization (FAO), development of farming systems, and farmer field schools (FFS).

(2) Commodity-based systems which are coordinated by State Corporations, out-grower companies and Cooperatives. This approach deals mainly with commercial crops such as coffee, tea, pyrethrum, and sisal, and extension services are motivated by profit.

However, the above two approaches have been beset by some flaws such as extension providers acting as individual entities. To address the flaws in these two approaches, a third approach to providing extension services emerged in the early 2000s as a response to the increasing complexities in extension. Hence, extension services as at 2014 are provided by
both public and private sector entities based on the principles of privatised agricultural extension services provided by private companies and non-governmental organisations (NGOs) under the NALEP.

NALEP operates in the government policy framework, specifically the policy associated with the Strategy for Revitalising Agriculture (SRA) 2004-2014 (Ministry of Agriculture and Ministry of Livestock and Fisheries Development, 2004). SRA’s overriding goal is to progressively reduce unemployment and poverty, which are the two major challenges that Kenya continues to face.

The other government policy framework influencing NALEP was the Economic Recovery Strategy for Wealth and Employment Creation (ERS) 2003-2008. The ERS strategy was anchored on four pillars: (1) restoring economic growth, (2) strengthening government institutions, (3) restoring and expanding physical infrastructure, and (4) investing in human capital for the poor. This policy was transformed into another policy in 2008 known as Vision 2030, which aims to transform the country’s economy into a middle-level economy by 2030. Vision 2030’s success, in turn, rests on economic, social, and political factors. Economically, the Kenyan Government has identified agriculture as one of the major sectors that has the greatest potential to contribute to realising the policy. Agriculture’s contribution to the policy is expected to be achieved through increased production and processing of agricultural produce as processing is perceived as having greater chances of increasing household incomes than selling raw produce, and also generates rural employment through increased investment in agro-industries (Ministry of Agriculture, 2009).

However, the environment under which the agricultural sector operates has undergone major changes since independence in the 1960s. For example, in the past, farm sizes were large, the population was low, land was fertile, and the government regulated the economy. Today, the opposite is true: farm sizes are small, population density is high, the economy is free, and there is increased environmental degradation. These changes call for increased and sustainable production by using appropriate technologies and advanced extension methods.

Section 2.7 discusses the smallholder farmers who are this study’s focus. The section defines “smallholder farmers”, and discusses the emerging challenges that are affecting them alongside those that have existed for many years.
2.7 Smallholders and the emerging challenges facing them in developing countries

The definition of smallholders differs between countries and between agro-ecological zones. According to the Food and Agriculture Organization (2003), based on agro-ecological zones, smallholders are farmers cultivating less than one hectare of land in favourable areas or cultivating 10 hectares or less in semi-arid areas. In Africa, the percentage of agricultural farms of less than one hectare increased from 50% to about 78% between 1980 and 1990 (Dixon et al., 2001). In SSA, two thirds of the individuals residing in rural areas are considered to be smallholder farmers. The term smallholder in SSA is used in reference to their limited resources relative to other farmers in the agricultural sector.

The traditional challenges associated with smallholders are mainly socio-economic in nature. They include insufficient access to markets, infrastructure, and technology; high marketing and transportation costs; and limited resources (both land and human capital) (Hazell et al., 2007; The World Bank, 2008b).

However, while these traditional challenges persist, smallholders’ vulnerability is worsened by the emerging complex challenges related to food prices, people’s health, the environment, and the financial risks. To cope with these emerging challenges, smallholders are pursuing livelihood strategies that involve lower-risk and lower-yielding agricultural activities. While such strategies can help farmers to cope with changes, they also cause poverty to persist, and result in farmers being trapped in a cycle of poverty (Hazell et al., 2007; The World Bank, 2008b). Smallholders face four emerging challenges:

1. **Vulnerability caused by food price volatility.** Increasing food prices can negatively impact smallholders, but can also generate opportunities for smallholders in developing countries to increase production and profits. Therefore, the direction and magnitude of vulnerability caused by changes in food prices to smallholders depends on whether they are buying or selling food. In situations where the farmers are buying foods, increased food prices cause adverse effects. On the positive side, rising food prices associated with high income for smallholder farmers can offer opportunities for smallholders to increase their investment in production and relieve their credit constraints (Karfakis et al., 2011; Minot & Dewina, 2013). However, although smallholders with surplus produce may profit from rising food prices, the price uncertainty makes it difficult for them to take advantage of these opportunities. This is
especially true when farmers lack proper storage facilities; hence, volatility related to future prices raises fundamental questions about the smallholders’ future income and risks, both as a producer and consumer (Nose & Yamauchi, 2012).

(2) **Health challenges.** Agricultural production is directly related to farmers’ health status Barnett & Rugalema, (2001) because farmers’ ill-health reduces farmers’ ability to undertake more-productive activities that generate food and income. This may lead to farmers switching to less labour-intensive crops like root crops that create lower yields and have less nutritional and economic value, which can result in a cycle of ill health and lower production (Barnett & Rugalema, 2001).

Development efforts in the past have focused on providing adequate food supplies by increasing agricultural production, but they have failed to provide adequate nutritionally balanced food to the poor. For example, strategies to increase food production during the Green Revolution which refers to a series of research, and development, and technological transfer initiatives, occurring between the 1940s and the late 1960s, that increased agricultural production worldwide, especially in developing countries, beginning in the late 1960s, focused on producing only cereal at the expense of more-nutritious crops (such as combining cereals and legumes), with less focus on enhancing human health (Welch & Graham, 1999).

(3) **Climate change.** Poor rural communities are more likely to be affected by climate change because smallholders are sensitive to rising temperatures that change rain patterns and increase the risks of crop pests, diseases, and even failure. Climate change is also likely to aggravate the already existing non-climatic factors associated with smallholders such as use of land with marginal productivity, and a limited access to technical knowledge, insurance, and financial services. Moreover, projections of climate change’s potential impacts indicate that there are threats to the already-strained global food-production systems, particularly with staple foods associated with smallholders such as maize and rice, the yields for which researchers predict to decrease (Nelson et al., 2010; Lobell et al., 2011). Furthermore, model simulations show that losses in agricultural production induced by climate change are expected to reach 10-20 % in Africa and Southern and Southeast Asian regions where a relatively large population of smallholders live (Wheeler, 2011). Essentially, smallholders, who have a low resource adaptive capacity, are more likely to experience climatic extremes
that will increase uncertainty in their agricultural productive systems (Borja-Vega & De la Fuente, 2013).

(4) **Limited access to finance and capital.** Many smallholders are excluded from financial capital capable of enhancing their agricultural productivity. This means that they are unable to secure fixed and working capital such as land, buildings, machinery, high-yield seeds, and fertiliser. The major financial constraint among smallholders is their limited access to financial options and services (e.g., for keeping their savings in bank accounts). This has contributed to low saving rates among smallholders and a lack of buffers against adverse conditions (Barnerjee & Duflo, 2007; Horioka & Wan, 2007; Dewen, 2010).

In the past several decades, microfinance, which was designed to enhance smallholders’ access to credit, has gained popularity as a poverty-reducing tool (Bateman, 2011). Microfinance refer to financial services for poor and low-income people offered by different types of service providers, such as loans and other services from providers that identify themselves as “microfinance institutions” (MFIs) However, the reality of these microfinance initiatives is mixed. First, microfinance loans are small, have short maturing periods, and have high interest; therefore, they do not adequately address the seasonality associated with smallholder production and income cycles, and they do not address farmers’ long-term needs for more productive capital investments such as machinery and storage facilities. Second, microfinance schemes lack adequate financial capacity to deal with risks such as droughts and floods that affect whole communities, and lack support for the high transaction costs arising from delivering services to smallholders who are geographically dispersed. As a result of these deficiencies, microfinance loans are generally unsustainable because they do not adequately meet farmers’ needs to improve productivity. Therefore, to pay unsustainable microfinance loans, farmers are forced to borrow from informal money lenders who charge higher interests than the microfinance schemes for short-term loans, which further aggravates the situation (Chen et al., 2010). Foreign direct investment (FDI) is another option available to developing countries to bridge the investment gap in agriculture. Currently, only a small segment of FDI in developing countries reaches the agriculture sector because challenges still remain about how to better link it to smallholders and how to maximise smallholders’ benefits from it (United Nations Conference on Trade and Development, 2009). Although the FDI concept in agriculture is not new, recent trends
shows increasing levels of resource-seeking as opposed to market-seeking investments, which were common in the past. A significant fraction of the growth in FDI flowing to Africa is spent on land acquisition, but it is not clear what proportion of it benefits smallholders (United Nations Conference on Trade and Development, 2009). Moreover, large-scale deals through FDI both positively and negatively impact smallholders. On the positive side, they have the potential to stimulate rural economic development by bringing in capital and technology. However, there are potential risks, which include irreversible natural resource degradation, displacement of smallholder farmers by the large capital-intensive farms, and increased domestic food insecurity due to rising food exports (Robertson & Pinstrup-Anderson, 2010).

Smallholders play a significant role in agricultural development in developing countries and the challenges affecting them generally involve socio-economic factors. The plight of these smallholders is at the heart of many development agencies and governments, which initiatives such as the millennium development goals (MDGs) evidenced.

### 2.8 Agricultural development programmes

Approaches to implementing agricultural development programmes have been undergoing changes to cope with the complex systems that characterise modern agriculture. For example, the discussion on public extension services in Kenya has shown how the service has transformed from a service that was criticised for being inefficient and unresponsive to farmers into a system that is participatory and responsive to farmers’ needs.

Table 2.1 presents the changing approaches from traditional to more-recent approaches in agricultural development programmes.
Table 2.1 Changing approaches to agricultural development programmes (adapted from Humphrey & Schmitz, 2002)

<table>
<thead>
<tr>
<th>Traditional approach</th>
<th>More recent approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Emphasis on increasing output and productivity</td>
<td>Broader concern with income, livelihood, vulnerability, and poverty reduction</td>
</tr>
<tr>
<td>2 Focus on “supply-side” interventions based on providers’ perceptions of producers’ needs</td>
<td>Increasing focus on market demand and the specific requirements for supplying different buyers and markets</td>
</tr>
<tr>
<td>3 Assumption that producers will sell into markets characterised by arm’s-length market relationships</td>
<td>Recognising markets’ structure by vertically coordinating buyers’ and intermediaries’ roles</td>
</tr>
<tr>
<td>4 Public sector extension services seen as prime deliverers of support to farmers</td>
<td>More emphasis on mobilising private sector support for producers</td>
</tr>
<tr>
<td>5 Interventions focused on producers</td>
<td>Systemic interventions from the value chain perspective, with the recognition of the potential importance of post-harvest activities for poverty reduction</td>
</tr>
<tr>
<td>6 Focus on traditional agricultural commodities</td>
<td>Support for expansion on non-traditional agricultural exports</td>
</tr>
<tr>
<td>7 Emphasis on technology</td>
<td>Broader emphasis on economic and social relationships</td>
</tr>
</tbody>
</table>

Realising that there is need to change approaches to agricultural development from traditional to more modern approaches has contributed to more sustainability in agricultural development (Pretty et al., 2007). In addition, Pretty et al., (2007) highlight some key components that should be included in agricultural policies that address sustainability and poverty. Some of the policies are (1) development programmes linked to local and export markets, (2) agri-business development focusing on both small and export-led businesses, and (3) agro-processing and value-adding activities, which ensure returns are maximised in specific countries.

According to the Donor Committee for Enterprise Development (2006), development agencies are using the value chain approach to identify how poor farmers and other vulnerable groups can be incorporated into agrifood chains to play a larger and more-profitable role in a particular value chain, and looking into ways of changing the structure of a value chain to enable it grow in pro-poor ways (Altenburg, 2006).

2.9 Value chain approach

Businesses do not exist in isolation: every business has suppliers of the goods it needs and buyers of the goods it, in turn, makes and/or sells. Both these suppliers and buyers have the
same driving forces and critical responses (Bryceson, 2008). The grouping of these businesses is called a chain Porter, (1985) of companies and tends to reflect the industry in which the businesses are involved.

Generically, industry chains are classified as either supply or value chains. Supply chains mean the physical flow of goods that are required for raw materials to be transformed into finished products (Waller, 1998; Beamon, 1999). Value chains (a term first referred to by Michael Porter in his seminal work on competitive advantage in 1985) are more complex and include the full range of activities that are required to bring a product from raw materials through the different phases of production to delivery to consumers; that is, a value chain exists when all of the actors in the chain operate in a way that maximises the generation of value along the chain (Porter, 1985).

Toward the end of the 1990s and into the early 2000s, the term demand chain started appearing in the literature to describe the sequence of processes initiated by the end-customer that enable companies to anticipate demand characteristics in a given market (Christopher, 2005; Juttner et al., 2005). This concept was initially linked to the issue of managing inventory in relation to demand, although Langabeer and Rose (2001) saw it more from the perspective of the eventual market with a demand chain being understood as a complex web of business processes and activities that help firms understand, manage and ultimately create consumer advantage. More recently Walters and Rainbird (2004) have pointed out that the demand chain concept is practically based on cross functional in a business or across an industry chain, and, in essence, “an integral component of the value chain and an emerging qualification for competitive advantage” (p. 474).

In practical terms, a supply chain (SC) and a value chain (VC) are complimentary components of an overarching endeavour that enables products and services to flow in one direction, and value as represented by demand and cash flow in the other (Cooper et al., 1997; Cox, 1999). Their key difference is in the opposing flow of product from a downstream supply source and value driven by demand from the upstream consumer (Feller et al., 2006).

In traditional marketing systems in which most of Kenya’s farmers operate, farmers produce commodities that are “pushed” to the market place (i.e., they are supply driven) (Beamon, 1999; Bryceson, 2008). In such systems, the farmers are also generally isolated from the majority of their produce’s consumers by intermediary traders and have minimal control over prices received for their goods. The exception is in situations where farmers have direct links
with consumers, but, in most traditional marketing systems, producers tend to receive minimal profit for their commodities (Altenburg, 2006; McCullough et al., 2008) (see Section 4.2.2).

On the other hand, in value chain marketing systems, farmers are linked to consumers’ needs and work closely with suppliers to produce the specific goods consumers required (Christopher, 2005; Juttner et al., 2005). Well-functioning value chains are more efficient in supplying products to consumers and, therefore, all actors including farmers and consumers benefit from the value chain development. The market “pull” is based on integrated transactions and information where consumers purchase products that are produced according to their preference. Therefore, farmers are the core link in producing commodities that consumers desire, which enhances the farmer’s market power and profitability (Altenburg, 2006; Enright, 2006; Ramamurti & Singh, 2009).

A value chain approach to developing an economy and reducing poverty is a participatory, stakeholder-driven approach that involves addressing the major constraints and opportunities faced by farmers and producers, processors, traders, and other businesses at multiple levels and points along a given value chain (Bryceson, 2003; Walters & Rainbird, 2004; Bryceson & Slaughter, 2010). A value chain approach includes analysis of the value chain in question by stakeholders (e.g., meat, fruit, vegetable, etc.); looking at the factors that influence product development including the delivery of business and financial services; the flow of information; access to and requirements of end markets; the legal, regulatory, and policy environment; the relationships between firms in the industry; and the level and quality of support services (Porter, 1985; Beamon, 1999; Bryceson, 2003, 2008; Department for International Development, 2008).

According to Webber and Labaste (2009), interest in the value chain approach is not new, and businesses worldwide have been using the approach and its implementation principles to formulate and implement competitive strategies since 1985 when it was popularised by Michael Porter. The approach’s popularity has been reinforced by its many important business strategy aspects such as: core competences, comparative and competitive advantage, outsourcing, vertical and horizontal integration, and best practices (Porter, 1985).

2.9.1 Applying value chain approach in Kenya: linking smallholders to markets

In Kenya, the value chain approach is being used in agricultural development through extension activities where traditional marketing channels with unplanned sales are being
gradually replaced with coordinated links among farmers, marketers, and retailers. This is achieved by mobilising stakeholders in a locality by public agricultural extension providers to come together and form linkages; for example, under NALEP, which defines one of its pillars as a participatory approach to extension delivery (Ministry of Agriculture and Ministry of Livestock and Fisheries Development, 2006; Ministry of Agriculture and Ministry of Livestock Development, 2008).

Although low-income rural households generally receive low gains from value chains, marginal increases to produce supply from chains will benefit the majority of country’s rural poor due to higher monetary gains (Food and Agriculture Organization, 2007). According to the International Fund for Agricultural Development (2010), changes in agricultural marketing systems and production technologies are opening up opportunities for smallholder farmers in developing countries, but the poor and marginalised rural people rarely benefit. For this reason, it is important to ensure that poor rural farmers have the necessary skills and are organised so that they can take advantage of competitive markets. In Kenya, a key focus of NALEP programme has been to build farmers’ capacity for production and marketing through the value chain approach as a catalyst to reduce rural poverty (Ministry of Agriculture, 2009).

The Kenyan Government’s NALEP implementation with the value chain approach has not been without challenges. The first challenge has involved empowering poor smallholders so that they can provide high-quality produce in a sustainable way to satisfy target markets. This means ensuring that smallholders have access to basic production input, credit, capacity, and market information (Dannson et al., 2004).

The second challenge has involved creating an enabling business environment by facilitating farmers’ access to the market to help reduce poverty, which involves improving their business management skills and marketing strategies, ensuring they have the knowledge and technologies required to meet food-quality standards, and providing adequate infrastructure (Dannson et al. 2004).

The third challenge has involved ensuring that the economic gains in value chains are fairly distributed among the various chain actors, especially smallholders, which require reduced market distortions, better relationships among the various chain actors, and stronger farmers’ organisations (Dannson et al., 2004).
In addition to the above challenges faced at the programme level, farmers are also faced with a variety of marketing constraints because marketing farmers’ produce is performed by private marketers who collect, regroup, and distribute the produce to terminal markets (Food and Agriculture Organization, 2007). The reality is that economic and institutional barriers limit growth of agrifood chains, which negatively affects the welfare of the large population of smallholder producers and other people who depend on the agriculture sector for their livelihoods. Nevertheless, the approach has potential to create an improved and well-functioning market that will enable smallholder producers to derive greater benefits from their production activities (Dannson et al., 2004; Food and Agriculture Organization, 2007).

2.10 Commercialisation approach

Agricultural commercialisation, which in the case of this thesis project builds on the value chain approach, is the process of increasing the proportion of agricultural products that farmers sell which increases their market participation and provides benefits such as improved income and living standards (Pradhan et al., 2010; Jayne et al., 2011). Commercialisation can take different forms and can occur either at the output side of production with increased market surplus at the input side with increased use of purchased inputs. It is the outcome of simultaneous decision making behaviour of farmers in both production and marketing (von Braun & Immink, 1994). Therefore, agricultural commercialisation and investment are major strategies for promoting modernisation, creating sustainable growth and development, and, hence, reducing poverty.

The commercialisation approach does not necessarily replace, support or supersede the value chain approach, it simply emphasises the market and the need to design and implement strategies that connect farmers to better, and more sophisticated markets more effectively.

The commercialisation process’s core focus involves achieving more output and agricultural growth, which involves a process that links a large proportion of the rural farming population to commercial high value agrifood chains (Jayne & Muyanga, 2011). Some of the factors necessary to bring about commercialisation (e.g. as identified by Wiggins et al 2011) include access to high-yield seeds, better animal breeds, improved farming technology, fertiliser, and farming knowledge. However, the agricultural growth and economies of scale arising from the commercialisation process can only be most beneficial in reducing rural poverty if the process is inclusive and involves the majority of smallholder households. This implies achievement of broad-based economic growth whose process embraces sections of the
population that traditionally have little access to these economic growth sources, hence requiring government-led initiatives and investments (Eicher & Kapfuma, 1998; Klasen, 2010).

The commercialisation process involves gradually replacing integrated subsistence farming systems with specialised enterprises for both crops and livestock, whereby poor individuals in rural areas are assisted to transform from subsistence farming to producing for the market place (Pingali & Rosegrant, 1995). Agricultural commercialisation can occur in any scale of production (e.g., small, medium, and large) or type of enterprise (e.g., food or cash crop) (Poulton et al., 2006). The explanation that is based on transition from subsistence indicates that commercialisation focuses on smallholder farmers that are still autarkic and who participate in agricultural markets mainly as buyers (produce takers) due to the prevalent problems of market failure (Okello & Swinton, 2007). Barret (2008) and Jayne et al. (2010) also propose that the majority of smallholder farmers fail to participate in markets as sellers since they have little or no marketable surpluses to sell because they do not adequately use improved farming technologies (e.g., lack of investment), which leads to low yields, (Barrett, 2008).

Smallholder agricultural commercialisation has been highly promoted, documented, and researched due to the fact that the majority of individuals in rural areas (especially in Sub-Saharan Africa) are engaged primarily in agricultural production. Hence, researchers have argued that no other viable alternative to smallholder-led economic growth exists (Jayne & Muyanga, 2011). In this case, agricultural production is the only pathway with the potential to include a large number of poor individuals in rural areas.

However, there is uncertainty regarding the extent to which the process of agricultural commercialisation has succeeded as a pathway to reducing poverty among SSA’s poor rural population due to mixed evidence that shows some level of success in some countries and failure in others (World Bank, 2008).

2.11 Agricultural commercialisation in SSA

Due to SSA’s diversity, successful agricultural commercialisation models cannot be replicated from one country or location to another. The success or failure of SSA’s agricultural commercialisation depends on two interrelated factors: (1) the governments and private promoters’ ability to develop models that suit specific social, economic, environmental, and geographical conditions, which requires a clear understanding of the
complexities of the specific location where the model is being promoted; and (2) the extent to which smallholder farmers are supported to overcome area-specific challenges along agrifood chains. The extent to which the government and private promoters overcome these two issues will determine whether the commercialisation strategies in the region will succeed or fail (Pradhan et al., 2010; Jayne et al., 2011).

In summary, factors that hinder commercialisation include socio-economic factors, lack of access to sufficient agricultural support services, transaction costs and institutional factors, inadequate or missing infrastructure, and the effect of climate change-induced risks. Factors that enhance agricultural commercialisation consist of farmer organisation and collective action, information and market access, and access to finances or credit (Barrett & Swallow, 2006). All these factors will now be discussed in details.

2.11.1 Factors enabling successful agricultural commercialisation in SSA

There are three major and highly interlinked factors that are necessary for successful agricultural commercialisation in SSA, with each being about bringing the markets closer to farmers and reducing transaction costs: farmer organisation, information, and direct access to markets and credit support.

(i) Farmer organisation, collective action, and innovation

Membership to a farmer organisation has both positive and negative impact on smallholder farmers. It positively impacts agricultural commercialisation because it increases a household’s access to market information, which is crucial for making production and marketing decisions (Olwande & Mathenge, 2012). On the other hand, it can negatively impact commercialisation due to challenges such as conflicts and mismanagement of members’ resources; as such, we need to better understand under what conditions collective action is useful and viable (Poulton et al., 2008). Collective action through farmer groups is a crucial social asset for smallholder farmers who continue to face challenges in accessing input and output markets because the majority of smallholder farmers are involved in subsistence and semi-subsistence agriculture (Barrett & Swallow, 2006; Barrett, 2008).

Therefore, collective action initiatives are strategies that can help reduce transaction costs, build capacity, and enhance information exchange (Bingen et al., 2003; Markelova et al., 2009). Collective action initiatives can also help improve smallholder farmers’ market power (Fafchamp & Hills, 2005).
The advantages of collective action outweigh the disadvantages; therefore, membership in farmers’ groups by smallholder farmers is expected to increase commercialisation by reducing transaction costs. Collective action also enables smallholder farmers to meet strict agrifood chain requirements such as food safety, which improves their access to high-value markets (Okello & Swinton, 2007; Okello et al., 2011).

Additionally, successful farmer organisations are able to innovate by implementing innovative marketing strategies such as centralising collection points, transporting produce from many individuals together to markets, and peer mechanisms that increase the adoption of new technologies that improve productivity (Zeitlin, 2009).

(ii) Information and direct access to markets
Direct access to markets by farmers lessens the chance that middlemen and other players along the agrifood chain will exploit smallholder farmers. In instances where farmers depend on intermediaries along the agricultural agrifood chain, they are less likely to succeed because they receive lower prices for their product and also incur higher transaction costs (Kirsten et al., 2012).

Using mobile phones to provide market information to rural areas has been the key innovation that has resulted in increased information access (Jari & Fraser, 2009). ICT tools such as the mobile phones enable farmers to receive information about prices in local and distant markets without the need to travel to such markets or the need to rely on middlemen who are unlikely to be truthful about prices. Information about produce’s price in the local and distant markets benefits farmers in that it provides them with power to bargain for higher prices, and it also reduces their transaction costs (Kirsten et al., 2012). Access to market information can spur agricultural commercialisation by increasing marketable surplus and facilitating farm holders’ participation in better-paying distant markets.

(iii) Finance and credit
The availability of finance in the form of non-farm income, savings, or credit is an important factor that determines the level of success of market-oriented production and market participation because it increases market outcomes such as income and farm productivity (Chirwa, 2002). This is due to the fact that smallholder credit provided at the farm level promotes farm holders to adopt new agricultural technologies. As such, this suggests that, for farm holders to achieve agricultural commercialisation, they need financial support and development of rural financial markets and services, which involves innovative rural banking
services and credit schemes. However, provision of farm credit to smallholder farmers is not easy because the credit systems often breakdown due to high default rates.

The key innovation in many SSA countries that has led to the sustainable provision of smallholder finance has been group based, whereby groups are used as a substitute for collateral (Chirwa, 2002). This innovation includes pre-conditions for groups to access loans, such as training on business and credit management and on group formation and management. This strategy uses social pressure to reduce default rates through peer monitoring; hence, group members need a sufficient level of cohesion for this strategy to work. The peer-monitoring strategy works better when combined with threat of sanctions (such as threats that members will be suspended or expelled from the group). Another pre-condition for group access to finance include savings money by the group members, to provide small initial loans to members.

These changes in the micro-finance sector combined with charging realistic interest rates have resulted in enormous increases in the availability of smallholder finance and credit. According to Besley (2009), the alternative to using group-based lending is using local individuals with a thorough knowledge of clients and local culture that can closely monitor borrowers. This strategy has been tried in developing countries with some success in micro-finance, but it has several disadvantages: for example, the monitors can conspire with local lenders to cheat. In case of close social ties, the monitor may not want to reveal cheating malpractices for fear of being isolated by the community. Additionally monitoring can be costly (Besley, 2009).

2.11.2 Factors that hinder successful agricultural commercialisation in SSA region

(i) Socio-economic characteristics of smallholder farmers

Smallholder farmers’ socio-economic characteristics are significant determinants of commercialisation’s success but, in most cases in SSA, they are also deterrents to successful market participation. Individual characteristics such as gender, age, and education, and household size can determine a household’s decision to sell in commercial markets and also the type of crops the household decides to commercialise.

On one hand, low literacy levels leads to poor networking, poor negotiation and bargaining power, and poor management of farm enterprises. On the other hand, higher literacy levels have a positive impact on market participation since literacy improves individuals’ skill and
ability to decode market information, which may, in turn, reduce marketing costs and make it more profitable to sell produce to the market (Gebremedhin & Jaleta, 2010).

A household head’s age may have a negative or positive impact on the household’s market participation. On the positive side, older farmers may make their decisions more easily than young farmers since the former have likely accumulated capital and long-term relationships with their clients, or because they might have preferential access to credit due to their age or family size (Sall et al., 2000; Adegbola & Gardebroek, 2007). Households with older participants can also suffer from having more dependants, which causes more consumption and lowering the household’s marketable surplus (Ehui et al., 2009). Age’s negative impact is also found in younger farmers who might have longer-term plans and be willing to take risks that may not always result in enhanced market participation (Zegeye et al., 2001). However, due to their longer-term plans and their risk-taking tendencies, younger farmers are more open to change.

The household head’s gender also influences the types of commodities they sell in markets and the extent of the household’s market participation: female-headed households mainly sell crops that are traditionally grown for home consumption (e.g., grains, legumes, roots, and tubers), while males typically control cash crops such as tea, coffee, and high-value vegetables. Additionally, when crops sold by female members of the family become commercialised, their production and marketing is controlled by male household members. Male-headed households are more resource endowed than their female counterparts (Jagwe et al., 2010), which has a positive influence on male-headed households’ market participation (Gutierrez, 2003).

The size of a household determines the family labour supply for production and also household consumption levels (Alene et al. 2008). Positive impact of a large household arises from provision of cheaper labour which result in production of more commodities such that the proportion sold is high. The negative impact is that a larger household is likely to consume more output hence leaving less proportion for sale.

In regard to external labour, female-headed households are more constrained by land and labour resources than male-headed households since most of female farmers own small land sizes and lack the resources to hire additional external labour to carry out recommended crop management practices in times of high labour demand such as planting and harvesting.
(ii) Lack of access to sufficient agricultural support services

Apart from pre-existing challenges such as poverty, lack of access to agricultural support services is a major hindrance to successful commercialization of smallholder agriculture in SSA. Smallholder farmers who have the potential and willingness to commercialize their farming enterprises are hampered by factors such: lack of access to market information, agricultural credit, timely agricultural advisory services and lack of access to input markets for high yielding seed and inorganic fertilizer (Gebremedhin & Jaleta 2010).

The fact that the delivery of support services to smallholder farmers in remote areas by the private sector in most SSA countries is not adequate due to economies of scale and profitability, agricultural support services in such area still require government involvement. However, according to Williams (2010), many governments in SSA are unable to provide public goods and services due to limited funds and liberalised markets. As such, governments have no monopoly in providing goods and services. As a result, rural farmers, especially those in remote areas, do not receive adequate support services.

Although Governments’ monopoly in fertilizer distribution and subsidies are nowadays rare, the realization that input fertilizer subsidy programmes combined with favourable climatic conditions contribute to bumper harvest of staple crops like maize has led to Governments in the SSA countries like Kenya to invest heavily in these programs as a way of increasing smallholder productivity in the country (Jayne et al. 2011).

(iii) Transaction costs and ground rules

Transaction costs are important factors hindering smallholder farmers’ sustainable participation in commercialised markets. Transaction costs include all resources required to transfer property rights from one economic agent to another (Williamson, 1991). They include the costs of making an exchange (i.e., searching for exchange opportunities and negotiating, monitoring, and enforcing agreements) and the costs of maintaining and protecting institutional structures (e.g., the judiciary, police force, and the army) (Pejovich, 1999).

Buyers of agricultural produce are mainly large and commercialised; thus, they are able to take advantage of economies of scale and exert market and negotiation power over smallholder farmers. Moreover, smallholder farmers are less competitive because they have low production capacities and lack sufficient transport, processing, and storage infrastructure, which bring about high transaction costs (World Bank, 2009). Despite these challenges,
farming contracts have the potential to provide guaranteed markets outlets (e.g., supermarkets) for smallholder farmers, which can reduce transaction costs, but supermarket outlets mainly favour large-scale farmers and agribusinesses because they desire large volumes of consistent-quality produce (Minot & Ngigi, 2003; Okello & Swinton, 2007).

Rules associated with market participation (e.g., quality requirements, regulations governing the sourcing and procuring of produce, and payment speed) have the potential to increase transaction costs for smallholder farmers, which can exclude them from participating in higher-value agricultural markets (Williamson, 1991).

(iv) Insufficient / missing infrastructure

Insufficient or missing infrastructure such as irrigation and water resources, electricity, and road networks also hinder market participation. Although many African Governments are making considerable effort to develop rural infrastructure, the poor population do not benefit directly because infrastructure is a public, non-excludable good. As such, it’s difficult to specifically target the poor (Gunatilaka, 1999). Governments have also found it difficult to strategically place rural infrastructure in a way that benefits the poor because they are usually sparsely located and, thus, require greater targeted investments (Gunatilaka, 1999). Poor infrastructure has a negative effect on smallholder farmers’ market participation since the majority of them in developing countries are located in remote areas with poor infrastructure and often fail to participate in the market due to the high transaction costs involved (Goetz, 1992; Key et al., 2000; Makhura et al., 2001).

However, evidence from research indicates that investing in infrastructure has large net returns to a country because it reduces transaction costs, which facilitates smallholder farmers’ access high-value markets (Okello & Swinton, 2007).

Key infrastructure projects specifically targeting the poor have involved information and communication technologies (ICTs) since they are recognised as development enablers (United Nations Conference on Trade and Development, 2011). Hence, efforts to resolve the challenge of the poor’s access to agricultural market information have focused on promoting information through ICT-based innovations (Barrett, 2008). For example, in Kenya, there were 35 projects that used ICT as a platform for disseminating agricultural information in 2007 (Munyua, 2007). Several studies on effects of ICT-based interventions on smallholder farmers in SSA suggest that using ICT benefits farmers and market actors, with users of ICT
receiving higher margins than their counterparts who do not use it due to reduced marketing costs (Ashraf et al., 2005; Aker, 2010; Kirui et al., 2010; Asingwire & Okello, 2011).

However, despite these benefits, using ICT for agricultural transactions is hindered by challenges such as: low literacy levels, the high cost of ICT tools and phone calls, lack of supporting infrastructure (e.g., electricity), age, and asset endowment (Kamungi & Okello, 2011; Katengeza et al., 2011).

2.12 Constraints to developing value chains and commercialisation in developing countries

The constraints to value chain development and to commercialisation Pradhan et al., (2010) in developing countries are generally associated with four factors; (1) market orientation (Grunert et al., 2005), (2) market participation and market access (Smith, 1776; Coarse, 1937; Moyo, 2010), (3) available resources and physical infrastructure (Porter, 1990), and (4) institutions and institutional factors (Scott, 1995).

2.12.1 Market orientation

The first constraint is market orientation which Kohli and Jaworski (1990) defined as the organization-wide generation of market intelligence, dissemination of the intelligence across departments and organization-wide responsiveness to it. The idea of Market orientation has been used widely in the Literature, and operationalized in the manufacturing sector. Essentially, it refers to the extent to which a producer uses market information (e.g., customer needs and product prices) to make decisions on the three economic questions of what to produce, how to produce, and how to market (Kohli & Jaworski, 1990; Jaworski & Kohli, 1993; Fritz, 1996). However, this definition is essentially the implementation of the marketing concept that contends that long-term profitability is best achieved with an organisation that coordinates its activities to satisfy the needs of a particular market segment or segments (Fritz, 1996).

In the food industry, this concept of market orientation has also gained ground over time—with the caveat that this industry deals essentially in commodities and where company performance can be related positively to a company’s market-oriented culture (Grunert et al., 2005).

Market orientation in agriculture, however, particularly in the development literature, is based less on sophisticated concepts of market intelligence, competitive intelligence gathering, and
the use of that information to make decisions, and more on the ratio of resource allocation (e.g., land, labour, and capital) to the production of agricultural produce meant for sale (Hinderink & Sterkenburg, 1987; Immink & Alacorn, 1993). In this context, market orientation is measured by the level to which a household financially commits to acquiring production equipment and storage facilities.

2.12.2 Market participation and market access

The second constraint is market participation and market access. An economic explanation of market participation should address production specialisation (Smith, 1776), with the dominant thought being that specialisation of tasks improves productivity, which leads to greater production and supply and effectively increasing the market’s potential (Smith, 1776). The theory on specialisation, however, mostly refers to manufacturing industries.

Specialisation as a central driving force in agricultural transformation has been recognised in the literature as crucial to the transformation process (Kurosaki, 2003). At a pure subsistence level, a family unit provides almost everything for itself, with agricultural tasks carried out using family labour and little possibility of specialisation. Kurosaki (2003) investigated the role of crop specialisation and diversification in the process of agricultural transformation in West Punjab, Pakistan, and noted that cropping patterns of subsistence agriculture changed significantly with the concentration of crop acreage in districts with higher and growing productivity, and observed rapid specialisation in crop production in some districts after a phase of sporadic specialisation. Wickramasinghe and Weinberger (2013) suggest that there are three important considerations when investigating market participation: (1) the costs of market participation (two kinds of which are critical: transportation and transactional), (2) the rural institutions that govern the degree of specialisation, and (3) limited land ownership and the technology use. The next section discusses these three considerations.

Smith (1776) recognises the role of geography, especially its implication for transportation costs, as a factor in the price differences between town and countryside. Indeed, farmers in distant areas (from commercialisation hubs) are disadvantaged due to the effort required to transport their goods. Coase (1937) recognises transaction costs—the costs firms incur for doing business—as the reason for firms’ existence. His theory established that firms exist to minimize transaction costs and that firms arise when they can produce what they need internally, which is typical of a subsistence agricultural household that produces a range of consumption goods, procures goods and services that it cannot produce through the market,
and that the importance of the household as a unit of production appears to decline with the reduction of transaction costs.

In relation to value chain developments, transaction costs, access to markets combined with the forces of quality demand, internationalisation and market differentiation has led to the emergence of three distinct food sub-systems in developing countries, each with its own specific quality and safety standards: the local low-income chain, the local middle- to high-income chain, and the export chain.

The local low-income chain is characterised by smallholders using traditional production systems. These local value chains may target local markets or may also connect to other low-end markets further away. The constraints in this sub-system arise from the presence of many intermediaries, which makes the chains relatively long. This, in turn, leads to the limited availability of market information and longer transportation distances (in terms of both distance and time). These types of sub-systems deliver a high proportion of agricultural production volume, but generate relatively little value (Trienekens & Willems, 2007).

The local middle-to high-income chain involves producers who aim to supply the emerging supermarket sector in many developing countries. Most products are delivered by small to medium-size producers that are organised into cooperatives and linked through subcontracting arrangements. Although the production volume associated with this sub-system is smaller than the local low-income chain’s production volume, the value generated is larger. Also, the produce in this sub-system is generally produced according the national and sometimes international food quality and safety standards. Compliance with the food quality and safety standards is costly to many smallholder farmers in Kenya, which excludes them from emerging markets. An example of this sub-system in Kenya is the vegetable production for contemporary South African retailers operating in the country (Trienekens & Willems, 2007).

The export chain is entirely focused on the export market. However, low-quality or rejected produce destined for the export market is sold in local retail markets. The trend in this sub-system is to move toward increasing economies of scale and direct foreign investments. The export chains are more integrated with fewer actors, but although the produce volumes are small compared to the other two sub-systems, the value added is relatively high. The challenge for smallholders in Kenya is how to achieve the economies of scale and comply with the food quality and safety standards that the export market requires (Trienekens &
Willems, 2007). An example of the third sub-system in Kenya is the international flower value chains (Hortiwise, 2012).

The decisions taken by smallholder farmers to produce surplus farm produce for sale in the markets (market orientation) and the subsequent actual selling of the produce in the markets (market participation) in the three subsystems in Kenya are mainly influenced by transactions costs incurred when producing and marketing the produce. In general across all three subsystems, access to market via all-weather roads and ownership of transport tend to enhance market orientation and market participation since they reduce transaction costs (Key et al., 2000; Gabre-Madhin, 2001; Barrett, 2008). A poor road network is expected to have negative effect on market orientation and market participation since the majority of smallholder farmers in developing countries are located in remote areas with poor roads and often fail to participate in the market due to the high transaction costs involved (Goetz, 1992; Key et al., 2000; Makhura et al., 2001).

Produce packaging may also influence market participation in various ways. Packaging affects market participation positively because it maintains the produce’s quality (e.g., from physical damage and contamination). As such, with better packaging, farmers can receive better prices. However, the costs associated with packaging can negatively influence market participation.

2.12.3 Resources and physical infrastructure

The third major challenge affecting value chains in developing countries is related to resources and physical infrastructure. In addition to market orientation, market participation and market access discussed above, farmers need adequate physical infrastructure and resources to enable value chain actors to sell their produce. The major constraints that value chains in developing countries face include a lack of specialised skills, farming technologies, inputs, market information, credit, and essential services (Porter, 1990; Giuliani et al., 2005).

Low levels of available physical resources such as input materials for production and other input supplies such as energy and water constrain a country’s ability to upgrade its value chains. Also, a value chain’s geographical location may affect its competitive edge, especially if it’s located far away from high-value markets.
Another resource constraint is related to the availability of educated labour and the availability of knowledge needed for production, distribution, and marketing (Giuliani et al., 2005). Education is a significant condition for influencing the behaviour of value chain actors. Resources related to the level and availability of technologies used for production and distribution activities in value chains are also crucial for upgrading them (Porter, 1990; Giuliani et al., 2005).

Apart from the availability of resources, adequate distribution and communication infrastructure is a basic requirement for developing and upgrading value chains because weak infrastructure hampers the efficient flows of product to markets and the exchange of market information (Porter, 1990; Giuliani et al., 2005).

### 2.12.4 Institutions and institutional factors

Institutions and institutional factors comprise the fourth component in a business environment that constrains value chain development in developing countries. Institutions can be regulative, normative, or cognitive institutions (Scott, 1995). Regulative institutions represent government regulations and policies that value chain actors must comply with, while normative institutions are business practices, business policies, and ethical standards. Cognitive institutions represent the way people interpret the world around them as the basis of rules, which encompasses the diverse cultural belief systems, values, and identities that inform people in different roles (Scott, 1995).

Institutional factors such as access to extension services, credit, a cold chain with cooled transport, and cooled storage facilities are expected to increase smallholders’ market orientation and market participation (Wilson et al. 1995). Access to extension services is expected to have a positive effect on smallholders because, through extension advisory services, farmers are able to acquire better skills and knowledge, and are also linked to contemporary technologies and markets (Lerman, 2004). Access to cooled transport and storage facilities is also expected to have a positive impact on smallholders since these facilities prolong the shelf life of fresh produce (Wilson et al. 1995). Access to credit enables farmers to adopt contemporary technologies, which increases marketable surplus and, in turn, increases market orientation and market participation.

### 2.13 The Horticulture industry in Kenya

The Horticulture industry contributes to the country’s economy and to achieving food security, creating income and employment, earning foreign exchange, and creating raw
materials for agro-processing and poverty reduction. The industry employs six million people through direct and indirect employment, and grew at an average rate of 15.9% between 2001 and 2010, especially in horticultural exports. It is currently the leading foreign exchange earner for the country (Ministry of Agriculture, 2012).

As discussed previously, in Kenya, the majority of agriculture is undertaken by smallholder farmers. Kenya’s agriculture sector comprises five major subsectors: horticulture, industrial crops, food crops, livestock and fisheries. This study focuses on the horticulture industry because the major high-value crops grown commercially for sale in supermarkets and export market such as vegetables fall under this industry. The industry comprises five commodities (percentage values indicate how much they contribute to the horticultural industry):

1. Vegetables (16%) (e.g., kale, cabbage, spinach, lettuce, tomatoes, carrots, french beans, potatoes and broccoli)
2. Flowers (7%) (e.g., rose, carnation, alastomeria, lilies, and tuberose).
3. Fruits (11%) (e.g., citrus, passion, tree tomato, bananas, mangoes, apples, and avocados).
4. Herbs and spices (1%) (e.g., coriander, chillies, celery and mint).
5. Nuts (1%) (e.g. macadamia, peanuts, and cashews).

As a whole, Kenya’s agriculture sector contributes 24% of the county’s gross domestic product (GDP). The horticulture industry is one of the leading contributors to the agriculture sector and the national economy: it contributes 36.5% of agriculture’s share of gross domestic product (GDP) (Ministry of Agriculture 2009).

2.13.1 Horticultural production in Kenya

Horticultural production is mostly performed by smallholder farmers (Ministry of Agriculture, 2009). The main vegetable production regions in Kenya are: (1) the Central Region: (Kiambu, Machakos, Embu, Kirinyaga, Meru, Murang’a, and Nyeri districts) and (2) the Rift Valley Region: (Baringo, Nakuru, and Nyandarua districts) (Lans et al., 2012). As for the horticultural products listed previously, flowers are mostly grown for export purposes, while most of the vegetables (90%) are grown for local consumption (Ayieko et al., 2008).

The significance of vegetables lie in their potential to improve livelihoods and attaining food security for the smallholder farmers who produce 100% of African indigenous vegetables and up to 70% of exotic and Asian vegetables. In Kiambu West district, horticultural crops,
especially vegetables, are an important source of income for smallholder farmers. Vegetables in the district have higher returns than most cash crops and are also suitable for the declining farm sizes in high agricultural potential areas such as the district in focus.

Figure 2.1 presents the value per hectare of the major vegetables in Kenya in 2009 and 2010.

Figure 2.1 Value per hectare of key vegetables (2009 and 2010) (Ministry of Agriculture, 2012)

A wide range of vegetables are produced in the main production regions and also throughout the country. Table 2.2 overviews production levels in tonnes for a variety of vegetables for the 2006-2010 period. The most common vegetables produced in this period were cabbages, kale, tomatoes, onions, french beans, and garden peas, both in terms of acreage and output. Production trends show a slight increase for vegetables. However, most of the vegetable production trends show a slight decline in production in 2007 and/or 2008. This is the period when the country was affected by post-election violence, which disrupted farming activities in many parts of the country.

Generally, production land for horticultural crops is declining in high-to medium-potential areas such as Kiambu West district due to the increasing human population and urbanisation. There is potential for expansion in the arid and semi-arid lands (ASALs) but, due to unpredictable weather patterns causing alternating droughts and floods, there is a continuous move toward greenhouse farming in the country.
Table 2.2 Annual production quantities of key vegetables in Kenya 2006-2010 (in tonnes)
(Horticultural Crops Development Authority, 2010)

<table>
<thead>
<tr>
<th>Crop</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomato</td>
<td>503,730</td>
<td>567,780</td>
<td>402,070</td>
<td>526,923</td>
<td>590,13</td>
</tr>
<tr>
<td>Cabbage</td>
<td>518,376</td>
<td>609,292</td>
<td>461,129</td>
<td>627,603</td>
<td>588,432</td>
</tr>
<tr>
<td>Kale</td>
<td>426,885</td>
<td>423,750</td>
<td>378,791</td>
<td>356,861</td>
<td>502,058</td>
</tr>
<tr>
<td>Green peas</td>
<td>40,375</td>
<td>59,045</td>
<td>45,472</td>
<td>75,404</td>
<td>151,522</td>
</tr>
<tr>
<td>Carrots</td>
<td>49,490</td>
<td>62,790</td>
<td>89,134</td>
<td>82,257</td>
<td>90,50</td>
</tr>
<tr>
<td>Spinach</td>
<td>48,919</td>
<td>47,684</td>
<td>76,219</td>
<td>50,539</td>
<td>76,571</td>
</tr>
<tr>
<td>French beans</td>
<td>61,540</td>
<td>67,330</td>
<td>92,095</td>
<td>46,496</td>
<td>55,841</td>
</tr>
<tr>
<td>Snow pea</td>
<td>12,582</td>
<td>14,766</td>
<td>11,563</td>
<td>14,267</td>
<td>21,050</td>
</tr>
<tr>
<td>Passion fruit</td>
<td>6,165</td>
<td>10,020</td>
<td>12,283</td>
<td>18,973</td>
<td>20,769</td>
</tr>
<tr>
<td>Egg plant</td>
<td>17,220</td>
<td>15,780</td>
<td>18,860</td>
<td>12,766</td>
<td>15,171</td>
</tr>
<tr>
<td>Courgettes</td>
<td>1,970</td>
<td>1,030</td>
<td>4,986</td>
<td>6,398</td>
<td>7,034</td>
</tr>
<tr>
<td>Baby corn</td>
<td>960</td>
<td>1,648</td>
<td>1,774</td>
<td>5,662</td>
<td>6,457</td>
</tr>
<tr>
<td>Okra</td>
<td>6,672</td>
<td>4,384</td>
<td>5,024</td>
<td>4,246</td>
<td>3,180</td>
</tr>
<tr>
<td>Cucumber</td>
<td>850</td>
<td>660</td>
<td>1,325</td>
<td>3,020</td>
<td>2,796</td>
</tr>
<tr>
<td>Broccoli</td>
<td>439</td>
<td>517</td>
<td>3,090</td>
<td>1,856</td>
<td>2,028</td>
</tr>
<tr>
<td>Lettuce</td>
<td>1,212</td>
<td>1,504</td>
<td>2,011</td>
<td>1,475</td>
<td>1,965</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>2,346</td>
<td>1,190</td>
<td>852</td>
<td>994</td>
<td>1,540</td>
</tr>
</tbody>
</table>
2.13.2 Marketing of horticultural produce in Kenya

Horticultural crops are marketed mainly at the domestic or international markets. Smallholder and medium-scale farmers access domestic fresh markets, transport and market information through brokers. They sell directly to traders at the wholesale market if they own their own transportation. Large-scale farmers tend to concentrate on only the export market, but sell lower-quality produce that does not meet export standards in the local markets.

The domestic market remains an important source of income for actors in the horticultural agrifood chains, with 90% of all fruits and vegetable produced being consumed domestically (Wiersinga & De Jager, 2007; Koenig et al., 2008; Pegasys, 2010). Vegetables sold in the domestic market account for 52% of the farm production, followed by vegetables consumed on farms (36%) and vegetables exported (12%).

The bulk of the domestic market’s commodities include vegetables, fruits, and herbs and spices; flower trading is limited and usually targets the export market. The key players involved in vegetable marketing include producers, traders, middlemen, transporters, and local authorities. However, there is a wide gap between farm gate prices and consumer prices, which indicates that producers’ profits are suppressed. Many domestic markets have inadequate physical facilities and do not provide facilities such as storage and cold rooms, weighing equipment, loading / unloading services, or social amenities, which renders the domestic market highly dysfunctional (Thomson, 2003).

The fresh vegetable outlets can be categorised as rural and urban. The structure of the rural market is informal, and is mainly supplied by small and medium-scale producers through brokers. Retail market outlets in rural markets are either covered market facilities in larger villages or open-air markets with no covered stalls.

The urban market is more complex and is characterised by four retail segments: (1) upscale green grocers, (2) supermarkets, (3) covered stalls, and (4) street hawkers. Upscale green grocer outlets are a relatively recent entrant in the market, but they have experienced remarkable growth. Supermarkets are mainly owned by large local entrepreneurs (e.g., Uchumi and Nakumatt supermarkets), or multinational market chains (e.g., Metro Cash & Carry and Woolworth supermarkets). These supermarkets outlets have been trying to expand their participation in selling horticultural commodities, but their market share remains low at 4%. The other market outlets in the urban category are open-air markets and vegetable...
corner shops (kiosks), which are the most important outlets, accounting for 55% and 33% of sales, respectively. Products from these two outlets are sold to retailers, green grocers, supermarkets, and institutions. However, vegetable quality in open-air markets is lower than in the covered stalls, but convenience is a key factor in determining where consumers buy their produce (Wiersinga & De Jager, 2007).

Although the agro-processing industry is not well developed in Kenya, there is a wide range of fruit and vegetable-processing facilities that range from modern, fully integrated plantation processors, modern mechanised processors, cottage industry processors, and micro-enterprises. Important processed products that are mainly sold at the domestic markets include canned tomatoes and tomatoes products, canned french beans, fruit juices, sauces and jams. There is also a small frozen-food segment focusing on beans and peas (Wiersinga and de Jager, 2007).

As for regional and international markets, data related to trade in horticultural commodities remain scant, but data indicates that Kenya is a net exporter of some horticultural commodities such as vegetables and flowers. Horticultural produce is exported mainly to the European Union (EU) countries, with other destinations including the United States of America (USA), the Middle East, Japan, Russia, and South Africa (Ministry of Agriculture, 2012). The export market can be divided into fresh produce and processed produce segments. The fresh produce segment is supplied by a few large-scale privately owned company farms, an increasing number of contracted commercial horticultural farms, and a decreasing but still significant number of contracted smallholder farmers. Produce from smallholder farmers is purchased by brokers or farmer-based cooperative societies, who sell it to exporters. The exporters then sell the produce to overseas importers who, in turn, distribute the produce to retailers, restaurants, and caterers (Wiersinga & De Jager, 2007).
2.13.3 Significance of vegetable consumption as a way to increase demand

Per capita consumption of fruits and vegetables in Sub-Saharan Africa (SSA) declined between 1986 and 1995 and continues to lag behind that of other regions in the world. Although per capita consumption of vegetables in developing countries increased by 0.92% to an average of 75.3kg by 1995, SSA showed a decline of 0.19% and remained low at 29 kg per capita (Ayieko et al., 2008). These levels are below the World Health Organization / Food and Agriculture Organization (WHO / FAO) recommended levels of 146kg per capita per year (Ruel et al., 2005). Therefore, this low intake of vegetables has led to serious problems in micronutrient deficiency in SSA.

Similar to most African communities, the Kenyan population rely on one or two staple foods such as maize, cassava, yam, or green bananas, which provide the bulk of energy intake. These are accompanied by a mixture of vegetables, beans, groundnuts, and fruits (Oniang'o et al., 2003; Kimiywe et al., 2007). Among the leafy vegetables, kale is the leading vegetable purchased.

Apart from nutritional challenges caused by low quantities of vegetable intake, another problem is the lack of diet variety (Figueroa et al., 2009). According to Hillocks (2011), an agricultural approach to solving the problems of micronutrient deficiencies caused by lack of or low intake of vegetables is to include high-quality food crops in the farming systems in addition to nutritional approaches such as dietary supplementation and biofortification (which means breeding crops to increase their nutritional value).

Producing and marketing horticultural commodities in Kenya is supported by a network of institutions from both the public and private sectors that perform varied roles. The Ministry of Agriculture is the lead agent in agricultural transformation in the country: it provides the overall policy, regulation, and operational directions. This ministry is supported by other ministries such as water and irrigation, public health and sanitation, environment, cooperatives development and marketing, local government and trade, and regional development authorities, whose mandate directly impact horticulture. The government institutions established under various agriculture acts include:

(1) The Horticultural Crops Development Authority (HCDA), which has the mandate of facilitating the development, promotion, coordination, and regulation of the horticultural industry in Kenya.
(2) The Kenya Plant Health Inspectorate Services (KEPHIS), which is charged with the responsibility of regulating plant health concerns related to phytosanitary and seed quality.

(3) The Kenya Agricultural Research Institute (KARI), which has the national mandate of carrying out research in the agriculture field.

(4) The Pest Control Products Board (PCPB), which regulates the importation, exportation, manufacturing, distribution, and usage of pesticides.

(5) The Kenya Bureau of Standards (KEBS), which promotes standardisation in commerce and industries.

(6) The Kenya Industrial Research and Development Institute (KIRDI), which is mandated to undertake research and develop industrial technologies that are relevant and affordable to Kenyan farmers.

(7) The Export Promotion Council (EPC), which identifies and addresses constraints affecting producers and exporters of goods and services destined for export markets.

(8) The Agricultural Universities and Colleges, which conduct research and development of human capacity (Ministry of Agriculture, 2012).

Many private sector organisations also provide diverse services to the horticulture industry. Four key institutions are:

(1) The Fresh Produce Exporters Association of Kenya (FPEAK), whose membership comprises both large and small-scale farmers and exporters. It enhances members’ welfare and business activities through lobbying, providing information, and offering marketing support, and also promotes members’ compliance with international standards.

(2) The Kenya National Federation of Agricultural Producers (KENFAP), which is the umbrella organisation of agricultural producers. This organisation lobbies for and advocates through producer groups and other commodity associations at national, regional, and international fora.

(3) The Agrochemical Association of Kenya (AAK), which has a membership comprising manufactures, re-packers, importers, distributors, farmers, and users of pest
control products. Its main objective is to promote the safe and effective use of pesticides chemicals.

(4) The Seed Traders’ Association of Kenya (STAK), which is an association for seed traders that represents trading companies operating in the country (Ministry of Agriculture, 2012).

Despite the challenges faced by smallholder horticulture farmers, economic liberalisation and the removal of trade barriers at the national, regional, and global markets has provided them with opportunities to participate in these markets; thus, it is the most appropriate industry to study.

2.14 Research questions and propositions

The literature review indicates that, considering the prevalence of poverty in rural areas, agricultural transformation is a precondition for growth. However, despite its potential rewards, adopting improved agricultural technology is usually slow and often incomplete, which partially explains why there are differences in productivity across countries and persistent poverty across the globe (Kassie et al., 2012). Some of the challenges leading to slow adoption are investment costs and variable maintenance costs associated with improved technologies. The decision taken by a farmer to adopt a new technology over an existing one is dependent on numerous complex variables that cannot be directly observed in a survey. Therefore, the focus of research efforts to establish the determinants of technology adoption has shifted away from market imperfections and market constraints to the role played by information, education, and social relationships (Akay et al., 2009). For example, a review of 21 studies on the adoption of improved maize varieties in developing countries showed that socio-economic factors such as age, education, farming experience, and gender were some of the determinant of attitudinal change among farmers (Kafle, 2010). To investigate the key determinants of smallholder farmers’ potential to explore new and sophisticated markets for their produce, the technology, business and socio-economic variables identified need to be reviewed and compared for their importance.

2.14.1 Research questions

The overarching research contribution of the dissertation is; “whether it’s possible to develop a framework that reflects the dynamics of commercialization taking place in a region by providing key elements driving the potential of smallholder vegetable farmers in Kenya’s Kiambu West District to explore new markets”.

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To address this overarching contribution, the following research questions were developed:

RQ (1). How is the value chain approach among smallholder farmers in the two Kenyan value chains (kale and coriander) examined in this study perceived by farmers?

Proposition 1: Smallholder farmers’ biographic characteristics will influence how the value chain approach is perceived by farmers.

RQ (2). What are the components in the business environment that affect farmers and undermine their access to markets?

Proposition 2: Socio-economic factors such as lack of linkages between chain actors and transportation costs constrain market access.

RQ (3). What are the main factors determining the potential to explore and participate in new markets in SME farmers—i.e. what impacts commercialisation in SME farmers?

Proposition 3: Socio-economic factors, institutional factors, transaction costs, collective action factors, and infrastructural factors influence the potential to explore new markets.

2.15 Conclusions

This chapter discussed the following broad issues: (1) the poverty situation in developing countries and specifically in Kenya, which has resulted in a lack of adequate assets for farmers to access modern markets; (2) the role played by the agriculture sector as a stimulant for growing the economy and reducing poverty; (3) the challenges facing the smallholder farmers in Kenya; (4) how the value chain approach is used as a development tool by development agencies to reduce poverty; and (5) the main factors that can impact smallholder farmers’ market participation and access.
Chapter 3. Research methodology and methods

3.1 Introduction

The overarching research contribution of the dissertation is; “whether it’s possible to develop a framework that reflects the dynamics of commercialization taking place in a region by providing key elements driving the potential of smallholder vegetable farmers in Kenya’s Kiambu West District to explore new markets”. Chapter 2 discussed literature that provided the context for the importance of such a question. This chapter presents the general research paradigm, research processes, development of research instruments, data collection, and analysis approaches employed.

3.2 The research paradigm

A research paradigm is a set of assumptions that provides a conceptual framework or a philosophical world view that enable one to conduct an organised study of the world around us (Suppes, 1970). Once this is established, good research needs to be well-thought-out, well planned, and designed with clear and detailed methods of data collection and analysis (Creswell, 2009). When combined, a research paradigm and research design provides the building blocks to enable the research to be undertaken in a logical and consistent way.

In general, two major research paradigms guide researchers: positivism and interpretivism (Creswell, 2009). Positivism assumes that the phenomena being studied have a stable reality that is measurable from the outside by an objective observer (Guba & Lincoln, 1994). The view assumes that the researcher views reality as objective and that both researcher and reality are separated. Positivists tend to use several methods as the preferred research methods, such as laboratory experiments, field experiments, and surveys. Through these methods, they gather large amount of data and normally adopt statistical analysis.

On the other hand, interpretism assumes that the researcher and reality are inseparable and tend to understand and interpret from the researcher’s own frame of reference. According to Guba and Lincoln (1994), interpretists tend to use case studies, ethnographic studies, phenomenographic studies, and ethno-methodological studies as their preferred research methods, and they normally use hermeneutics and phenomenology to decipher indirect meanings and reflect on hidden ones. In this paradigm, the researcher can interact directly with the subjects in order to interpret the meaning that the subject has about a phenomenon.
Quantitative and qualitative approaches to data collection represent different ends of a continuum. Data categorised as quantitative are generally gathered through structured questions in questionnaires. Qualitative data are derived from broad answers to specific questions in interviews, responses to open-ended questions in a questionnaire, through observations, or from already available information gathered from various sources. Quantitative and qualitative research methodologies differ in the philosophies that underpin their mode of enquiry and, to some extent, in methods, models, and procedures used (Sechrest & Sidani, 1995).

However, in recent times, researchers in the social and behavioural sciences have increasingly combined the two major paradigms by presenting a third paradigm, which is commonly referred to as pragmatism (Creswell, 2009), which places the research problem as the central focus and applies all possible approaches in order to understand the problem. Researchers adopting pragmatism now typically refer to it as a “mixed-methods approach” (Brewer & Hunter, 1989; Reichardt & Rallis, 1994; Creswell & Plano, 2007).

For this study, pragmatism was adopted based on three considerations (all adopted from Creswell, 2009):

(1) The researcher’s training and experience influenced the choice of research paradigm: the researcher has had many years of experience in agricultural extension while working for the Ministry of Agriculture in Kenya and has extensive experience in working with smallholder farmers who are disadvantaged economically and who, therefore, rely heavily on government support, especially when there are crises such as those created by adverse weather.

(2) The problem’s nature: linking farmers to contemporary markets as a pathway out of poverty is complex and calls for a pragmatic approach.

(3) Study’s audience: the audience of the study is expected to comprise both scholars and non-scholars. Therefore, using a mixed-methods approach offers an opportunity for readers to understand the study from their preferred perspective. The researcher’s choice of overarching paradigm also influenced the choice to adopt a mixed-methods approach.

The literature indicates that pragmatism is the best paradigm for using the mixed-methods studies because it provides a paradigm that philosophically adopts the use of research designs
with multiple methods and avoids the use of metaphysical concepts (truth and reality) (Creswell, 2009).

### 3.3 Research process

Figure 3 shows the research process employed. This approach, as Frankfort-Nachmias and Nachmias (1992) describe, has seven main stages:

**Figure 3.1** The main stages of research process (Frankfort-Nachmias & Nachmias, 1992)

In stages 1 and 2, a literature review was conducted to provide the context for the research through which the research problem, objectives, research questions, and associated research propositions were developed. The literature review also identified relevant theories that were then used for developing the research design and approach. These theories include those of the value chain approach in economic development in developing countries (Department for International Development, 2008), market orientation and market participation in the commercialisation of subsistence-based agriculture (Kohli & Jawaorski, 1990, Goetz, 1992; Gebremedhin & Jaleta, 2010; Moyo, 2010; Wickramasinghe & Weinberger, 2013).

Stage 3 involved determining the research approach and design to employ in the study, which was based on a two-stage study approach (Figure 3.2) using a mixed-methods approach to collect data.

In stage 4, both qualitative and quantitative data were collected with two related but separate survey instruments that reflected the two-stage study process (see Figure 3.2). This involved
two different cohorts of smallholder farmer participants in Kenya’s Kiambu West district. Both Likert scale questions and semi-structured questions were embedded in the questionnaires in both the (1) value chain approach study, and (2) the commercialisation study. Before the survey questionnaires were finalised, a review exercise was carried out with in-country experts to validate the questionnaires’ content.

The fifth and sixth stages of data collection and analysis were undertaken for each of the studies in the two-stage study process. These studies focused on Kenya’s Kiambu West district with two different cohorts of smallholder farmers that produced kale, coriander, and tomatoes. Analysis techniques included descriptive and inferential statistical methods. Chapter 4 discusses the detailed data collection methods and analyses techniques pertaining to the value chain approach study, and Chapter 5 discusses the methods and analyses techniques pertaining to the commercialisation study.

At the seventh stage, the findings of the two-stage study process were discussed in totality by combining all the analysis results and comprehensive conclusions were drawn with some recommendations about potential policies that could be developed to aid smallholder farmers in becoming more commercialised in their farming.
Figure 3.2 The two-stage research design based on theories derived from literature review
3.4 **Research Method (Mixed-Methods approach)**

A mixed-methods approach refers to both quantitative and qualitative data collection techniques and analyses, given that the type of data collected is also strongly intertwined with how it’s analysed (Krathwohl, 1993; Thomas, 2003).

In this study, both quantitative and qualitative data were collected at the same time due to resource limitations (e.g., time and money). It was not possible, for example, to first run a survey based on quantitative methods and then conduct in-depth interviews based on qualitative methods to fill the gaps in the first data, or vice versa. Additionally, collecting quantitative and qualitative data concurrently (Creswell, 1995) meant that one form of data could be compared and cross-validated against another to ensure that the methods were investigating the issues they were meant to investigate which enabled any weaknesses in one strategy during data collection to be compensated by the strength of the other (Miles & Huberman, 1984; Flood & Carson, 1993). In the value chain approach study, for example, collecting data during the focus groups complemented the subsequent survey exercise, and vice versa.

However, the mixed-methods approach was predominantly used to achieve triangulation by combining and comparing data sources to study the same social phenomenon (Denzin, 1978; Patton, 1990; Olsen, 2004). Triangulation ensured the results were credible and could be generalised (at least to some extent) to the rest of the population. This study achieved:

1. **Data triangulation** by using a variety of data sources: this was achieved by collecting primary data during the interviews in the field and the secondary data collected from existing literature in form of books, journals, and reports.

2. **Methodological triangulation** by using multiple methods to study the research problem: in this case, both quantitative and qualitative methods were used during the data collection, analysis, and interpretation phases.

3. **Investigator triangulation** by hiring and training in-country research assistants to help with collecting data (especially interview data with the survey questionnaire). These enumerators provided objective data that could then be compared and cross validated.
3.5 Sampling procedures

In sampling, one selects a subset of a population to study, and proper sampling is critical so that valid, reliable, and useful results are realised using the available resources (Johnnie, 2012). When conducting research, it’s rarely possible to study the totality of a population because, even when the population is small, only a certain portion of it is accessible for research (Tashakkori & Teddlie, 1998). Therefore, to make inferences and decisions that are applicable to other groups or populations, one need to study groups of populations that best represent their respective populations.

The target population for the study was the smallholder farmers in Kiambu West district. The community leaders and the local administration official (chief) facilitated access. As this study had two components that were sequentially performed, - two groups of smallholder farmers from the district were surveyed separately. To select the representative sample of the population, a multi-stage non-probability purposive sampling procedure was used to target and study individuals and groups that satisfied the criteria of having participated in horticultural production in a locality where NALEP had been implemented. Second, in this category, the sample of the population used in each of the two-stage process was then randomly selected for interviews and survey. Using the combined strategies of non-probability purposive and probability simple random sampling ensured that the selected sample was representative of all the sites countrywide where NALEP had been implemented, and, therefore, the results could be generalized to other actors if additional interviews with non-participants in the Kale and Coriander Chains were interviewed (Levy & Lemeshow, 2008; Johnnie, 2012).

3.5.1 Identifying the study sample

Choosing the study sample involved considering whether the population in the identified area was adequate and accessible for sampling, and whether their spatial distribution was close enough to reduce the cost of conducting research (Johnnie, 2012). The sample size selected for the Face-to-Face survey was 302.

3.6 Data collection tools and techniques

The multiple data collection methods embraced by this study included interviews, surveys, questionnaires, observations, focus group, and a review of existing documents.
3.6.1 Interviews / survey

The interview is considered a powerful method of data collection because it provides one-on-one interaction between researchers and the individuals or groups being studied (Krueger, 1988; Rapley, 2007). Face-to-face interviews minimise the rate of non-responses and maximise the quality of the data collected because researchers can ask respondents to clarify their answers when they are unclear (Fowler & Mangione, 1990; Groves et al., 2004; Lavrakas, 2013). A survey is a systematic method for gathering information from a sample to quantitatively summarise the attributes of the larger population of which the entities are members, which can be descriptive or analytical (Groves et al., 2004).

Face-to-face interviews were used in both studies in this thesis to elicit both quantitative and qualitative information.

3.6.2 Observational methods

The advantage of using observational methods is that, by directly observing behaviour rather than asking individuals about it, the effects on observations by the feelings of participants being observed are reduced (Tashakkori & Teddlie, 1998). There are two types of observational methods: participant and nonparticipant observation.

In this research, both participant and nonparticipant observation methods were used. The researcher acted as a participant observer during the value chain approach focus group meeting and at the beginning of interviews during the surveys when explaining the research’s purpose to the respondents. However, when the survey questionnaire was administered, the researcher was a nonparticipant observer and therefore was not an active part of the setting in which the behaviours or interactions were observed. The observational method of data collection was used throughout the field work in combination with the other methods of data collection.

3.6.3 Secondary data

Secondary data is commonly collected to complement and validate data collected through first-hand data gathering methods and, hence, contribute to the credibility of research findings (Hewson 2006; Smith 2008; Menter et al. 2011).

Secondary data collection in this study involved collecting and reviewing data documented by individuals or institutions in the form of reports, books, and manuals relevant to the entire study. This data was used to supplement and to triangulate the data collected using the other
methods. Therefore, credible sources of information such as government institutions, organisations, books, and journal articles were sourced when collecting secondary data to maintain accuracy.

3.6.4 Focus groups

Krueger & Casey (2000) identify the focus group as a carefully planned series of discussions aimed at obtaining perceptions on a certain area of interest in a permissive and non-threatening environment. The main purpose of using focus groups is to take advantage of group dynamics, which can generate new thinking about an issue and result in a much more in-depth discussion because participants are stimulated to interact with each other (Morgan, 1988; Kitzinger, 1995; Morgan & Krueger, 1998).

The focus group was one of the research tools used in the value chain approach study which comprised a homogenous group of 12 farmers. The interviews were conducted in a familiar public place (Nursery School) easily accessible to all for 11/2 hours from 10.00AM to 11.30 AM on Weekdays. Financial incentives were provided to cater for their transport and refreshments. The participants signed the consent form after an explanation for the purpose of the meeting was provided. The researcher acted as the moderator to keep the discussion on track. Some of the rules applied when conducting the discussion were that participants should speak one at a time and they should respect each other’s’ opinion. All participants were given a chance to speak freely and they were not to discuss focus group information outside the meeting. The discussion was recorded.

In order to achieve the desired results, all the participants were involved to participate as opposed to allowing one individual to dominate. The researcher also modified questions that were not clear to achieve the required information and summarised long responses from participants. The researcher started the discussion with an ice breaker and ensured that all the questions were covered within the agreed meeting time. During the discussion, the researcher was able to observe participants’ non-verbal behaviour, which enhanced or contradicted their spoken words; hence they were asked to clarify their responses. The focus group created a situation whereby the group contribution generated more information than the sum of individual inputs (Barbour, 2007; Hennink, 2007).
3.7 Data analysis strategies

The strategy of concurrent data analysis whereby qualitative and quantitative data are analysed simultaneously to triangulate data was adopted in this study (Caracelli & Greene, 1993; Kvale, 1996; Tashakkori & Teddlie, 1998).

Once the process of data collection was completed, data from the field was edited, coded, and cleaned to ensure that it was consistent and accurate. Data were then analysed using descriptive and inferential statistics.

3.8 Validity, reliability, and ethical concerns

Rigor or validity is considered a necessary ingredient in all research to ensure that the results can be trusted (Flood & Carson, 1993; Kvale, 1996). Validity is usually described with two terms: external and internal validity. External validity refers to findings’ generalizability to the population at large, while internal validity refers to results’ credibility (Rosnow & Rosentahl, 1996). Moreover, reliability refers to the extent to which results are consistent over time (Spradley, 1979; Golafshani, 2003).

A researcher’s and a study’s background are significant when considering ethical issues because researchers bring to studies experiences and perceptions of what the study and the results should be. Therefore, if a researcher’s work is to be accepted and valued, it is important that it is viewed as being objective (Sieber, 1980).
3.8.1 Validity and Reliability
To address the validity and reliability concerns in this study, the following measures were taken:

(1) The methodology design was rigorously followed, as set out for each of the two component studies, from sample selection, data collection, and analysis.

(2) The study sample was selected randomly from the population of farmers involved in value chains in the study site so that it could be generalised to the entire population.

(3) A triangulation strategy was employed, which was achieved by using multiple sources of data, multiple methods of data collection, and multiple enumerators to confirm emerging findings.

(4) The questionnaire was pre-tested using several respondents to ensure that the questions were clear and understandable; where there was need, changes were made.

(5) In analysing the data from the first study, Cronbach’s Alpha test was used to measure the reliability of selected variables used to test the Research Propositions (Cronbach 1951).

3.8.2 Ethical issues
To address the ethical concerns in this study, the researcher adopted the University of Queensland’s policy and guidelines on ethical research. Therefore, while designing this study, ethical concerns related to the following issues were addressed:

(1) Methods and protocols to be used in the research.

(2) The questionnaire(s) to be used.

(3) Interview questions.

(4) The process of obtaining informed consent from participants.

(5) The approach of providing feedback to the participants.

3.9 Study challenges and how they were overcome
Several issues were encountered during the project, and the four key issues that had significant impact were that:
(1) The initial strategy for field work was a single field trip to Kenya for collecting data on horticultural value chains from smallholder farmers. The trip was originally meant to last four months—long enough to cover any additional details that came out of the field work. However, this field trip was reduced to three months as a result of logistic issues; as a result, data collection was not optimal. Additionally, it was only after analysing these data back in Australia that it was decided the research required a second study and a second survey conducted in Kenya to elucidate details around market access by smallholder farmers and the commercialisation of subsistence agriculture. This second data-gathering field trip/survey some 18 months after the first was completed created a logistic (time) and funding issue.

(2) There were difficulties in obtaining national statistics, especially longitudinal information: that is, data gathered for the same subjects repeatedly over long periods of time.

(3) During the focus group interviews, only farmers were interviewed since they said they could provide information about the other actors along the value chains. This was because the chains were short and farmers could transform from one value chain actor to another.

(4) The fact that only value chain participants were included in the study while omitting the non-participants was a major limitation.

These limitations were overcome by:

(1) The researcher recruiting and training a number of in-country enumerators and a technical supervisor who spoke the local dialect to assist in conducting face-to-face interviews in both the first and the second studies, which sped up the process and removed the funding requirement for a second international flight for field work by the researcher.

(2) Multiple sources of data, including online resources, were used as secondary data, especially from researchers and organisations with the capacity to carry out longitudinal studies in developing countries.

3.10 Summary

This chapter described the overarching research methodology and methods used in this study. A two-stage research design was developed that included two distinct but complementary studies investigating the problem of poor commercialisation in developing countries. The research paradigm used was pragmatism and the methodology adopted was that of a mixed-
methods approach whereby both quantitative and qualitative methods of data collection, analysis, and interpretation were employed.

Note: The sample size for the first study (value chain approach) was 302 and for the second (commercialization) was 200.
Chapter 4. The value chain approach study

4.1 Introduction

As Chapter 3 discussed and as Figure 3.2 illustrated, the value chain approach study was the first of two studies undertaken in this multilevel research project to investigate the issues of how and why smallholder farmers in Kenya sell their produce to market, to which market they sell it to, what affects their market accessibility, and what potential exists for smallholder farmers to explore new markets such as export markets. The study assessed the relatively common approach to understanding market dynamics known as the “value chain approach” for its applicability in the Kenyan subsistence smallholder farmer context.

This value chain approach study specifically set out to answer Research Questions 1 and 2.

Research Question 1. How effective is the value chain approach among smallholder farmers in two Kenyan horticultural value chains (Kale and Coriander) to improving livelihoods?

Proposition 1: Smallholder farmers’ biographic characteristics mediate the effectiveness of the value chain approach.

Research Question 2. What are the components in the business environment that affect farmers and undermine their access to markets?

Proposition 2: Social-economic factors such as linkages between chain actors and transportation costs mediate market access.

The study

Addressing these research questions required two steps that involved (see Figure 4.1) both qualitative and quantitative methods. These methods were designed to be sequential, with the first method informing the second. The two methods were:

(1) A focus group of smallholder farmers designed to identify and explicitly map key issues in the two horticultural value chains (Kale (Brassica oleracea) (Small, 2009) and Coriander (Coriandrum sativum) (Verma, 2011) to define the value chain stakeholders/actors, assess individual farmers’ relationships with their value chain and their position in the chain, and the flows of influence between stakeholders in the chains.

(2) A face–to–face survey. The survey questions were informed by the focus group discussions to collect data from individual farmers from a purposeful random selection of
farms on a variety of issues such as biographic characteristics and socio-economic factors that enhance or diminish market access. The data sourced from the survey was analysed using a range of statistical techniques including general linear model (GLM) and binary logistic regression.

Figure 4.1 outlines the design of the study.

Stage (Level) 1 – Value Chain Approach (VCA) Study to investigate the linkage of SME farmers producing vegetables to different markets. Based on theory that rural development can best be achieved in the context of market-based rewards, which can only occur if supply is linked to the demands of the consumer through markets (Porter, 1985; DFID, 2008; and Webber & Labaste, 2009).

Methods

Qualitative: Focus Group of smallholder farmers designed to identify and explicitly map key issues in the two horticultural value chains (Kale (Brassica oleracea), and Coriander (Coriandrum sativum)).

Mapping Value chains – Stakeholders, Products, Processes, Opportunities, Constraints, Governance

Quantitative: Face-to-face survey to examine the relationships between the biographic characteristics of farmers, the market segments and the value chain approach – Data analysis via a range of statistical techniques including General linear model (GLM) and Binary logistic regression.

Figure 4.1 Value chain approach study outline

The analysis objectives of this value chain approach study were:

(1) The qualitative objective was to present the results of the four key value chain issues that the focus group mapped during the value chain analysis exercise.

(2) The quantitative objectives were:

(i) To examine the relationships between the biographic characteristics of farmers and the promoted items.

(ii) To examine the relationships between the market segments supplied by farmers and the constraints identified in the business environment.
4.2 Process of qualitative data analysis

The process of analysing qualitative data (which was in text form) was influenced by the hermeneutic perspective: in this perspective, researchers go through five stages to construct a reality using their interpretation of the text that a study’s respondents provide (Patton, 1990). Figure 4.2 identifies these five stages as: documentation, categorization, examination, corroboration and reporting (Patton, 1990; Kvale, 1996).

![Qualitative Analysis of Data Cycle](image)

**Figure 4.2 Qualitative analysis of data cycle**

1. Documentation of the data as notes during interviews conducted during the focus group meeting, where the Focus group was used to conduct the value chain analysis.
2. In the categorisation stage data from the first stage were categorised into important concepts.
3. In the examination stage, relationships in the data and why things happened in focus group setting were examined.
4. In the corroboration stage, the focus group’s conclusions were corroborated by examining other studies for explanations that supported or refuted them.
5. In the reporting stage, the findings were reported in form of text, tables, figures, and diagrams.
4.3 Value chain analysis through the focus group

In agriculture and in developing countries in particular, a range of tools support researchers to examine the interactions between different chain actors. Most notable has been the Department for International Development (2008) workbook entitled *Making Value Chains Work Better for the Poor*, which offers a toolbox for value chain analysis practitioners. The value chain analysis exercise that is identified in this workbook is important in that it creates an understanding of issues like markets, relationships, participation of different chain actors and the constraints that limit the growth of production in value chains and consequently the competitiveness of smallholder farmers.

Additionally, value chain analysis assists researchers to focus on both the micro and macro aspects of production and exchange activities associated with a product. As such, it can provide insight into chain actors’ businesses and farms. Value chain analysis can also create understanding of economic processes, which are all too often studied only at the national level, which neglects local forces that shape socio-economic change and affect policy outcomes (Department for International Development, 2008).

This study’s focus group comprised 12 smallholder kale and coriander farmers who were selected from a large self-selected general group of farmers who were previously provided with information about the project. Discussion among focus group members was encouraged using a series of open-ended and semi-structured questions (Appendix 1). Data was collected on the respective value chains through the focus group to bridge farmers’ information gap about value chains by reaching a common understanding. Focus groups are an appropriate technique to use for value chain analysis rather than one-on-one interviews because group dynamics can be captured as individuals represent their role in the value chain (Bloor, 2001; Morgan, 1997).

During the focus group meetings, four key value chain aspects were identified and mapped based on information that the farmers involved provided (see Figure 4.3). These aspects were:

(1) The processes, activities, and chain actors associated with the two vegetable chains; that is, the core processes that the raw material went through before being consumed and the chain actors involved with the two vegetable chains under consideration.
(2) The margin distribution along the value chains (i.e., revenues, costs, and margins). This was performed to provide information about whether the value chains were accessible to the smallholder farmers and whether they were good sources of income for them.

(3) The constraints affecting the farmers.

(4) The governance issues, which were identified to examine the system of coordination, regulation, and control in the region’s value chains.

Figure 4.3 Kale and coriander value chain analysis by the focus group (clockwise from top left)

Mapping and identifying the value chain aspects through the focus group offered an exploratory prelude to the broader data collection through the survey and subsequent analysis process to examine whether the smallholder farmers in Kenya could be linked to modern markets.

4.3.1 Mapping value chain processes, actors, and activities.

Mapping both the kale and the coriander value chains produced very similar outcomes: both had six distinct chain stakeholders or actors (input providers, producers, collectors / intermediary traders, wholesale marketers, retail marketers, and final consumers) and their functions along the chain (Figure 4.4). Some functions such as input provision had specific
functions, while others such as collection / intermediary trading, wholesale, and retail marketing shared some similar functions such as storage of produce.

![Figure 4.4 Processes, actors and activities in kale and coriander value chains](image)

Processes, actors, and activities in each chain level were related. The input provision process comprised both privately owned businesses and those owned by farmers’ groups such as cooperative groups (societies). The actors in this stage sourced farm inputs in bulk and then de-bulked them for smallholder farmers. The production stage had vegetables farmers as the actors, and they mainly grew, harvested, and preliminarily sorted and bunched the vegetables. The next two processes of collection/intermediary trading and wholesale marketing were involved in almost similar activities of collecting, sorting, bunching, storing, and transporting produce. However, the wholesale marketer, distributing the commodity in bulk to retail marketers, handled a greater commodity volume than the collector. The retail marketer formed the link with final consumers, and was involved in de-bulking, sorting, and bunching vegetables according to consumer needs. The final consumers paid for all the value added to both kale and coriander along the chain when purchasing them. However, chain actors performed a lot of the same activities (i.e., they exhibited vertical integration).

The processes, actors and activities in the kale and coriander value chains were almost similar, but had several differences. The main difference between the kale and coriander
value chains was that the input provision stage in the coriander value chain also included farmers who harvested coriander seeds and sold them to other farmers; this did not occur in the kale value chain. Additionally, while the activities in each chain were similar, performing activities in the two different vegetable chains was different in terms of how frequently they were performed. For example, once the kale was ready for harvesting after two-and-half months, leaves were harvested every two weeks for the next four months. However, coriander was harvested once every one-and-half months by uprooting the entire plants.

Both chains mainly supplied domestic / traditional markets that were characterised by spot market relationships: no evidence of contracting or of chain actors participating in export markets or secondary-processing activities was found. The only value addition activities observed along the chains were the typical primary processing activities of sorting, bunching, and occasionally chopping and pre-packing vegetables by final retailers on consumers’ request. As one focus group participant indicated, limited resources were available to package and market produce:

*We have been taught how to sun-dry the vegetables and then package them in plastic bags, but they don’t have a long shelf-life due to lack of equipment to seal them into airtight condition. Also, without labels and a mark of quality from the authorised agency [the Kenya Bureau of Standards], it is difficult to convince consumers to buy. Therefore we prefer to sell the vegetables as fresh produce.* (Focus group participant (FGP) 2).

To further understand the extent of the value added to the vegetables at each stage of the chain, the margin-flow across the two chains was examined. This was conducted to determine whether these chains were profitable to the chain actors or not. As such, the income between actors in value chains were compared to examine the trends and options for growth, to reveal any opportunities for competitive improvement in the chains, and to identify if there was any enhancing socio-economic relationships in the business environment where the smallholders operated (Krugman, 1991; Mason-jones et al., 1998).

### 4.3.2 Analysing gross margin distribution along the chains

Analysing gross margin flow across the value chains was crucial to understanding how the participation of, and returns to the farmers could be improved. As such, the value chain analysis needed to be detailed and quantifiable.
Gross margin flow was calculated based on the value added to the raw materials to achieve a product that the consumer could purchase regularly (Clark, 2004; Guenzi & Troilo, 2006). Several assumptions were made in the case of the kale and coriander chains:

(1) Figures used were based on farmers’ recollection of the costs and revenues because none kept consistent farm records; therefore, the data is essentially an estimate and susceptible to subjectivity.

(2) The farmers interviewed did not have capital investments such as machinery because they used subsistence techniques and traditional farming implements. Hence, there were no fixed costs factored into the calculations, which leaves an assessment of variable costs only.

(3) All actors interviewed were full-time farmers; hence, no wages were factored in the calculation and farmers’ labour was not deducted from the income because it was considered as income from own labour, and only the hired labour during land preparation and harvesting was deducted as a business cost (Department for International Development, 2008).

**Gross margin distribution along the kale value chain**

Based on the information from the focus groups about producing kale, farmers cultivated kale on land that was, on average, 50m x 100m, and farmers had two plantings seasons a year. Harvesting started two-and-a-half months after planting and was undertaken twice a month for four months, which yielded 200 bunches per fortnight or 400 bunches per month.

The total variable cost of producing kale for one season that lasted six months was KShs12,500 (See Table 4.1). The total cost of producing kale per bunch was calculated as KShs4, while the revenue per bunch was KShs7, which leaves a net gross margin of KShs 3 at the farm gate. Table 4.2 show gross margin for actors along the chain (KShs 80 was equivalent to US$1 using 2011 foreign exchange rates).

There was no need to estimate the standard deviation in Table 4.1 because the data was collected through consensus in the focus group and not through a survey.
Table 4.1 Variable costs for producing kale

<table>
<thead>
<tr>
<th>Input</th>
<th>Unit cost (KShs)</th>
<th>Total costs (KShs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land preparation</td>
<td>400/month</td>
<td>2400</td>
</tr>
<tr>
<td>Seedlings</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Fertiliser (planting)</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Fertiliser (top-dressing)</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Manure</td>
<td>1500</td>
<td>1500</td>
</tr>
<tr>
<td>Pesticides</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Transport of produce (four months)</td>
<td>1200/month</td>
<td>4800</td>
</tr>
<tr>
<td>Harvesting labour (four months)</td>
<td>450/month</td>
<td>1800</td>
</tr>
<tr>
<td><strong>Total cost for six months</strong></td>
<td></td>
<td><strong>12,500</strong></td>
</tr>
</tbody>
</table>

“Note: all focus group respondents (n=12)”.

Table 4.2 Estimated gross margin distribution along the kale value chain

<table>
<thead>
<tr>
<th>Row</th>
<th>Calculations</th>
<th>Producer</th>
<th>Collector</th>
<th>Wholesaler</th>
<th>Retailer</th>
<th>Supermarket</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total cost/bunch (KShs)</td>
<td>4</td>
<td>7</td>
<td>12</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>Total revenue/bunch (KShs)</td>
<td>7</td>
<td>12</td>
<td>18</td>
<td>22.5</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>Net income/bunch (KShs)</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>4.5</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Total income (KShs) per year (Row 3x3200 bunches)- area of production (50mx100m)</td>
<td>9600</td>
<td>16000</td>
<td>19200</td>
<td>14400</td>
<td>22400</td>
</tr>
<tr>
<td>5</td>
<td><strong>Total income (KShs) per year/ha (row 3 x 64,000 bunches)</strong></td>
<td><strong>192,000</strong></td>
<td><strong>320,000</strong></td>
<td><strong>384,000</strong></td>
<td><strong>288,000</strong></td>
<td><strong>448,000</strong></td>
</tr>
</tbody>
</table>

Calculations of gross margin in ideal conditions from literature

<table>
<thead>
<tr>
<th>Row</th>
<th>Calculations</th>
<th>Producer</th>
<th>Collector</th>
<th>Wholesaler</th>
<th>Retailer</th>
<th>Supermarket</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Total income/year/ha (KShs) (based on 96,000 bunches) (row 3x 96000)</td>
<td>288,000</td>
<td>480,000</td>
<td>576,000</td>
<td>432,000</td>
<td>672,000</td>
</tr>
</tbody>
</table>

“Note: all focus group respondents (n=12)”.

The supermarket, (i.e., a domestic modern market) was included in Table 4.2 to show the difference in gross margin of retailers participating in the domestic traditional market and those participating in domestic modern markets. The supermarkets bought the produce from wholesalers at the same price as retailers operating in domestic traditional markets but, due to value-adding measures such as storing the vegetables in cooled facilities, they were able to sell at higher prices than actors in traditional markets. However, as mentioned earlier, the data is an estimate and hence highly simplified due to the assumption that the farmers did not have fixed costs arising from fixed assets like farm buildings and machinery.

After calculating the yearly income-flow for Kale along the chain, a comparison was made with documented information on kale yields in regions where modern farming technologies were employed. From secondary data, the yields for kale were given as 96,000 bunches per hectare (Small 2009). Therefore, to calculate the gross margin distribution along the chain in
these conditions, the number of bunches produced per year was multiplied by the gross margin at each process (Table 4.2, row 3), in KShs and presented in row 6 of the same table.

According to Small (2009), Kale is usually harvested on demand two to four times over a four-month period, but leaves can be harvested weekly when demand is high. Therefore, the harvesting regime under ideal conditions is quite similar to the one that the farmers in the study were practising.

If the gross margin per year for a producer in the chain operating at the farmers’ conditions (see Table 4.2, row 5) is compared to the income per year for a producer operating in ideal farming conditions (Table 4.2, row 6), one can conclude that the producers in Kenya were realising approximately 67% of their productivity potential per year. As such, smallholder farmers were earning less from their farming activities than their counterparts in other regions of the world whose productivity levels are close to the ideal conditions due to use of modern farming technologies.

The Kenyan Ministry of Agriculture’s Strategic Plan 2008-2012 states that agricultural productivity in Kenya has stagnated at 25% of the country’s potential when compared to international averages (Ministry of Agriculture, 2009).

However, the figure for farmers’ potential production estimated in this study (67%) is clearly higher than 25%. This large discrepancy might be explained by the fact that the figures given by the farmers were, as stated earlier only estimates, were susceptible to subjectivity, and may well have been unrealistically high. Further, the study area had a high agricultural potential (i.e., it received up to 2000mm of rainfall per annum) (Ministry of Planning, 2009), which suggests that the study area was likely to have higher productivity than other regions in the country that receive as low as 300mm of rainfall per annum.
**Gross margin distribution along the coriander value chain**

The inputs included in the production costs for coriander were slightly different from kale due to the differences in the two products’ production processes. For instance, coriander required less labour than kale did because coriander seeds were drilled and uprooted after one-and-a-half months. Farmers also applied pre-emergence herbicides to control weeds before planting, which meant that the labour requirements were minimal during the one-and-a-half months that the coriander was growing.

Coriander production took a period of one-and-a-half month from planting to harvesting. The area under cultivation in this case was on average 10m x 20m. From this portion of land, four baskets each containing 150 bunches were harvested after one-and-a-half months. One basket containing 150 bunches was sold at a farm gate price of KShs 600. The estimated cost for producing coriander for one-and-a-half months was KShs1560 (Table 4.3).

**Table 4.3 Variable costs for producing coriander**

<table>
<thead>
<tr>
<th>Input</th>
<th>Unit cost (KShs)</th>
<th>Total costs (KShs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeds</td>
<td>700</td>
<td>700</td>
</tr>
<tr>
<td>Fertiliser (Planting) 2Kg</td>
<td>80</td>
<td>160</td>
</tr>
<tr>
<td>Fertiliser (Top-dressing) 2Kg</td>
<td>80</td>
<td>160</td>
</tr>
<tr>
<td>Herbicide</td>
<td>170</td>
<td>170</td>
</tr>
<tr>
<td>Fungicide</td>
<td>170</td>
<td>170</td>
</tr>
<tr>
<td>Labour</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td><strong>Total costs (one-and-a-half month)</strong></td>
<td></td>
<td><strong>1,560</strong></td>
</tr>
</tbody>
</table>

“Note: all focus group respondents (n=12)”.

From the total costs of producing coriander, the costs of producing one bunch was calculated as KShs2.6. These figures were extrapolated to a year, and showed that a total of 4800 bunches were produced per year. The total cost of production per bunch per year (4800 x 2.6) was therefore KShs 12,480, while the yearly revenue per bunch (4800 x 4.1) was KShs 19,680. Hence, the net gross margin per bunch per year (19,680–12,480) was KShs 7,200 (Table 4.4).
Table 4.4 Estimated gross margin distribution along the coriander value chain

<table>
<thead>
<tr>
<th>Row</th>
<th>Calculations</th>
<th>Producer</th>
<th>Collector</th>
<th>Wholesaler</th>
<th>Retailer</th>
<th>Supermarket</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Total cost/bunch (KShs)</td>
<td>2.6</td>
<td>4.1</td>
<td>6</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>Total revenue/bunch (KShs)</td>
<td>4.1</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>3</td>
<td>Net Income/bunch (KShs) (Row 2 - 1)</td>
<td>1.5</td>
<td>1.9</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Total income/year (row 3 x 4800 bunches)-area under production (10mx20m)</td>
<td>7,200</td>
<td>9,120</td>
<td>9,600</td>
<td>9,600</td>
<td>19,200</td>
</tr>
<tr>
<td>5</td>
<td><strong>Total income/year/ha (row 3 x240000 bunches) KShs</strong></td>
<td><strong>360,000</strong></td>
<td><strong>456,000</strong></td>
<td><strong>480,000</strong></td>
<td><strong>480,000</strong></td>
<td><strong>960,000</strong></td>
</tr>
</tbody>
</table>

“Note: all focus group respondents (n=12)”. Data on yields for coriander grown under ideal conditions were not available in secondary data because coriander is generally produced commercially for seed production (the seeds are dried and ground to be used as spices); thus, comparison with farmers’ practices (the entire plant was uprooted and fresh leaves used as spices) was not possible. Similar to Table 4.2, the data in Table 4.4 is an estimate and simplified due to the assumption that the farmers did not have fixed costs arising from fixed assets like farm buildings and machinery.

**Comparison of gross margin distribution along the kale and coriander chains**

Figure 4.5 compares the gross margin levels for the two selected vegetables. The results show that the earners in the kale value chain in KShs/bunch (from highest to lowest) were the supermarkets (KShs7), followed by the wholesale marketers (KShs6), retail marketers (KShs4.5), and collectors (KShs4), while producers earned the lowest (KShs3). In the coriander value chain, the earners in KShs/bunch (from highest to lowest) were the supermarkets (KShs4), retailers and wholesale marketers, and collectors earned equal amounts (KShs2). The producers earned the lowest (KShs1.5).
Comparison of kale’s and coriander’s gross margin distributions along the value chain

The combined gross margin levels of kale and coriander earned by each actor from the highest to the lowest were the supermarkets, wholesale marketers, retail marketers, collectors, and, finally, the producers, which agrees with the work of Altenburg (2006) and McCullough et al., (2008). The fact that the more you move downstream, the more the units traded by actors further amplifies that the income distribution is even more inequitable. Therefore, the income distribution along the chains should be compared to the amount of investment, and hence investments risk.

Other studies on perishable food chains (such as fish and dairy) support the finding that traders generally earned better income than producers. According to Alam et.al. (2012) and the Donor Committee for Enterprise Development (2006), traders take the largest share of marketing margin, while producers earn the least because traders can procure produce over a large distance. They are also knowledgeable about the high and low peaks of production and year-round produce prices. As such, they can stay in business longer than the less-versatile chain actors (e.g., producers who only sell what they have produced instead of those who source produce from other areas where production is in high peak season when production is low on their farms). Meanwhile, in value chains dealing with produce with a longer shelf-life like grains, producers earn the highest, while traders earn the least due to competition (Karimi et al., 2010).

Another study supporting this finding shows that the lack of market power for individual farmers, coupled with the lack of competition among input providers and intermediary traders, often leads to value chain actors other than producers capturing profits increases from

Figure 4.5 Comparison of kale’s and coriander’s gross margin distributions along the value chain
improved technologies (Reardon & Timmer, 2007). The input providers and the intermediary traders in most cases have the capacity to source and transport goods and services over large distances, which often make them the lead firms that enforce informal rules and regulations and that provide market information between consumers and producers.

Additionally, the poor infrastructure found in many developing countries increases the market power of intermediaries by raising the cost of distributing goods and services. Therefore, a vicious cycle characterised by low take-up of improved technologies by farmers emerges, which results in few traders with high market power, which, in turn, lowers farmers’ profits and depresses resources’ availability to farmers, which would support innovation on their farms. Day-to-day subsistence is not conducive to innovation, and it is innovation that enhances productivity and profitability. Innovation by farmers who have access to resources takes the form of shifting from producing low-value crops to high-value crops. Another area that farmers can innovate in is the adoption of farm inputs that enhance productivity, such as using certified seeds and fertilisers, which leads to better profits (Reardon & Timmer, 2007).

A weak contracting environment also worsens the existing constraints caused by market inefficiencies at the input and output ends of the value chains by making it difficult to enforce compliance with contracts. This situation occurs because individual farmers may not be able to produce sufficient commodity at the required quality to sustain a contract agreement.

Kenya’s agriculture is dominated by smallholder farmers who carry out production activities on farms averaging 0.2 to 3 hectares that include both livestock and crops. This has led to a cycle where farmers’ production levels are low due to their inability to invest in improved inputs such as pesticides, hybrid seeds, fertiliser, and machinery. As one respondent summarised:

*The main problem affecting farmers is the high cost of inputs such as seeds and pesticides leading to losses from pests and diseases, the fungal diseases are particularly difficult to treat in this area due to the wet and humid weather conditions. The feeder roads are also sometimes not passable in wet conditions and we have to carry the produce out of the farms to the main road using donkey drawn carts or human portage. (FGP 7)*

The fact that traders have knowledge on supply and demand that other chain actors may not have often leads to unethical trade practices that are unfavorable to the weaker chain actors
(in this case, the producers). However, the focus group participants still considered intermediary traders to be valuable in operating the value chains because they provided the link between consumers and producers. As one respondent summarised:

_We wake up at dawn to harvest vegetables, while some people harvest at night so as to sell them while they are still fresh. Many farmers who cannot operate at those odd hours due to age or other family commitments rely on brokers to collect and sell their produce in the markets._ (FGP 4).

The production and post-harvest process is a very important part of the whole value chain because the initial quality of the product determines its shelf-life, especially for fresh vegetables. Therefore, appropriately managing produce at the production/post harvest stage can increase quality. The opportunity to improve producer’s position as a value creator often comes with collective action. According to Gulati (1998) and Coleman (1990), communities with strong social structures (i.e., those characterised by trust and strong relationships) are able to act collectively to increase their bargaining power. This suggests that promoting the formation of networks, associations, and groupings among the smallholder farmers would provide them with the social capital necessary to strengthen their position in the value chain. This would reduce their dependence on intermediary traders and transporters for input supplies on the one hand, and market access on the other (Schimtz, 1999; Kilelu et al., 2011).

### 4.3.3 Identifying challenges faced by the chain actors

The third issue the focus grouped identified (Figure 4.2) comprised the challenges they faced while participating in the two value chains.

Out of the myriad challenges affecting farmers, respondents identified the key challenges as ranging from economic issues to operational and relational ones. The challenges facing each chain actor generally related to the activities they were involved in. For example, the input providers were affected by the cost for renting business premises and the associated levies charged for businesses, while producers were constrained by small land sizes and low soil fertility. Traders encountered challenges related to high transportation costs. Consumers faced challenges related to the consistent supply of quality produce, especially in times of low supply caused by unreliable weather conditions. Table 4.5 presents the analysis of challenges that the chain actors faced.
Table 4.5 Challenges the chain actors faced

<table>
<thead>
<tr>
<th>Actors</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input providers</td>
<td>Rent, levies, high transport costs</td>
</tr>
<tr>
<td>Vegetable producers</td>
<td>High input prices, low-quality inputs (adulterated), small land sizes, low soil fertility, lack of credit</td>
</tr>
<tr>
<td>Intermediary traders</td>
<td>High transport costs, lack of consistent supplies</td>
</tr>
<tr>
<td>Wholesalers</td>
<td>High transport costs, storage costs, lack of cold storage and transport facilities, multiple levies, changes in market prices</td>
</tr>
<tr>
<td>Retailers</td>
<td>High transport costs, storage costs, inadequate cold storage facilities, multiple levies, changes in market prices</td>
</tr>
<tr>
<td>Consumers</td>
<td>Inconsistent produce supplies, low-quality produce</td>
</tr>
</tbody>
</table>

Note: Adulterated inputs imply addition of inferior and low quality inputs to high quality inputs.

“Note: all focus group respondents (n=12)”.

From Table 4.5, we can be seen that some challenges were specific to particular value chain stages (e.g., rent incurred by input providers), while other challenges, such as high transportation costs were shared by several chain actors.

At the production stage, the major inputs demanded of smallholder farmers in Kenya included seeds, fertiliser, pesticides, and farm implements/machinery. However, farmers faced challenges acquiring these items: for example, fertiliser and pesticides were packaged in larger quantities than what the farmers required. Re-packaging these inputs into smaller quantities led to further challenges of low-quality products in cases where improved inputs were substituted or mixed with materials of inferior quality by some dishonest traders (Nyoro, 2002).

The impact of the high cost of inputs was aggravated by declining soil fertility due to over-cultivation as various crops and livestock enterprises competed over the ever-diminishing agricultural land.

Once the produce was ready for marketing, logistical challenges related to transportation arose, particularly for farmers living in rural areas, due to poor feeder roads connecting households to all-weather roads and unreliable transport, which increased costs drastically. Lack of private sector investment in cooling facilities that were accessible to smallholders meant that smallholder farmers who could not afford these facilities continued to receive low or uneconomic prices for their produce because of its inferior quality.

Other constraints related to marketing produce included lack of effective marketing information, which made farmers vulnerable to changes in demand. Mismanagement of key institutions such as farmers’ organisations that supported farmers to access credit and inputs
as well as facilitating marketing of farmers’ produce also denied the farmers opportunities to achieve economies of scale (Central Bureau of Statistics-Kenya, 1998; Ministry of Agriculture, 2009).

In conclusion, challenges along the entire value chain impacted farmers. From Table 4.5, we can see that challenges at the input provision stage included levies and high transportation costs when sourcing and distributing inputs from large distributors and import companies. These costs were passed on to producers, who faced the challenge of high input costs, which were aggravated by the fact that farmers tended to possess small land sizes and, accordingly, low production volumes. On the marketing end of the chain, traders faced challenges related to high transportation costs due to poor feeder roads and a lack of cooled transportation and storage facilities. This led to deteriorated produce and, in turn, farmers’ receiving low prices. At the marketing end, farmers could not access adequate market information; as such, they were unable to respond to changes in consumers’ demand. Therefore, the financial and organisational challenges facing smallholder farmers have made it difficult for them to participate in modern markets and have also discouraged exporters from sourcing produce from smallholder farmers. This situation has occurred because farmers were not able to meet the conditions that consumers and exporters required.

### 4.3.4 The role of governance

The fourth issue the focus group identified concerned the governance issues and how the value chains were governed. This study explains these issues via the structure of relationships and coordination mechanisms that existed between actors in the value chains (Gereffi, 1994; Department for International Development, 2008).

It is clear from the focus group discussion that the relative power and influence of the various actors in the value chains had a major impact on the governance in those chains. Section 4.3.2 makes a link between the returns to stakeholders in the chain, and the implications for producers in low-technology chains who end up taking whatever price they are offered when chains are dominated by traders.

In this study, governance was analysed to investigate both the rules operating in the chains and the system of coordination, regulation, and control in them (Hartwich et al., 2007; United Nations Industrial Development Organization, 2009). The governance issues farmers
identified as rules, regulations, and standards that they had to abide by can be categorised as belonging to one of two broad categories: formal rules and informal rules.

The formal rules category concerns government rules and regulations such as business licences, taxes, and levies. The farmers had little control over many of these rules, particularly where social capital had not been sufficiently built among farmers. Changes in government policies relating to taxes on goods and services affected the farmers. For example, an increase of levies and taxes on imported farm inputs affected input providers, who passed the extra costs on to the producers by increasing input prices. Other government rules and regulations such as levies that the local and central government charged to enter markets negatively impacted farmers’ participation in these markets. However, some government rules were significant in enhancing farmers’ effective participation in value chains: these included rules regulating the quality of farm inputs and services that private organisations supplied to the farmers to ensure they were of high quality.

Formal rules were enforced by relevant government agencies at different levels such as the local government, the Kenya Bureau of Standards (KEBS), and the Kenya Plant Health Inspectorate Services (KEPHIS). Sanctions for non-compliance generally resulted in business disruptions: for example, actors being denied access to participate in markets or having their trade licences withdrawn. In extreme cases, chain actors such as input providers could be fined for dishonest activities such as adulterating inputs and, sometimes, the sub-standard inputs were confiscated and destroyed.

In contrast, the informal rules category concerns informal rules that were active where the government rules were poorly enforced or weak. The traders in this study also referred to as brokers generally served as the lead firms that enforced the informal rules on producers on matters related to pricing and product quality. On the positive side, they provided producers with information about produce’s demand. However, since the information on issues such as produce’s demand and pricing was relayed mainly through mobile phones, the poorer producers who had no mobile phones were disadvantaged when dealing with the ever-changing market conditions. As a result, the domestic market where these farmers operated was small and fragmented, Ministry of Agriculture and Ministry of Livestock and Fisheries Development, 2004), and lacked effective marketing information and infrastructure. One example of an informal rule was where traders avoided coriander produced from certified seeds and instead preferred those produced using locally produced seeds. The traders argued
that, since coriander was used as fresh spices, local seeds produced plants with stronger aroma than plants produced using certified seeds. As one coriander farmer stated:

*The broker can tell whether coriander is grown from local or improved seeds just by smelling the leaves. If improved seeds are used the broker will refuse to buy the product claiming it does not have strong aroma as required of fresh spices. However, the brokers are important as a source of market information on demand and supply to both the farmers and consumers since they have access to both groups.* (FGP1)

Traders and final consumers generally enforced informal rules with sanctions, such as rejecting produce or offering lower prices (especially when there was an oversupply of produce). However, in off-peak seasons with occur particularly in dry weather, producers enforced rules on prices and which markets they supplied their produce to.

To summarise, the formal and informal rules and regulations that they had to abide by, farmers had little control over many governance issues surrounding their produce. Government agencies enforced formal rules, such as taxes and levies. Moreover, government agencies could deny business licences or farmers’ access to market places and, in extreme cases, confiscate and destroy defective goods. Although the farmers generally perceived these formal rules as challenges to their participation in value chains, some formal rules were critical in enhancing their productivity, such as rules that controlled the quality of farm inputs and services provided to farmers by the private sector (e.g., seeds and fertiliser).

Informal rules concerned produce’s quality and price, and were active where inadequate formal rules operated. Informal-type of sanctions included rejecting produce on sale or offering of low prices for produce perceived to be of low quality. Traders and consumers predominantly enforced informal rules, particularly the former because they possessed information on both ends of the value chain. However, the farmers also considered traders to be an important link between consumers and producers and a source of market information (e.g., demand and supply and product prices). Table 4.6 summarises the formal and informal rules.
Table 4.6 Types of rules and regulations affecting value chain actors

<table>
<thead>
<tr>
<th>Actors</th>
<th>Types of rules</th>
<th>Examples</th>
<th>Enforcement and sanctions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input providers</strong></td>
<td>Formal</td>
<td>Licence fees, taxes on goods and earnings, levies on business premises, implementation of standards of locally produced and imported seeds (Kenya Plant Health Inspectorate Services), policy on agricultural inputs (Ministry of Agriculture), research and multiplication of seeds (Kenya Agricultural Research Institute)</td>
<td>Withdrawal of business licence, closure of business, destruction/confiscation of sub-standard inputs, fines</td>
</tr>
<tr>
<td><strong>Vegetable producers</strong></td>
<td>Informal</td>
<td>Standards on produce’s quality and pricing, which were enforced by intermediary traders (e.g., coriander producers should use local seeds because they produce spices with stronger aroma than those produced from certified seeds), kale should be free of pest infestation and diseases</td>
<td>Rejection or avoidance of produce, lower prices offered for defective produce</td>
</tr>
<tr>
<td></td>
<td>Formal</td>
<td>Policy framework on agricultural extension services, research and multiplication of planting materials, research and training from local universities</td>
<td>Enforced by agricultural extension providers.</td>
</tr>
<tr>
<td><strong>Intermediary traders</strong></td>
<td>Informal</td>
<td>Standards on produce’s quality and pricing, which were enforced by the marketers (e.g., produce should be free of disease and pests)</td>
<td>Rejection or lowering of prices offered for the defective produce.</td>
</tr>
<tr>
<td><strong>Wholesale marketers</strong></td>
<td>Informal</td>
<td>Standards on produce’s quality and pricing, which were enforced by the retail marketers (e.g., produce should be free of disease and pests)</td>
<td>Rejection or lowering of prices offered for the produce.</td>
</tr>
<tr>
<td></td>
<td>Formal</td>
<td>Market levies from central and local government, levies on business premises, business licences</td>
<td>Denial of access to operate in specific market places, fines</td>
</tr>
<tr>
<td><strong>Retail marketers</strong></td>
<td>Informal</td>
<td>Standards on produce’s quality, pricing, quantity, consistency, which were enforced by the final consumers (e.g., produce should be free of disease and pests)</td>
<td>Rejection or lowering of prices offered for the produce.</td>
</tr>
<tr>
<td></td>
<td>Formal</td>
<td>Levies on business premises, business licences</td>
<td>Closure of business, fines</td>
</tr>
<tr>
<td><strong>Final Consumers</strong></td>
<td>Formal</td>
<td>Policies that affected food prices</td>
<td>Consumers had no choice in most cases but to comply</td>
</tr>
<tr>
<td></td>
<td>Informal</td>
<td>Inconsistent supplies and low quality produce especially in off-peak seasons</td>
<td></td>
</tr>
</tbody>
</table>

“Note: all focus group respondents (n=12)”
Validating the focus group conclusions against other studies

The proportion of farmers who supplied the four local market segments (i.e., supermarkets, wholesalers, retailers, and final consumers) was analysed. Results show that a small proportion of chain actors (4%) (See Table 4.13) supplied the domestic/modern market (i.e., supermarkets). This market segment was characterised by network relations via contractual agreements. The fifth market segment (exports) was excluded from analysis because farmers supplied it at an extremely low proportion compared to the other market segments (1.3%). Thus, it’s safe to assume that most were not even aware of it. Accordingly, most opportunities for the farmers were in local and regional areas.

These findings run counter to earlier studies that show that traders dealing with fresh vegetables from developing countries including Kenya were linked to suppliers and consumers in developed economies (Gereffi, 1994; Watts, 1994; Fearne & Hughes, 1998).

In reality, this could only be achieved via collective action; that is, where farmers formed strong producer groups that export companies assisted to meet the conditions that export markets require (Narrod et al., 2009). According to the Kenya Horticulture Competitiveness Project (2010), smallholder farmers in Kenya contributed 18% of the volume of vegetables exported from Kenya for the 2006-2010 periods. Some of the aspects that give Kenya and other Sub-Saharan Africa countries a comparative advantage in producing vegetables over other regions in the world include cheap labour, favourable climatic conditions, and a geographical proximity to European markets (Barrett et al., 1997).

However, as this study reveals, many smallholder farmers in Kenya have not been integrated into export markets due to the continued decline in Kenyan exporters’ sourcing fresh produce from these farmers (United States Agency for International Development, 2013). This is a major departure from the situation in the 1990s when a large proportion of fresh produce vegetables came from smallholders, but, by 1998, only 18% of the produce was sourced from these farmers Barrett et al., (1997), a statistic that has continued to this day. Instead, Kenyan exporters preferred to source produce from exporter-owned farms and private, large commercial farms. As such, smallholder farmers are missing out on financial and linkage benefits from more-advanced markets, and their capacity to add value is limited unless they act collectively.
Indeed, other studies support the finding that poorer smallholder farmers in Kenya choose spot market relationships found in traditional/domestic markets (i.e., willing buyer and willing seller) instead of contracts and vertical integration found in modern markets (Williamson, 1999). In this study, the reasons farmers gave to explain this behaviour relates to uncertainties caused by poor physical infrastructure, weak institutional infrastructure and governance, unfavourable social and political conditions, and inadequate communication infrastructure (see Table 4.6). Poor physical infrastructure such as poor road conditions (especially in rural areas) increases of the cost of transporting produce and, sometimes, farmers cannot access markets (such as in the rainy season). Weak institutional infrastructure relates to inadequate mechanisms to enforce the quality of farm inputs supplied to the farmers on one hand, and the outputs that go to the market on the other. Unfavourable social-political and communication infrastructure arises due to a lack of linkages and relationships among the chain actors (e.g., such as by having few producer groups, which build social capital and can enhance farmers’ bargaining power). Accordingly, various studies report that farmers feel insecure (Watts, 1994; Grover & Malhorta, 2003).

4.4 Survey data collection and analytical techniques

Building on the findings from the focus group for kale and coriander value chains, a face-to-face survey (Lavrakas, 2013; Fowler & Mangione, 1990; Groves et al., 2004; Krueger & Casey, 2000; Rapley, 2007), was conducted on a variety of issues, such as the biographic characteristics and socio-economic factors that enhance or diminish farmers’ access to markets, to quantitatively test the two research propositions outlined at the start of the chapter. The survey comprised several semi-structured questions informed by the focus group discussion and scale questions, and was conducted with smallholder farmers in the study site.

Government agricultural extension providers and community leaders provided access to the potential study population, which was estimated at 1200 households. As such, the necessary sample size was calculated to be 300.

The survey questions (Appendix 2) were developed to provide data on several different variables that were to be used to test the first two research propositions.

Research Proposition 1

Research proposition 1 states that smallholder farmers’ biographic characteristics will influence how the value chain approach is perceived by farmers.
To test this proposition, a set of independent variables were created from five of the farmers’ biographic characteristics: gender, age, education, experience in value chain, and stage of value chain the farmers were involved in. These independent variables (see Table 4.7) were identified as being capable of increasing or decreasing the probability that the farmers would perceive the value chain approach to be effective.

Table 4.7 Description of farmers’ biographic characteristics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description/Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Number of Male and Female farmers above 15 years’ old interviewed.</td>
</tr>
<tr>
<td>Age</td>
<td>Number of farmers above 15 years in each of the age brackets; (16-25, 26-45, 46-65, and &gt;65) interviewed.</td>
</tr>
<tr>
<td>Educational level</td>
<td>Farmers’ education level (no formal education, primary education, secondary education, and tertiary education)</td>
</tr>
<tr>
<td>Experience in value chain participation</td>
<td>Number of farmers above 15 years’ old who had participated in value chains for various periods of time in years (≥2, 2-5, 5-7, and 7-10).</td>
</tr>
<tr>
<td>Stage of value chain</td>
<td>Number of farmers above 15 years’ old who had participated in the five stages of value chains (input provision, production, intermediary trading wholesale marketing and retail marketing).</td>
</tr>
</tbody>
</table>

“Note: all survey respondents (n=302)”.

A set of dependent variables was also identified and termed the “Promoted Items”. This set of variables comprised nine value chain items that were being promoted by NALEP and which were combined into a single scale to remove skewness present in individual response data (Carmines & Zeller, 1979; Spector, 1992). The nine variables were:

(1) Governance (e.g., contracts)
(2) Building relationships, linkages, and trust
(3) Increasing profits while decreasing production costs
(4) Equitable income distribution along the chain
(5) Equitable employment distribution along the chains
(6) Knowledge (facts)
(7) Skills (competence)
(8) Technology transfer, and
(9) Support services.

However, the scale is strongly skewed with 50% of people scoring below 0.4444. This forms the justification for combining the nine components into a single scale so that measurement
errors can average out when individual scores are combined to obtain a single scale (Spector, 1992; Carmines & Zeller, 1979).

**Descriptive statistics on the nine variables**

The nine variables were combined from two sets of questions measuring farmers’ perceptions towards the effectiveness of the value chain approach.

The first question had five variables: (governance, building linkages, capacity to increase profits while reducing costs of production, equitable income distribution along the chains and equitable employment distributions along the chains). The five variables are ordinal categories based on a three point scale (0 to 2), where 0 means that the variables are perceived as ‘not effective’, while 2 means that the variables are perceived as being ‘extremely effective’ (Table 4.8)

**Table 4.8** Attitude towards key value chain operational components promoted by NALEP

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>Not effective</th>
<th>Extremely effective</th>
<th>Mean</th>
<th>SE</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Governance (eg contracts)</td>
<td>301</td>
<td>86.1%</td>
<td>5.6%</td>
<td>0.352</td>
<td>.059</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>2. Building relationships, linkages and trust</td>
<td>301</td>
<td>84.7%</td>
<td>5.9%</td>
<td>0.380</td>
<td>.061</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>3. Increasing profits while decreasing costs of production</td>
<td>301</td>
<td>73.9%</td>
<td>6.3%</td>
<td>0.561</td>
<td>.067</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>4. Equitable income distribution</td>
<td>301</td>
<td>73.1%</td>
<td>3.5%</td>
<td>0.484</td>
<td>.057</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>5. Equitable employment distribution</td>
<td>301</td>
<td>74.6%</td>
<td>3.8%</td>
<td>0.491</td>
<td>.059</td>
<td>P &lt; .001</td>
</tr>
</tbody>
</table>

*Note: Number of respondents who answered the question (N=301)*

Mean and SE calculated on scores Not Effective (0), and extremely Effective (2)

All the five variables are significantly different (p < .001) from response (1).

The second question had four variables which comprises strategies that can assist farmers to improve on value adding of the produce as it moves through various stages from production to consumption. These include: knowledge (facts), skills (competence), improved technologies and support services. The four variables are ordinal categories based on the three point scale (0 to 2), as the first question (Table 4.9).
Table 4.9 Attitude towards value chain upgrading opportunities for value creation

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>Not effective (0)</th>
<th>Extremely Effective (2)</th>
<th>Mean</th>
<th>SE mean</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledge</td>
<td>301</td>
<td>49.2%</td>
<td>14.3%</td>
<td>1.176</td>
<td>.083</td>
<td>P &lt; .05</td>
</tr>
<tr>
<td>(facts)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Skills</td>
<td>301</td>
<td>48.8%</td>
<td>15.3%</td>
<td>1.173</td>
<td>.083</td>
<td>P &lt; .05</td>
</tr>
<tr>
<td>(competence)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Technology</td>
<td>301</td>
<td>66.1%</td>
<td>8.0%</td>
<td>0.701</td>
<td>.070</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>4. Support</td>
<td>301</td>
<td>62.1%</td>
<td>7.3%</td>
<td>0.751</td>
<td>.069</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

“Note: Number of respondents who answered the question (N=301)”
Mean and SE calculated on scores Not Effective (0), and extremely Effective (2)
The first two variables are significantly different (p < .05) from response (1), while variables 3 and 4 are significantly different at (p < .001).

The correlation between the nine variables in the scale was examined using Spearman’s correlation coefficients. The test showed that the nine variables were significantly correlated with each other, which justifies the nine components’ construction in a single scale (Table 4.10).

Table 4.10 Spearman’s correlation coefficients between the nine variables.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Contract</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.Linkages</td>
<td>0.88</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.Profits</td>
<td>0.66</td>
<td>0.72</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.Income</td>
<td>0.57</td>
<td>0.63</td>
<td>0.84</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.Employment</td>
<td>0.60</td>
<td>0.62</td>
<td>0.81</td>
<td>0.92</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.Knowledge</td>
<td>0.49</td>
<td>0.50</td>
<td>0.54</td>
<td>0.54</td>
<td>0.56</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.Skills</td>
<td>0.49</td>
<td>0.52</td>
<td>0.51</td>
<td>0.48</td>
<td>0.46</td>
<td>0.91</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.Technology</td>
<td>0.44</td>
<td>0.42</td>
<td>0.36</td>
<td>0.34</td>
<td>0.36</td>
<td>0.61</td>
<td>0.64</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>9.Support</td>
<td>0.31</td>
<td>0.30</td>
<td>0.29</td>
<td>0.32</td>
<td>0.37</td>
<td>0.54</td>
<td>0.52</td>
<td>0.55</td>
<td>1.00</td>
</tr>
</tbody>
</table>

The Correlation Coefficients show that all the components are significantly correlated with each other, (p < 0.001). A measure of size effect indicates that correlations above 0.3 would be considered meaningful (Field 2009).

Both the items’ reliability Lincoln & Guba, (1985) and the internal validity Tashakkori & Teddlie, (1998) were assured using different methods. To estimate the scales’ internal reliability, Cronbach’s alpha (Cronbach, 1951) was used, for which a score of above 0.7 is acceptable (Nunnally & Beinstein, 1994). Item analysis of the nine variables yielded
acceptable results ($\alpha = 0.9376$). The scales’ validity (Bryman & Cramer, 2008; Schuman & Presser, 1981) was addressed by using two measures: (1) the participating sample was randomly selected to reduce bias, and (2) a large sample size of farmers (302) was surveyed using multiple enumerators.

**How the nine variables were combined into a single scale**

This was achieved by allocating 0 to “not effective at all” up to 4 for being “extremely effective”. This was averaged across the nine different variables to come up with a single scale.

The **descriptive statistics** for the nine variables from the two questions in Tables 4-8 (CQ1) and 4-9 (CQ2) are as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>SE Mean</th>
<th>Minimum</th>
<th>Median</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>CQ1&amp;2</td>
<td>301</td>
<td>0.7291</td>
<td>0.0588</td>
<td>0.0000</td>
<td>0.4444</td>
<td>4.0000</td>
</tr>
</tbody>
</table>

“Note: Number of respondents who answered the question (N=301)”

**Research proposition 2**

Research Proposition 2 states that socio-economic factors such as linkages between chain actors and transportation costs constrain market access.

The set of independent variables used to test this proposition comprised the five variables: policy environment, economic environment, social environment, physical environment, and the composite score comprising the first four variables.

The set of dependent variables comprised the four market segments:

1. Supermarkets
2. Wholesalers
3. Retail,
4. Final consumer.

**4.4.1 Measurement levels for variables**

There are four levels of measurement which are normally presented as an ascending scale of refinement-nominal; ordinal; interval and ratio (Zeller & Carmines 1980; Schuman & Presser 1981; Bryman & Cramer 2008). The dependent and independent variables were either nominal or ordinal.
4.4.2 Scale construction for variables

In social research, researchers are usually faced with whether to employ one or several indicators in the data analysis process because, in surveys like the one used to collect data in this study, a single indicator may not capture a respondent’s attitude toward an issue due to misunderstanding or misinterpretation of the questions. In such cases, employing more than one indicator and then combining their scores to form a total score for each respondent decreases the likelihood of measurement error (Spector, 1992; Nunnally & Beinstein, 1994). In this study, the first set of dependent variables (the Promoted Items variables) was constructed into a single scale, while the second set of independent variables (business environment constraints) remained as five independent scales.

4.4.3 Data analysis techniques

Multivariate analysis determines simultaneous relationships among several variables to examine and explain variance in dependent variables using independent variables. In this study, two multivariate analysis techniques were used: the general linear model (GLM) and binary logistic regression (BLR) (Cooper & Weekes, 1983; Singh, 2007; Tabachnick & Fidell, 2007).

(1) The general linear model (GLM)

GLM was used to explain social phenomenon (De Vaus, 2001); in this case, the Kenyan government’s “value chain approach”, which it was implementing through NALEP as a strategy to develop a market-oriented culture.

To explain an outcome, one should try to identify the causal circumstances that brought it about (Little, 2010). Since human social behaviour is complex, one can only infer, and not observe, cause, either deterministically or probabilistically (Suppes, 1970; Hutchison, 2007) and since structures can constrain behaviour, one can achieve probabilistic explanations by explaining that a given factor increases or decreases a particular outcome’s probability (Marshall & Rossman, 2010).

Most of the statistical analyses that are used in applied and social research use the GLM (William 2006). It is the foundation for the T–Test, Analysis of Variance (ANOVA), Analysis of Covariance (ANCOVA), regression analysis, and many of the multivariate methods (Dobson, 2001; McCulloch & Searle, 2001).
GLM is suitable to use when dependent variables are presented in nominal and ordinal categories or when data are continuous. It allows one to predict one dependent or response variable from one or more independent, predictor or explanatory variables. However, the terms dependent and independent variables should be used with caution because dependency in this case does not imply causality (Dey et al., 2000; Harding & Hible, 2001). The analyses were conducted using SAS computer programme.

(2) Binary logistic regression (BLR)

BLR deals with dependent variables that are dichotomous and their relationship with multiple independent variables to predict whether they will belong to any of the dependent variable categories (George & Mallery, 2000; Field, 2005). Proposition 2 was tested using BLR, which is suitable when a dependent variable has only two possible states (no/yes or 0/1).

BLR employs binomial probability theory in which there are only two values to predict; that is, probability (p) is 1 rather than 0 (Plewis, 1997; Dobson, 2001). Therefore, the outcome is not a prediction of the dependent variables but a probability of belonging to one of the two conditions in the dependent variables (McCullaggh & Nelder, 1989; Agresti, 1996). Discriminant function analysis is used if all the predictors are continuous and well distributed, while logit analysis is used if all predictors are categorical (Long, 1997; Hosmer & Lemeshow, 2000). Logistic regression is chosen if the predictor variables are a mix of continuous and categorical variables and/or if they do not meet the assumptions of normality because logistic regression makes no assumptions about the distributions of predictor variables (Tabachnick & Fidell, 2007). Logistic regression using the logit link function was chosen as the data analytic tool for dichotomous categories in this study.

4.5 Survey results and discussion

4.5.1 Proposition 1—effectiveness of value chain approach

Proposition 1 states that there is a relationship between farmers’ biographic characteristics as independent variables (gender, age, education, time in value chain participation/experience, and stage of value chain the farmers were involved in) and the nine components in the “Promoted Items” as dependent variables. To support proposition 1, at least one independent variable should have a significant relationship with the dependent variables.
To test Proposition 1, a general linear model (GLM) was developed in which the independent variables were tested against the dependent variables to examine any existing relationships (Dey et al., 2000; Harding & Hible, 2001). Least squares means were estimated and compared using the F-test (Merriman, 2007), and differences were considered significant if \( p < 0.05 \).

**Fitting the models**

The Model tested the Proposition: there is a relationship between gender, age, educational level of farmers, length of time that farmers had participated in the value chains, five stages of value chain (input, production, intermediary, wholesale and retail marketers) and the promoted items scale. The results showed that, gender (\( p=0.448 \)) and age (\( p=0.062 \)), time in VC (\( p=0.78 \)), input (\( p=0.0638 \)), production (\( p=0.216 \)) and intermediary (\( p=0.513 \)) had no significant association, but there was a significant association between education (\( p < 0.001 \)), wholesale (\( p=0.039 \)), retail (\( p=0.026 \)) and the promoted items.

Table 4.11 presents results of the relationships between farmers’ biographic characteristics and the promoted items.

The Degree of Freedom is different from one predictor to another because they had different levels (i.e. gender, input, production, intermediary, wholesale and retail predictors had two levels; age and education had four; and experience in value chain had five). Therefore, when using the F-test, the between level degrees of freedom is one less than the number of levels (e.g. gender (2-1=1Df), age (4-1=3Df)).
Table 4.11 Relationships between farmers’ biographic characteristics and the promoted items

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Df</th>
<th>F stat</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>1</td>
<td>0.58</td>
<td>0.448</td>
</tr>
<tr>
<td>Age</td>
<td>3</td>
<td>2.48</td>
<td>0.062</td>
</tr>
<tr>
<td>Education</td>
<td>3</td>
<td>7.01</td>
<td>0.0001**</td>
</tr>
<tr>
<td>Time in VC</td>
<td>4</td>
<td>0.44</td>
<td>0.78</td>
</tr>
<tr>
<td>Input</td>
<td>1</td>
<td>0.22</td>
<td>0.638</td>
</tr>
<tr>
<td>Production</td>
<td>1</td>
<td>1.54</td>
<td>0.216</td>
</tr>
<tr>
<td>Intermediary</td>
<td>1</td>
<td>0.43</td>
<td>0.513</td>
</tr>
<tr>
<td>Wholesale</td>
<td>1</td>
<td>4.32</td>
<td>0.039*</td>
</tr>
<tr>
<td>Retail</td>
<td>1</td>
<td>5.02</td>
<td>0.026*</td>
</tr>
</tbody>
</table>

Model Df=16
\[ R^2=13.6\% \]
\[ R^2=8.7\% \]
\[ SDev=0.975 \]

“Note: all survey respondents (n=302)”.

As such, we can see that the three predictors that had a significant effect were education (p < 0.001) and the wholesale marketers (p < 0.039 and retail marketers (p <.026).

The model was refitted including only statistically significant predictors, and with wholesale and retail combined into a single category. The results showed that there was a significant association between education (p < 0.001), combined wholesale /retail (p < 0.001) and the promoted items.

Table 4.12 further summarises the least squares means for the two significant predictors in Table 4.11.

Table 4.12 Least square means for education and marketing group

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Mean</th>
<th>SE Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education (none)</td>
<td>0.78</td>
<td>0.19</td>
</tr>
<tr>
<td>Education (Primary)</td>
<td>0.66</td>
<td>0.10</td>
</tr>
<tr>
<td>Education (Secondary)</td>
<td>1.08</td>
<td>0.09</td>
</tr>
<tr>
<td>Education (Post-secondary)</td>
<td>1.52</td>
<td>0.20</td>
</tr>
<tr>
<td>Marketing Group (0)</td>
<td>1.31</td>
<td>0.13</td>
</tr>
<tr>
<td>Marketing Group (1)</td>
<td>0.71</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Note: For the Marketing Group variable ‘0’ means not involved in either wholesale or retail marketing: ‘1’ means involved in either wholesale or retail marketing, or both

“Note: all survey respondents (n=302)”.
The key findings from this analyses show that farmers’ education and the stage of value chain they were involved in were the key determinants of their attitude toward the value chain approach’s effectiveness, but weak R-squared values mean the explanatory power was also weak. Farmers’ gender, age, and the length of time they had participated in the value chains had no impact on their attitude toward the value chain approach.

The least squares means for the two significant predictors (Table 4.12) show that, as education level increase, so too does the perceived effectiveness of the value chain approach. There is no real difference between the two lowest levels of education (no formal education and primary levels), but the perception levels increase thereafter. This suggests that farmers with more education understood the value chain approach better. Other studies support these results: they show that education increases a farmer’s capacity to receive, decode, and understand information, which affects their ability to make informed decision about whether they need to adapt to change to increase their production levels (The World Bank, 2006; Kudi et al., 2011).

To explain why farmers’ gender had no effect on their perceptions of the value chain approach, we can turn to studies that indicate that gender issues in agriculture are complex due to the unequal power between male and female farmers in most developing societies (Nyamu-Musembi, 2002; Deere & Doss, 2006; Food and Agriculture Organization of the United Nations and World Food Programme, 2011). Females are generally associated with subsistence farming, while males are associated with cash crops (Tura et al., 2010). However, generally gender does not seem to play a significant role in changing farmers’ attitudes.

In the case of age variable, it was expected that farmers’ age will have a positive attitude toward the value chain approach, but the results were contrary to this expectation. The lack of effect is due to two counteracting effects that the younger farmers with a longer planning horizon hence more receptive to change have limited ownership of land which is in the hands of the older farmers. (Marenya & Barrett, 2007). The younger farmers in Kenya are constrained by land because land ownership among the youth is minimal, which Tura et al. (2010) also reports. Possible reasons for why younger farmers are constrained by land include the customary practice by which land is passed from farther to sons, and the limited finances that young people can use to purchase land.

In their study, Lewa & Ndungu (2012) conclude that, despite the expectations that the youth who comprise 60% of Kenya’s population will be significantly involved in farming activities,
farming still attracts older people, which threaten the country’s agricultural production and food security. The average age of Kenyan farmer is 50-60 years’ old, which constrains the country’s adoption of modern farming techniques (Lewa & Ndungu, 2012). The age composition of the chain actors in this study showed that about 53.6% of the population were 46 years old and above.

The variable on the length of time that chain actors had participated in value chains had no effect on their attitude toward the value chain approach. However, others studies have contradicted this finding. They suggest that the time farmers allocate and the skills they develop to establish contacts with other actors in the value chain will result in their acquiring relevant knowledge (Tepic et al., 2012). This is expected to increase farmers’ ability to recognise changes in market rules, shifts in market competition and new possibilities to serve their customers (Lie et al., 2012). Amaza et al. (2007) show that farmers’ experience had a positive influence on their attitude toward change, which contradicts the current study’s findings. Based on evidence from previous studies, it was expected that the farmers who had participated in value chains for several years would perceive the value chain approach as effective, but the results were contrary to these expectations. One explanation can be derived from the fact that NALEP had been implemented for 10 years by the time this field work was conducted. This may have been sufficient time for the majority of farmers to conclude whether the approach was effective or not, but they indicated it was not effective. Regular contact with extension staff can enhance farmers’ understanding of a programme, but with the study area having a 1:770 staff-farmer ratio, the farmers were unlikely to be adequately serviced, hence lacked an understanding of the programme (Koimbori, 2011).

For marketers, the least square means analysis in (Table 4.12) show that chain actors who were involved in marketing of any sort scored much lower on the perceived effectiveness of the value chain approach than chain actors who were not involved in marketing. This suggests that the value chain approach has not effectively addressed the marketing challenges facing farmers, which continue to undermine their access to modern markets because the marketing end of the value chains in Kenya is still characterised by inadequate markets and marketing infrastructure, which hinders farmers’ marketing efforts (Ministry of Agriculture 2009). Another constraint is that agricultural produce, especially produce destined for modern markets, face restrictions due to poor packaging methods, transportation damage, and poor quality control. According to the Ministry of Agriculture (2009), agricultural marketing infrastructure is poorly organised and hence inefficient and unresponsive to farmers’ needs.
Implications

The results indicate that some biographic factors such as gender, age, time in value chains, and value chain stages such as input provision, production, and intermediary trading had a non-significant association with the promoted items. Other factors such as education and value chain stages related to wholesale and retail marketing had a significant association with promoted items. As such, Proposition 1 was partly supported. However, overall, the farmers perceived the value chain approach to not be effective in linking smallholder farmers to modern markets.
4.5.2 Research Proposition 2—Access to market segments supplied by chain actors

Research Proposition 2 states that social-economic factors such as lack of linkages between chain actors and transportation costs constrain market access. To be supported, at least one independent variable needed to have a significant relationship with the dependent variables. This section examines the probability of farmers supplying each of the four market segments in relation to the conditions in the business environment in the country. This was achieved by analysing data using binary logistic regression.

The participants in the focus group identified the independent variables comprising the constraints in the business environment that ranged from: policies related to the agriculture sector, social, economic, and the physical environment issues. Each of the variables comprised two or more items. Additionally, a fifth variable (composite score) was developed by combining all the 21 items from the other four variables. Table 4.13 summarises the variables.

Table 4.13 Constraints in the business environment

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Policy environment</td>
<td>Three items (rules &amp; regulations, taxes &amp; levies, land tenure)</td>
</tr>
<tr>
<td>(2) Social environment</td>
<td>Seven items (lack of linkages &amp; relationships, lack of trust, educational level, inadequate health facilities, inadequate business knowledge, inadequate electrical power supply, inadequate water supply)</td>
</tr>
<tr>
<td>(3) Economic environment</td>
<td>Nine items (availability of inputs, cost of labour, credit facilities, cost of inputs, cost of joining value chain, fluctuations in market prices, access to market, knowledge of market demand, roads conditions)</td>
</tr>
<tr>
<td>(4) Physical environmental</td>
<td>Two categories (soil conditions, land size)</td>
</tr>
<tr>
<td>(5) Composite (Policy, Social, Economic, and Physical environment)</td>
<td>All 21 items contained in the above four variables.</td>
</tr>
</tbody>
</table>

“Note: all survey respondents (n=302).”

In summary, this set of independent variables contained five variables in total. The five variables in the business environment were ordinal categories scored on a 0 (“no effect”) to 2 (“gross effect”) scale. The items in each of the five variables were combined into single scale to reduce measurement errors (Carmines & Zeller, 1979; Spector, 1992; Nunnaly & Beinstein, 1994).
Descriptive statistics for Table 4.13 (policy, social, economic and physical environment)

Policy components

Table 4.14 Policy components

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>No effect (0)</th>
<th>Gross effect (2)</th>
<th>Mean</th>
<th>SE mean</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rules &amp; regulations</td>
<td>300</td>
<td>54.3%</td>
<td>28%</td>
<td>0.737</td>
<td>0.050</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Taxes &amp; levies</td>
<td>300</td>
<td>45%</td>
<td>32.7%</td>
<td>0.877</td>
<td>0.051</td>
<td>0.015</td>
</tr>
<tr>
<td>Land tenure</td>
<td>300</td>
<td>75.5%</td>
<td>16.7%</td>
<td>0.410</td>
<td>0.044</td>
<td>P &lt; .001</td>
</tr>
</tbody>
</table>

"Note: Number of respondents that answered the question (N=300)"

Mean and SE calculated on scores no effect (0), and gross effect (2)
Significance of difference from response (1) (**p < .01; *p < .05, ns no significant difference)

Results show that two of the items (rules and regulations and land tenure) are highly significant (p < .001), while one of these item (taxes and levies) show mild significance at p < .05.

Table 4.15 Social components

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>No effect (0)</th>
<th>Gross effect (2)</th>
<th>Mean</th>
<th>SE mean</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>linkages</td>
<td>299</td>
<td>20.5%</td>
<td>59%</td>
<td>1.381</td>
<td>0.047</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Trust</td>
<td>299</td>
<td>17.5%</td>
<td>62%</td>
<td>1.448</td>
<td>0.045</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Education</td>
<td>299</td>
<td>54.3%</td>
<td>13.6%</td>
<td>0.589</td>
<td>0.042</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Health facilities</td>
<td>299</td>
<td>48.7%</td>
<td>19.7%</td>
<td>0.706</td>
<td>0.045</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Business knowledge</td>
<td>299</td>
<td>56.7%</td>
<td>33.7%</td>
<td>0.763</td>
<td>0.053</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Power supply</td>
<td>298</td>
<td>42.6%</td>
<td>31.9%</td>
<td>0.668</td>
<td>0.045</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Water supply</td>
<td>298</td>
<td>52%</td>
<td>26.5%</td>
<td>0.893</td>
<td>0.050</td>
<td>0.031</td>
</tr>
</tbody>
</table>

"Note: Number of respondents that answered the question (N=299)"

Mean and SE calculated on scores no effect (0), and gross effect (2)
Significance of difference from response (1) (**p < .01; *p < .05, ns no significant difference)

The results reveal that six of the items are highly significant (p < .001), while one of these item (water supply) show mild significance at p < .05.
Table 4.16 Economic components

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>Does not affect (0)</th>
<th>Grossly affect (2)</th>
<th>Mean</th>
<th>SE Mean</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input availability</td>
<td>299</td>
<td>27%</td>
<td>44.8%</td>
<td>1.177</td>
<td>0.048</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Cost of labour</td>
<td>299</td>
<td>37.1%</td>
<td>32.8%</td>
<td>0.957</td>
<td>0.048</td>
<td>0.370ns</td>
</tr>
<tr>
<td>Credit facilities</td>
<td>299</td>
<td>20%</td>
<td>53.2%</td>
<td>1.331</td>
<td>0.046</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Cost of inputs</td>
<td>299</td>
<td>6.4%</td>
<td>69.2%</td>
<td>1.629</td>
<td>0.035</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Cost of joining value chain</td>
<td>299</td>
<td>25.8%</td>
<td>40.1%</td>
<td>1.144</td>
<td>0.046</td>
<td>0.002</td>
</tr>
<tr>
<td>Fluctuating market prices</td>
<td>299</td>
<td>14.7%</td>
<td>68.2%</td>
<td>1.535</td>
<td>0.043</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Access to market</td>
<td>299</td>
<td>47.5%</td>
<td>30.1%</td>
<td>0.826</td>
<td>0.050</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Knowledge of market demand</td>
<td>299</td>
<td>55.5%</td>
<td>36.5%</td>
<td>0.809</td>
<td>0.054</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Roads conditions</td>
<td>298</td>
<td>44.8%</td>
<td>39.8%</td>
<td>0.950</td>
<td>0.053</td>
<td>0.374 ns</td>
</tr>
</tbody>
</table>

"Note: Number of respondents that answered the question (N=299)"
Mean and SE calculated on scores no effect (0), and gross effect (2)
Significance of difference from response (1) (**p < .001);**p < .01; *p < .05, ns no significant difference)
Results reveal that seven of the items are highly significant (p < .001), while two of these items (cost of labour, and roads conditions) has no statistical significance.

Table 4.17 Physical environment components

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>No effect (0)</th>
<th>Gross effect (2)</th>
<th>Mean</th>
<th>SE Mean</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil condition</td>
<td>298</td>
<td>52%</td>
<td>26.5%</td>
<td>0.745</td>
<td>.0.049</td>
<td>P &lt; .001</td>
</tr>
<tr>
<td>Land size</td>
<td>298</td>
<td>57%</td>
<td>33.9%</td>
<td>0.769</td>
<td>0.054</td>
<td>P &lt; .001</td>
</tr>
</tbody>
</table>

"Note: Number of respondents that answered the question (N=298)"
Mean and SE calculated on scores no effect (0), and gross effect (2)
Significance of difference from response (1) (**p < .001);**p < .01; *p < .05, ns no significant difference)
From the results, both the items are highly significant (p < .001).
To use the five variables as individual single scales, both the items’ reliability (Field, 2005) and the internal validity (Tashakkori & Teddlie, 1998) needed to be assured. A similar procedure used to measure the reliability and validity of the items in the promoted items scale using the Cronbach’s alpha (α) was used to measure the four variables’ reliability.

First, each item in the four variables (policy, social, economic, and physical environment) was measured separately. Subsequently, these items were measured as a combined set. Table 4.18 presents the results of the item analysis.

**Table 4.18 Cronbach’s alpha for items in the business environment**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number of items</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy</td>
<td>3</td>
<td>0.7066</td>
</tr>
<tr>
<td>Social</td>
<td>7</td>
<td>0.7404</td>
</tr>
<tr>
<td>Economic</td>
<td>9</td>
<td>0.8042</td>
</tr>
<tr>
<td>Composite (Policy, Social, Economic, Physical and environment)</td>
<td>21</td>
<td>0.8393</td>
</tr>
</tbody>
</table>

“Note: all survey respondents (n=302)”.

Results from Table 4.18 show that the Cronbach’s alpha values for the policy and social were below 0.8; however, they were still considered to be suitable because alpha level values for data collected in a survey over 0.7 are acceptable (Kline, 1999; Nunnally & Bernstein, 1994). Garson, (2012) also states that the widely accepted cut-off level of alpha in social science studies is 0.7.

Cronbach’s alpha test could not be conducted for the items in the physical environment variable because there were only two items. Therefore, Pearson’s correlation coefficient was used to test for correlation. The test showed that the two items (soil conditions and land size) were significantly correlated \((r = 0.626, n = 298, p <.001)\). Therefore, the scale was treated similar to the other four variables.

Validity concerns of the constructed scales related to the constraints in the business environment were also addressed using similar measures as those used to address validity concerns in the scale associated with the set of dependent variables identified as the promoted items.

The dependent variables comprised the four market segments that the focus group identified. These variables had dichotomous responses as to whether a farmer supplied to a certain market segment or not \((0 = no, 1 = yes)\). The market segments were represented by the supermarket, wholesalers, retailers, and final consumer. A fifth market segment (export) was
excluded from analysis because it had an extremely low number of respondents (4/302 or 1.3%). Table 4.19 presents information on market segments.

Table 4.19 Market segments that farmers supplied

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of respondents who supplied each market segment (A)</th>
<th>% of responses for each market segment (C) (C=A/B*100)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supermarket</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>Wholesale market</td>
<td>50</td>
<td>16.6</td>
</tr>
<tr>
<td>Retail market</td>
<td>114</td>
<td>37.7</td>
</tr>
<tr>
<td>Final consumer</td>
<td>122</td>
<td>40.4</td>
</tr>
<tr>
<td>Total</td>
<td>298 (B)</td>
<td>98.7</td>
</tr>
</tbody>
</table>

Note: “A” = number of respondents, “B” = total respondents, and “C” = % responses

“Note: respondents who supplied produce to markets (n=298)”.

Evaluation of the models

Since the independent variables representing constraints in the business environment were highly correlated, it was not possible to fit models with more than one predictor. Instead, the predictors that were most useful were identified. Therefore, the logistic regression model was evaluated in terms of statistical tests of (i) individual predictors and (ii) goodness-of-fit statistics (Peng & So, 2002).

(i) Statistical tests of individual predictors: The statistical significance (p < 0.05) of each predictor in the model was tested using the Wald chi-square statistics, whereby the significant predictors of the items that affected chain actors who were supplying the four market segments were identified (Menard, 1995, 2009).

(ii) Goodness–of-fit statistics: Goodness-of-fit statistics assess a logistic model’s fit against actual outcomes (i.e., whether a farmer supplying produce to a market segment was affected by the items in the business environment). In this analysis, the goodness-of-fit test was estimated using the Akaike information criterion (AIC) (Burnham & Anderson, 2002). The AIC compares different models derived from the same sample. A smaller AIC value (including negative values) suggests a better model fit. Therefore, the best three models for each market segment were identified by ranking the models using AIC from the models with the lowest AIC value when compared with the null model.
(1) **Supermarket**: for the supermarket variable, the Wald chi-square statistics indicated that all the five individual predictors were significant \((p < 0.05)\). Using the AIC, the three models that best approximated the reality of the data (lowest to highest) were physical, composite score, and policy (Table 4.20).

<table>
<thead>
<tr>
<th>Predictor</th>
<th>AIC (Rank)</th>
<th>Wald test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Policy</td>
<td>3</td>
<td>10.63</td>
</tr>
<tr>
<td>Social</td>
<td>5</td>
<td>11.52</td>
</tr>
<tr>
<td>Economic</td>
<td>4</td>
<td>12.88</td>
</tr>
<tr>
<td>Physical</td>
<td>1</td>
<td>7.76</td>
</tr>
<tr>
<td>Composite score</td>
<td>2</td>
<td>16.19</td>
</tr>
</tbody>
</table>

“Note: respondents who supplied produce to supermarkets (n=12)”.

(2) **Wholesale**: for the wholesale market variable, the Wald chi-square statistics indicated that all the five individual predictors in the wholesale market segment were statistically significant \((p < 0.05)\) (Table 4.21). The AIC statistics showed that the best three models (lowest to highest) were the composite score, physical, and economic.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>AIC (Rank)</th>
<th>Wald test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Policy</td>
<td>4</td>
<td>10.50</td>
</tr>
<tr>
<td>Social</td>
<td>5</td>
<td>9.77</td>
</tr>
<tr>
<td>Economic</td>
<td>3</td>
<td>13.43</td>
</tr>
<tr>
<td>Physical</td>
<td>2</td>
<td>13.84</td>
</tr>
<tr>
<td>Composite score</td>
<td>1</td>
<td>13.86</td>
</tr>
</tbody>
</table>

“Note: respondents who supplied produce to wholesale market (n=50)”.

(3) **Retail market**: for the retail market variable, the Wald chi-square statistics indicated that two predictors-policy and social were statistically significant \((p < 0.05)\), while the other three predictors economic, physical, and the composite score were non-significant. The AIC showed that the best three models from (lowest to highest) were policy, social, and composite score (Table 4.22).
Table 4.22 Retail market variable testing

<table>
<thead>
<tr>
<th>Predictor</th>
<th>AIC (Rank)</th>
<th>Wald test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Policy</td>
<td>1</td>
<td>5.60</td>
</tr>
<tr>
<td>Social</td>
<td>2</td>
<td>4.11</td>
</tr>
<tr>
<td>Economic</td>
<td>6</td>
<td>0.20 (ns)</td>
</tr>
<tr>
<td>Physical environment</td>
<td>5</td>
<td>0.53 (ns)</td>
</tr>
<tr>
<td>Composite score</td>
<td>3</td>
<td>2.31 (ns)</td>
</tr>
</tbody>
</table>

“Note: respondents who supplied produce to retail market (n=144)”.

(4) Final consumer market: for the consumer market, the Wald chi-square statistics indicated that all the five predictors were statistically significant (p < 0.05). The AIC showed that the three best models for this market segment (lowest to highest) were physical, composite score, and economic (Table 4.23).

Table 4.23 Final consumer model

<table>
<thead>
<tr>
<th>Predictor</th>
<th>AIC (Rank)</th>
<th>Wald test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Policy</td>
<td>4</td>
<td>21.86</td>
</tr>
<tr>
<td>Social</td>
<td>5</td>
<td>19.69</td>
</tr>
<tr>
<td>Economic</td>
<td>3</td>
<td>36.64</td>
</tr>
<tr>
<td>Physical</td>
<td>1</td>
<td>48.70</td>
</tr>
<tr>
<td>Composite score</td>
<td>2</td>
<td>39.35</td>
</tr>
</tbody>
</table>

“Note: respondents who supplied produce to final consumers (n=122)”.

Summary of the models

The composite score was selected to predict the probability of chain actors supplying each of the four markets segments (Table 4.24). This was justified by the fact that it was among the best three models for all the four market segments using the AIC statistics. The summary of models was based on the estimates of the intercept model ($\beta_0$) and data model ($\beta_1$).

Table 4.24 Summary of models using the composite score

<table>
<thead>
<tr>
<th>Market segment</th>
<th>Intercept (SE)</th>
<th>Slope (SE)</th>
<th>Probability level (Wald x^2 p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supermarket</td>
<td>-0.351 (0.474)</td>
<td>-2.974 (0.739)</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Wholesalers</td>
<td>0.177 (0.288)</td>
<td>-1.203 (0.299)</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>Retailers</td>
<td>1.417 (0.308)</td>
<td>-0.418 (0.276)</td>
<td>0.129</td>
</tr>
<tr>
<td>Final consumer</td>
<td>3.733 (0.460)</td>
<td>-2.255 (0.360)</td>
<td>&lt; .0001</td>
</tr>
</tbody>
</table>

“Note: respondents who supplied produce to markets (n=298)”.
Figure 4.6 graphically represents the estimates to indicate how likely farmers were to supply each market segment relative to the constraints in the business environment.

**Figure 4.6 Supply to the four market segments**

**How Figure 4.6 is derived**

Figure 4.6 is a result of the logistic regression modelling. The probability (Pr) of supplying each segment is modelled as a function of the composite EQ score. The fitted models are:

- \( Pr(\text{consumer}) = 1 / \{1 + \exp(-3.73297 + 2.25512 \times \text{(EQ composite score)})\} \)
- \( Pr(\text{retail}) = 1 / \{1 + \exp(-1.41664 + 0.418359 \times \text{(EQ composite score)})\} \)
- \( Pr(\text{wholesale}) = 1 / \{1 + \exp(-0.17684 + 1.20305 \times \text{(EQ composite score)})\} \)
- \( Pr(\text{supermarket}) = 1 / \{1 + \exp(0.35085 + 2.97419 \times \text{(EQ composite score)})\} \)

The larger the slope (ie what we multiply the score by), the more rapidly probability of supply drops away. So retail is robust, but supermarket drops off quickly.

The key findings from this analysis indicate that the supermarket segment was the most sensitive to the business environment constraints compared to the other market segments. When there were no constraints in the business environment (as represented by the 21 items in the set of independent variables), the probability of a farmer supplying each of the market segments was 98% for final consumer, 80% for retail, 55% for wholesale, and 40% for supermarket. However, as the constraints increased in number, chain actors supplying the
supermarket (followed by the wholesaler, consumer, and retail market) decreased rapidly. By the time a smallholder farmer was affected by all 21 items in the business environment, they had ceased supplying to supermarket. Supply to the other markets segments also dropped approximately to 10% for wholesale, 25% for consumer, and 63% for the retail.

The retail model was observed to be at odds to the other market segments because the probability of supply seemed to be marginally affected by the increasing levels of constraints and remained relatively constant with a non-significant association with the composite score ($p = 0.129$) (See Table 4.22) This can be explained by the results from the focus group, which showed that traders in the value chains were more flexible than other chain actors; hence, they were able to procure produce over a large distance. They also possessed knowledge of the high and low production peaks and of all year-round prices; hence, they earned higher incomes than other chain actors (Donor Committee for Enterprise Development, 2006; Alam et al., 2012). However, the retail model had a weak association with the policy predictor (rules and regulations; taxes and levies and land tenure). The policy predictor was also observed as the only predictor among the five predictors that had consistently shown a significant association with all the four market segments (See Tables 4.20 to 4.23). The analysis of governance issues in Section 4.3.4 supports these results: the analysis’s results suggested that one of the key challenges to revitalising the agricultural sector in Kenya is its unfavourable policy environment (Ministry of Agriculture 2009).

Further analyses using Chi-square tests to examine which of the 21 items in the business environment led to a decreased probability of supplying produce to the four market segments showed that the most important constraints that affected the farmers when marketing their produce were economic and social environment factors. Economic factors dominated and included; limited credit facilities, fluctuations in market prices, costs of joining the value chains, inputs costs, and market access. Social factors affecting the farmers comprised lack of relationships and coordination in the chains. Again, the focus group support this finding in that they also identified similar constraints during the value chain analysis exercise (See Section 4.3.3).

These findings on business environment’s effect on chain actors supplying local markets are supported by other studies that indicate that macroeconomic environment directly or indirectly affects whether farmers adopt improved technologies, which can assist them to access modern markets. For example, government policies that directly distort commodity
prices (which affects whether farmers adopt improved technologies) include subsidies on farm inputs and credit and price controls (Schiff & Valdes, 2002). Such policies decrease farmers’ rate of adopting technologies if they do not make profits since they cannot sell their produce at the market price that demand versus supply dictates or face unfair competition from farmers receiving subsidies and credit facilities. The policies that indirectly impact farmers’ adopting improved technologies include interest and exchange rates because changes in farm input prices from government policies are felt first by input providers, who then pass on the changes to producers and traders (Schiff & Valdes, 2002).

The multiple challenges associated with economic issues as revealed in these analyses can be attributed to the collapse of organisations that used to support farmers in Kenya with services after the economy was liberalised in the 1980s (Husi et al., 1993; Central Bureau of Statistics, 1998; Shiferaw et al., 2008; Vermuelen et al., 2008; Bernard & Spielman, 2009).

As for economic challenges, other studies have shown that, due to poor infrastructure in many developing countries, input suppliers charge higher prices to recover transportation costs and to compensate for the low volumes versus the high variability of input demand. Inputs such as fertiliser, seeds, and pesticides are also sometimes packaged in large sizes to lower distributors’ costs. However, when farmers are forced to purchase more inputs than they need, this creates risks and financial constraints because farmers often cite lack of capital as the main barrier to adopting improved technologies (Croppenstedt et al., 2003). Crops that rely on complex marketing chains are also affected by market inefficiencies associated with the input and output ends of value chains. When farmers are not assured about, for example, the long-term viability of an export value chain before they are encouraged to adopt the value chain, this may lower their adoption rate of improved technologies (Ashraf et al., 2009).

On social constraints, other studies show that if markets and intermediary traders are unreliable, crops that are sensitive to timing such as fresh vegetables and those that are required to meet quality standards are less likely to be taken up by modern markets because they deteriorate quickly. On the other hand, richer farmers are able to participate in modern markets and increase their income from 10% to 100%, suggesting that the gap between rich and poor will widen (The World Bank, 2008b).

Physical environmental and agro-ecological factors such as low soil fertility and extreme weather conditions are also likely to affect the poor smallholders who are most dependent on
natural resources such as land (Hassan et al., 2005). However, according to Paudel & Matsuoka (2008), socio-economic factors such as a lack of relationships and coordination along the value chains and limited financial capacity influence whether farmers can adopt improved technologies more than physical environmental and agro-ecological factors.

Improving services is critical to the agriculture sector’s growth. According to Dixon, et al. (2001), production intensity is closely correlated to poor farmers’ access to, and the availability of, agricultural support services rather than these farmers’ agricultural potential. This means that low-potential areas with well-developed services can generate high production rates, while high-potential areas with low levels of support services can have low production (Dixon et al., 2001).

However, despite the challenges facing value chain development, many developing countries’ agricultural markets are transforming with the rise of international supermarkets and the lowering of trade barriers for agricultural exports. In this regard, export companies contract farmers directly or through wholesalers, which help farmers to overcome marketing barriers by providing credit and other inputs. However, export companies prefer to deal with farmer organisations and cooperatives over individual farmers because such groups are able to meet the volume, cost, quality, and consistency that export companies require (Reardon & Timmer, 2007)

4.6 Implications
Overall, the findings suggest that the Kenyan Government and stakeholders in the agriculture sector have a gap on provision of infrastructure and services that they need to address.

4.7 Summary of value chain approach study
The picture that emerges from this study is that the value chain approach is not effective in linking smallholder farmers to modern markets because producers sell directly into markets without recourse to wholesalers or retail marketers and, thus, the value chains are very short, mainly because agricultural produce, especially the produce destined for modern markets, face restrictions due to poor packaging methods, transport damage, and infections due to a lack of quality control. Additionally, the marketing end of horticultural value chains in Kenya is still characterised by inadequate market and marketing infrastructure, which hinders farmers’ marketing efforts (Ministry of Agriculture, 2009).
Finally, education and the activities that farmers were involved in along the value chains were shown to be the key drivers that influenced their decisions to adapt to changes that could assist them in accessing modern markets. As such, socio-economic challenges to accessing this education contribute to the barriers smallholder farmers face when trying to access modern markets.
5.1 Introduction

The commercialisation approach study is the second of two studies undertaken in this multilevel research project to investigate the issues of how and why smallholder farmers in a developing country (Kenya) sell their produce to market, which market they sell it to, what affects their market accessibility, and the potential for smallholder farmers to explore new markets such as export markets. The sample size for the survey was 200 smallholder vegetable farmers.

The findings in Chapter 4 indicate that the value chain approach was not a successful strategy when dealing with smallholder farmers. This second study builds on the value chain approach study and investigates whether the more recent strategy to understand market dynamics—the commercialisation approach—is more applicable in the Kenyan subsistence smallholder farmer context. This required a research design which unpacked the two approaches, even though they are often employed in tandem, to assess their impact separately.

This study focused on investigating whether it was possible to identify the determinants associated with smallholder farmers exploring new markets by answering Research Question 3.

**Research Question (3)** What are the main factors that influence smallholder farmers’ potential to explore new markets?

**Proposition (3):** Socio-economic factors, institutional factors, transaction costs, collective action factors, and infrastructural factors influence the potential to explore new markets, and thus should be a focus for policy development.
5.2 The study
To address these research questions, a three-step study was developed (Figure 5.1) with a face-to-face survey.

Step (1): Two conceptual frameworks (smallholder market orientation (SMO) and smallholder market participation (SMP) were created by extrapolating information from existing studies. SMO’s and SMP’s determinants were then identified via inferential regression analysis.

Step (2): The determinants of smallholder farmers’ choice of markets outlets was analysed as a result of the value chain approach study’s findings, which indicated that farmers’ choice of markets was an important component of their ability to become more commercial in their outlook.

Step (3): A new framework describing the potential of smallholder farmers to explore new markets was developed. Determinants were identified using the regression analyses results from steps 1 and 2.

Figure 5.1 presents the three-step study.
5.2.1 Description and analysis of study’s component parts

Part 1: Conceptual frameworks for smallholder market orientation (SMO) and smallholder market participation (SMP)

Market orientation

In agricultural and development economics, market orientation is usually calculated based on the proportion of commodity sold to total amount produced in relation to the amount of land allocated to a particular crop to total land operated by a household (Gebremedhin & Jaleta, 2010). In this study, market orientation was not itself calculated. Instead, its determinants were identified by calculating three components that were incorporated into a framework as
proxy for smallholder market orientation (Figure 5.1). This is because the definition for Market Orientation in agriculture adopted in this study was; “the degree of allocation of resources (land, labour and capital) to the production of agricultural produce that are meant for exchange or sale (Hinderink and Sterkenburg, 1987; Immink and Aarcon, 1993). The results of these calculations were statistically correlated with nineteen explanatory variables derived from this study and other studies that recognised their importance in either increasing or decreasing smallholder farmers’ potential of exploring new markets (Moyo, 2010; Sigei, 2014; Gebremedhin & Jaleta, 2010).

The three components used in the conceptual framework for smallholder market orientation were:

(i) Land fragmentation (Blarel et al., 1992; Ziping et al., 2005).
(ii) Farm capitalisation (a household’s commitment to invest in farm equipment contrasted with the proportion of land allocated to each piece of equipment) (Alexandratos, 1995; Food and Agriculture Organization, 1996).
(iii) Attitude of farmers’ toward supplying markets.

A smallholder market orientation index (SMOI) was calculated to confirm the reality of the framework which was derived from data collected. SMOI was calculated by combining land fragmentation (SIi), farm capitalisation (FCi) and farmers’ attitude toward markets, (Ai). A high SMOI indicated that the smallholder farmer involved had a strong propensity for selling produce into markets and, conversely, a low SMOI indicated a low propensity for selling produce into markets.

(i) **Land Fragmentation (SIi)**

The degree of land fragmentation was calculated for the households in the sample using the Simpson index (SI) (Blarel et al., 1992; Ziping et al., 2005):

\[
SI_i = 1 - \sum_{j=1}^{c} t_{ij}^2 \\
\frac{1}{A_i^2} ; 0 \leq SI_i \leq 1
\]

(Equation 1),

Where \( t_{ij}^2 \) is area of the \( c^{th} \) plot and \( A_i^2 \) is the total area of major crops operated by a household.
A zero-value $SI_i$ indicates complete land consolidation (one parcel), while a value closer to one indicates numerous parcels of equal size. An index value close to zero shows that a household is more market oriented due to specialisation, and a value close to one indicates that a household is less market oriented because the land is highly fragmented with different crop enterprises being produced.

(ii) Farm Capitalisation ($FCI_i$)

According to Barret (2008) and Jayne et al. (2010), the majority of smallholder farmers fail to participate in markets as sellers because they have little or no marketable surpluses to sell. In the main, this is due to their inadequate use of improved farming technologies occasioned by lack of adequate investment, which results in low yields (Barret, 2008). In this case, owning equipment (or capitalisation) is considered to be an indication that the household has decided to participate in the markets (Doll & Widdows, 1981). However, according to Adelekan (2012), smallholder households face challenges with farm capitalisation such as low purchasing power, inadequate agricultural credit, inadequate skills to operate equipment, poor-quality equipment, and inadequate after-sale services support. Thus, as it is usually defined, farm capitalisation per se was regarded in this study as an inadequate influence on smallholder farmers’ decisions to produce marketable surplus to take to market because of the challenges associated with acquiring and using farm equipment. Both the value chain approach study’s findings and secondary data support this logic. Thus, there was a need to acquire other information to calculate farm capitalisation to ensure its adequacy as a variable. As such, logistics (the accessibility of cooled storage (cooled shed)) along with the standard equipment used for farm capitalisation calculations (Dolls & Widdows, 1981) were included. The equipment was allocated a monetary value based on the Kenya Shilling value in 2014 as a way of examining its level of contribution toward improved productivity. Therefore, farm capitalisation ($FCI_i$) was calculated as follows:

$$FCI_i = \frac{\sum_{k=1}^{K} V_{ik}}{A_i}$$

(Equation 2),

where $V_{ik}$ is the total value for all equipment $k$ owned by farmer $i$, and $A_i$ is the total land in acres owned by farmer $i$. 

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The $FCl_i$ represents the capital density, i.e. the amount of money invested per acre of land. It has a minimum value of zero and no theoretical maximum.

**(iii) Farmers’ attitude toward markets (MAi)**

A farmer’s attitude toward markets was estimated by examining the importance of farm equipment whether owned or not owned by farmers as a proxy for farmers’ attitude toward investment in various types of farm equipment and thus attitude toward supplying to markets. A farmer’s attitude $A_i$ was calculated as follows:

$$MA_i = \sum_{j=1}^{11} I_{ij} * V_j$$

where $I_{ij}$ is the importance placed on equipment $j$, $V_j$ is the average cost of equipment $j$, and $V_j/\sum V_j$ is a weighting term between 0 and 1, weighted by the value of the equipment.

The survey question contained 11 perceptions of farm equipment on a 5-point Likert scale that was used to calculate market perceptions for each farmer sampled. To use the 5-point scale, it was re-scaled to be from 0 to 1 so that 1 = positive attitude toward supplying into markets and 0 = negative attitude toward supplying into markets.

**Market Participation**

Market participation is commonly calculated as the proportion of a crop’s sale value compared to total value of producing it (von Baun et al., 1994; Gebremedhin & Jaleta, 2010). However, as it was not possible to obtain the total value of producing crops in the district of study because farmers did not keep records and the District Agriculture Office also had no relevant data. As with market orientation, market participation was not itself calculated. Instead, its determinants were identified by calculating three components that were incorporated into a conceptual framework as proxy for smallholder market participation (Figure 5.1). The results of these calculations were statistically correlated with the same nineteen explanatory variables used for market orientation.

The three components used in the conceptual framework for market participation were:
(1) Market access: transport costs incurred while taking produce to the market (market access), type of transport (e.g., public or own vehicle).

(2) Market charges incurred in the market place (e.g., entry, stall, and parking charges) that either enhanced or limited smallholder farmers’ market participation.

(3) Farmers’ attitude toward market access and charges.

As with smallholder market orientation, a smallholder market participation index (SMPI) was calculated to confirm the reality of the framework which was derived from data collected. SMPI was calculated by combining market access (MKAC), market charges (MKCHG), and farmers attitude toward market access and charges (MKACCHG). A high SMPI indicated that the smallholder farmer was more likely to participate in commercialised behaviours. (i)

**Market Access (MKAC)**

Transport costs Matungul, et al., (2001) incurred while taking produce to the market by each farmer $MKAC_i$ based on type of transport was calculated as follows:

$$MKAC_i = \left( \sum_{j=i}^{3} C_{ij} \right) \times NT_i$$

(Equation 4),

where $C_{ij}$ is the cost of transport based on the type (public, hired individually, and own vehicle) incurred by farmer and $NT_i$ is the total number of market trips per year.
(ii) Market Charges (*MKCHG*)

Market charges Acharya, (2004) incurred at the marketplace for a farmer to participate in it were calculated as follows:

\[
MKCHG_i = \left( \sum_{j \neq i}^4 C_{ij} \right) * NT_i
\]

(Equation 5),

where \( C_{ij} \) is the cost of market fees (entry, stalls, public toilets, and parking) incurred by farmer \( i \) and \( NT_i \) is the total number of market trips per year.

(iii) Farmers’ attitude toward importance of market access and charges (*MKACCHG*)

The calculations of farmers’/suppliers’ attitude Musser & Musser (1984) toward importance of market access and charges or service importance were calculated using data gathered on five levels of perceptions which was initially recorded on a 1 to 5 score. The service importance is the average of the 5 importance scores minus 1, so it goes from 0 to 4. It is then divided by 4, giving a 0 to 1 score where 0 is low importance and 1 is high.

A farmer’s attitude toward importance of market access and charges (*MKACCHGi*) was calculated as follows:

\[
MKCHG_i = \left( \sum_{j \neq i}^4 I_{ij} \right) / 4
\]

(Equation 6),

where \( I_{ij} \) is the average of the 5 importance scores minus 1, all divided by 4.
Part 2: Choice of marketing outlets

The household heads were presented with three choices of marketing outlets in the questionnaire: local/traditional, local/modern (supermarket), and regional/export. The results showed that household heads sold their vegetables in the first two markets (local/traditional and local/modern). None were sold in the regional/export market.

Hence, the dependent variable comprising the choice of marketing outlets used in the analysis to examine factors that determine whether a farmer would supply the supermarket or not was dichotomous in nature (0 = would not supply the supermarket, 1 = would supply the supermarket).

Part 3: Framework to identify the potential of smallholder farmers to explore new markets

Commercialisation in agriculture implies that farmers are producing a commodity for sale. This type of production system is different from a subsistence system because it focuses on specific produce to satisfy consumers’ different needs and interests and, thus, generate higher profits. The commercialisation process involves a gradual replacement of highly fragmented and diversified farming systems by specialised mono- or duo-culture enterprises (Pingali & Rosegrant, 1995). Commercialisation can occur in any scale of production (small, medium, or large) and types of crops (food or cash crops) as long as certain crops are produced for the market (Poulton et al., 2008).

A framework to identify smallholders’ potential to explore new markets was developed using the factors (determinants) that were statistically (either positively or negatively) significant in influencing the variables calculated in this study. The underpinning reasoning for the new framework was that studies on market orientation and participation (Gebremedhin & Jaleta, 2010; von Baun et al., 1994) indicate that the stronger the market orientation and market participation, the higher the likelihood that a household will be more open to exploring new markets. Also, adding the factors from choice of market outlets from part 2 in the value chain approach study (see Chapter 4) enabled a more robust and generalizable model/framework.

With the analyses, policy makers should enhance factors that positively influence market orientation and market participation, and factors that negatively influence market orientation and market participation are used to suggest strategies to minimise their influence so that
smallholder farmers can exploit the potential to explore new markets as a pathway toward commercialisation.

5.3 Data and data collection
The data collection method for this study included both face–to–face interviews and a new semi-structured questionnaire developed for the study (Fowler & Mangione, 1990; Krueger & Casey, 2000; Groves et al., 2004; Lavrakas, 2013; Rapley, 2007) (Appendix 3). Before the data collection process commenced, the questionnaire was pre–tested on a group of farmers to evaluate whether the questionnaire was appropriately and clearly designed and whether the questions were relevant. Any suggested modifications were then incorporated into the questionnaire. Three enumerators were recruited and trained on administering the questionnaire and the expected interviewing process. The recruited enumerators came from the study area and were familiar with the language and socio-cultural practices of the households; hence, they experienced fewer communication barriers.

The survey questions built on the learning from the value chain study (eg choice of market outlets) (Appendix 3) and were developed to provide data on several different variables to test Research Propositions 3 and 4. (ie socio-economic characteristics of household heads, access to market and transaction costs variables)

Primary data used in this study were based on data collected at household level. The data were collected by administering the semi–structured questionnaire to 200 kale and tomato farmers (a different sample to those smallholders involved in Study 1 because it was important for the purpose of comparison for the commercialisation approach to involve farmers growing a high-value crop such as tomatoes because they are produced mainly for sale in the market and would provide a better perspective of how smallholder farmers in Kenya’s Kiambu West District were gradually transforming from subsistence to commercial farming). Data on households’ socio-economic characteristics and other factors such as the households’ access to markets, their access to institutional services, their transaction costs, their collective action, and their marketing charges were collected (Wild & Diggines, 2010).

Secondary data was collected from sources in the form of reports, journals, books, online sources, and manuals that complemented the primary data collection to enhance the research findings’ credibility (Hewson, 2006; Smith, 2008; Menter et al., 2011).
5.4 Data analysis

Once the data collection process was completed, data from the field was cleaned, and coded to ensure that it was consistent and accurate. Data analysis was conducted using three different computer software analytic tools: Microsoft Excel and SAS to run frequencies and descriptive analysis and regression models, and “R” to generate the residual plots.

To address the Research Questions and Propositions 3 and 4, both descriptive and inferential statistical analyses were performed on the survey data.

5.4.1 Descriptive statistics

Descriptive statistics—which included measures of central tendency such as mean, median, and mode; measures of variability such as minimum and maximum values and standard deviations; and data’s distribution such as frequencies and percentages—were used to describe the smallholder vegetable farmers’ socio-economic characteristics. Other factors described were market access, institutional factors, transaction costs, and collective action. The data were then summarised using tables, graphs, and charts using MS Excel (Mann, 1995; Holcomb, 1998; Todd, 2007).

5.4.2 Inferential statistics

There are many techniques used in regression analysis, including simple linear regression and ordinary least squares regression, in which regression function is defined in terms of a finite number of unknown parameters that are estimated from the data. Multiple linear regression is an extended version of simple linear regression and is used when the value of a variable based on the value of two or more other variables is required, which was the case in this study (Allison, 2012; Cohen, 2003). Binary logistic regression was also used in this analysis when the dependent variable was dichotomous and the explanatory variables were either continuous or categorical variables (Hosmer & Lemeshow, 2000; 2013).

Inferential statistical analyses were conducted differently in the first study (Chapter 4) than in this one because, while the explanatory variables were either categorical or nominal in the first study, in this study, the explanatory variables were either continuous or dichotomous. Thus, in this study, the factors (variables) influencing the degree of land fragmentation, farm capitalisation, attitude toward the market, market access, market charges, and attitude toward market access and charges as dependent variables were examined using multiple regression because these variables were bound between 0 and 1 (Bickel & Doksum, 2007; Gujarati,
The factors influencing the presence of land fragmentation and choice of marketing outlets as dependent variables were examined using binary logistic regression due to the fact that the variables were dichotomous in nature (Allison, 2012).

Dependent variables for multiple regression analysis (Table 5.1) were chosen using existing empirical studies looking at similar issues, which were then identified in the conceptual frameworks described in Section 5.2 and illustrated in Figure 5.1 as a proxy for a smallholder market orientation (Kohli & Jawaorki 1990; Goetz, 1992; Gebremedhin & Jaleta 2010; Wickramasinghe & Weinberger 2013) and smallholder market participation (Moyo, 2010; Gebremedhin & Jaleta 2010; They were calculated from survey response data as outlined in Section 5.2. Expected sign signifies the expectation by the researcher that after inferential data analyses, a variable can have a positive or negative effect, or it can have a positive effect with one variable and a negative one with another.

The choice of data analysis techniques in this study was influenced by the need to examine market orientation and market participation in connection with commercialisation of smallholder farmers based on the context of agricultural development literature rather than that of manufacturing industries. In the context of this study, the concept of market orientation was measured as the ratio of resource allocation (e.g., land, labour, and capital) to the production of agricultural produce meant for sale (Hinderink & Sterkenburg, 1987; Immink & Alacorn, 1993). Market participation was investigated using factors such as; the costs of market participation (e.g. transportation and transactional), the rural institutions that govern the degree of specialisation (e.g. access to extension and credit services), and limited land ownership and the technology use (Wickramasinghe and Weinberger, 2013).

Table 5.1 Dependent variables used in multiple regressions

<table>
<thead>
<tr>
<th>Variable description</th>
<th>Measurement of the variables</th>
<th>Expected sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of land fragmentation</td>
<td>Area of plot allocated to each crop divided by total land</td>
<td>+</td>
</tr>
<tr>
<td>Farm capitalisation per acre</td>
<td>Investment in farm equipment/acre</td>
<td>+</td>
</tr>
<tr>
<td>Farmers’ attitude</td>
<td>Farmers’ attitude toward markets /farm capitalisation</td>
<td>+</td>
</tr>
<tr>
<td>Market access</td>
<td>Cost of transport based on type of transport</td>
<td>+</td>
</tr>
<tr>
<td>Market charges</td>
<td>Cost of different market charges</td>
<td>+</td>
</tr>
<tr>
<td>Farmers’ attitude</td>
<td>Farmers’ attitude toward market access and charges</td>
<td>+</td>
</tr>
</tbody>
</table>

“Note: all survey respondents (n=200)”.
Explanatory variables for multiple and binary regression (Table 5.2) were taken directly from the survey responses and were chosen based on previous empirical studies (Figure 5.1) of likely contributing factors to smallholder market orientation and smallholder market participation and on the suitability of the responses.

The dependent variable used in the logistic regression associated with “Presence or absence of land fragmentation” was the calculated index discussed in Section 5.6.1, and “Household choice of marketing outlets” was taken directly from the survey responses (local=1, supermarket=2 Table 5.3).
### Table 5.2 Explanatory variables used in multiple and logistic regression

<table>
<thead>
<tr>
<th>Variable description</th>
<th>Measurement of the variables</th>
<th>Expected sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age of household head above 15 years’ old (years)</td>
<td>Continuous</td>
<td>+/-</td>
</tr>
<tr>
<td>Gender of household head above 15 years’ old</td>
<td>Dummy (male=1, female=0)</td>
<td>+/-</td>
</tr>
<tr>
<td>Education of household head above 15 years’ old (years)</td>
<td>Continuous</td>
<td>+/-</td>
</tr>
<tr>
<td>Household size (no.)</td>
<td>Continuous</td>
<td>+/-</td>
</tr>
<tr>
<td>Persons involved in farming (no.)</td>
<td>Continuous</td>
<td>+/-</td>
</tr>
<tr>
<td>Farm size</td>
<td>Continuous</td>
<td>+</td>
</tr>
<tr>
<td>Livestock owned (no.)</td>
<td>Continuous</td>
<td>+</td>
</tr>
<tr>
<td>Average price for kale / bunch</td>
<td>Continuous</td>
<td>+</td>
</tr>
<tr>
<td>Average price for tomatoes / small crate</td>
<td>Continuous</td>
<td>+</td>
</tr>
<tr>
<td>Packaging</td>
<td>Dummy (yes=1, no=0)</td>
<td>+</td>
</tr>
<tr>
<td>Produce loss through transportation</td>
<td>Dummy significant=1, non-significant=0</td>
<td>+/-</td>
</tr>
<tr>
<td>Contractual agreement</td>
<td>Dummy (yes=1, no=0)</td>
<td>+</td>
</tr>
<tr>
<td>Membership in marketing group</td>
<td>Dummy (yes=1, no=0)</td>
<td>+</td>
</tr>
<tr>
<td>Distance to the nearest important market (km)</td>
<td>Continuous</td>
<td>+</td>
</tr>
<tr>
<td>Distance to the nearest all weather road (km)</td>
<td>Continuous</td>
<td>+/-</td>
</tr>
<tr>
<td>Ownership of vehicle</td>
<td>Dummy (yes=1, no=0)</td>
<td>+</td>
</tr>
<tr>
<td>Knowledge of the term demand</td>
<td>Dummy (yes = 1, no = 0)</td>
<td>+</td>
</tr>
<tr>
<td>Access to extension services</td>
<td>Dummy (yes = 1, no = 0)</td>
<td>+</td>
</tr>
<tr>
<td>Access to credit</td>
<td>Dummy (yes = 1, no = 0)</td>
<td>+</td>
</tr>
</tbody>
</table>

“Note: all survey respondents (n=200)”.

### Table 5.3 Dependent variables used in logistic regression

<table>
<thead>
<tr>
<th>Variable description</th>
<th>Measurement of the variables</th>
<th>Expected sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence or absence of land fragmentation</td>
<td>Present=1, absent=0</td>
<td>+</td>
</tr>
<tr>
<td>Household choice of market outlets</td>
<td>Local=1, supermarket=2</td>
<td>+</td>
</tr>
</tbody>
</table>

“Note: all survey respondents (n=200)”.

### 5.5 Analysis of Results

The first analysis investigated Proposition 3 and involved analysing the descriptive statistics related to socio-economic variables, land fragmentation, marketing, transaction costs, collective action, market access, transport type, market charges, and institutional characteristics. These variables were selected for descriptive analysis since some of them
were to be used in inferential analysis as explanatory variables. Therefore it was necessary to examine their suitability as explanatory variables (e.g. continuous or dummy) by first describing those using measures of central tendency and variability as well as data distribution such as frequencies and percentages. It also involved undertaking a multiple and binary regression analysis to estimate the dependent variables’ determinants.

5.5.1 Household heads’ socio-economic characteristics

The survey results (Table 5.4) show that the youngest farmer was 24 years’ old and the oldest was 78 years’ old, while the mean age for the sample households was 46.6 years (i.e., most of the sample were young to middle aged and could, therefore, be expected to still be receptive to change to some degree as opposed to an ageing farmer population). Additionally, the mean number of years each farmer had been schooled was 11, which indicates that the farmers were likely to be literate and could understand and interpret farming information.

The smallest household with one member was headed by a 24-year-old male who had a secondary level of education and owned 0.25 acres of land; the largest household had ten members headed by a 69-year-old female who had no formal education and owned 2.5 acres of land. If the number of household members is taken as proxy for farm labour, the district had adequate labour in relation to the land sizes, which were small (mean household members were 1.83 and mean land size was 1.23 acres). Households with large numbers of members relative to others also tended to have more persons involved in farming, but, due to the fact that land sizes in the district were relatively small, the majority of the household tended to have only one to two persons carrying out farming activities.

The smallest land size owned was 0.25 acres and the largest was 10 acres, while the mean was 1.23 acres.
Table 5.4 Descriptive statistics for variables used in regression analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>No.</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land fragmentation</td>
<td>200</td>
<td>0</td>
<td>0.83</td>
<td>0.37</td>
<td>0.32</td>
</tr>
<tr>
<td>Farm capitalisation per acre</td>
<td>200</td>
<td>16.9</td>
<td>197.4</td>
<td>54.6</td>
<td>42.5</td>
</tr>
<tr>
<td>Farmers’ attitude (markets)</td>
<td>200</td>
<td>0.45</td>
<td>1</td>
<td>0.92</td>
<td>0.1</td>
</tr>
<tr>
<td>Market access per year</td>
<td>200</td>
<td>4800</td>
<td>192000</td>
<td>33592.8</td>
<td>35064.2</td>
</tr>
<tr>
<td>Market Charges per year</td>
<td>200</td>
<td>2640</td>
<td>979200</td>
<td>18642</td>
<td>12134.8</td>
</tr>
<tr>
<td>Farmers’ attitude (market access &amp; charges)</td>
<td>200</td>
<td>0</td>
<td>1</td>
<td>0.85</td>
<td>0.1</td>
</tr>
<tr>
<td>Household choice of market outlets</td>
<td>200</td>
<td>0</td>
<td>1</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>Age of household head above 15 years’ old (years)</td>
<td>200</td>
<td>24</td>
<td>78</td>
<td>46.6</td>
<td>9.44</td>
</tr>
<tr>
<td>Gender of household head above 15 years’ old</td>
<td>200</td>
<td>0</td>
<td>1</td>
<td>0.52</td>
<td>0.5</td>
</tr>
<tr>
<td>Education of household head above 15 years’ old (years)</td>
<td>200</td>
<td>0</td>
<td>20</td>
<td>11</td>
<td>3.77</td>
</tr>
<tr>
<td>Household size (no.)</td>
<td>200</td>
<td>1</td>
<td>10</td>
<td>4.05</td>
<td>1.5</td>
</tr>
<tr>
<td>Persons involved in farming (no.)</td>
<td>200</td>
<td>1</td>
<td>4</td>
<td>1.83</td>
<td>0.65</td>
</tr>
<tr>
<td>Farm size</td>
<td>200</td>
<td>0.25</td>
<td>10</td>
<td>1.23</td>
<td>1.27</td>
</tr>
<tr>
<td>Livestock owned (no.)</td>
<td>200</td>
<td>0</td>
<td>608</td>
<td>18.04</td>
<td>68.23</td>
</tr>
<tr>
<td>Average price for kale / bunch</td>
<td>200</td>
<td>1000</td>
<td>25</td>
<td>20.9</td>
<td>2.02</td>
</tr>
<tr>
<td>Average price for tomatoes / small crate</td>
<td>200</td>
<td>1000</td>
<td>2000</td>
<td>1341.8</td>
<td>242.42</td>
</tr>
<tr>
<td>Packaging</td>
<td>200</td>
<td>0</td>
<td>1</td>
<td>0.51</td>
<td>0.5</td>
</tr>
<tr>
<td>Produce loss through transportation</td>
<td>200</td>
<td>0</td>
<td>1</td>
<td>0.91</td>
<td>0.29</td>
</tr>
<tr>
<td>Contractual agreement</td>
<td>200</td>
<td>0</td>
<td>1</td>
<td>0.25</td>
<td>0.43</td>
</tr>
<tr>
<td>Membership in marketing group</td>
<td>200</td>
<td>0</td>
<td>1</td>
<td>0.6</td>
<td>0.49</td>
</tr>
<tr>
<td>Distance to the nearest important market (km)</td>
<td>200</td>
<td>6</td>
<td>45</td>
<td>32</td>
<td>7.77</td>
</tr>
<tr>
<td>Distance to the nearest all weather road (km)</td>
<td>200</td>
<td>0.25</td>
<td>8</td>
<td>2.29</td>
<td>1.5</td>
</tr>
<tr>
<td>Ownership of vehicle</td>
<td>200</td>
<td>0</td>
<td>1</td>
<td>0.12</td>
<td>0.32</td>
</tr>
<tr>
<td>Knowledge of the term demand</td>
<td>200</td>
<td>0</td>
<td>1</td>
<td>0.78</td>
<td>0.42</td>
</tr>
<tr>
<td>Access to extension services</td>
<td>200</td>
<td>0</td>
<td>1</td>
<td>0.75</td>
<td>0.44</td>
</tr>
<tr>
<td>Access to credit</td>
<td>200</td>
<td>0</td>
<td>1</td>
<td>0.39</td>
<td>0.49</td>
</tr>
</tbody>
</table>

“Note: all survey respondents (n=200)”.

5.5.2 Crop Production

The crops grown in the district in order of importance based on the numbers of households involved in their cultivation were; kale, tomatoes, maize, cabbage, Irish potatoes, and beans. Kale and tomatoes were mainly grown for commercial purposes and had the highest number of households involved in their production, while maize and beans were grown as staple food crops. Table 5.5 presents the land allocated to each type of crop, which shows that maize was allocated larger portions of land relative to other crops because it basically needs more land for the enterprise to be economically viable compared to vegetables that can be grown intensively on smaller land sizes for commercial purposes.
Table 5.5 Land allocated to kale, tomatoes, maize, cabbage, Irish potatoes, and beans

<table>
<thead>
<tr>
<th>Type of crop</th>
<th>Number of farmers</th>
<th>Mean</th>
<th>Std</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kale</td>
<td>180</td>
<td>0.5</td>
<td>0.35</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>75</td>
<td>0.5</td>
<td>0.32</td>
</tr>
<tr>
<td>Maize</td>
<td>52</td>
<td>0.63</td>
<td>0.52</td>
</tr>
<tr>
<td>Cabbage</td>
<td>32</td>
<td>0.52</td>
<td>0.29</td>
</tr>
<tr>
<td>Irish potatoes</td>
<td>30</td>
<td>0.51</td>
<td>0.45</td>
</tr>
<tr>
<td>Beans</td>
<td>24</td>
<td>0.57</td>
<td>0.44</td>
</tr>
</tbody>
</table>

“Base: all survey respondents (n=200)”.

5.5.3 Marketing of Vegetables

The sampled households sold their vegetables in two major types of markets: local/traditional and local/modern. Kale was sold in bunches that weighed approximately 1kg and tomatoes were sold in small crates weighing approximately 13.5kg. The results in Table 5.6 show that the mean price for kale was KSh15.4 in the local/traditional markets and KSh20.9 in supermarkets. The mean price for tomatoes in the local/traditional market was KSh1, 341.8 and KSh1,875 in the supermarkets. Supermarkets placed many conditions on suppliers (e.g., constant volume, quality, appropriate packaging, and so on, and only the farmers who were able to meet these conditions received higher prices than those who sold to the traditional markets.

Table 5.6 Mean prices offered in in local/traditional and local/modern (supermarket) outlets for kale and tomatoes

<table>
<thead>
<tr>
<th>Type of vegetable</th>
<th>Unit of sale</th>
<th>Type of market outlet</th>
<th>Number of farmers</th>
<th>Mean price offered (KShs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Kale</td>
<td>Bunch (1Kg)</td>
<td>Local/traditional</td>
<td>171</td>
<td>15.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local/modern (supermarket)</td>
<td>11</td>
<td>20.9</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>Small crate (13.5Kg)</td>
<td>Local/traditional</td>
<td>61</td>
<td>1341.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local/modern (supermarket)</td>
<td>16</td>
<td>1875</td>
</tr>
</tbody>
</table>

“Note: all survey respondents (n=200)”.

The types of challenges household heads had to address while marketing vegetables were transport costs (95%), low produce prices (92%), post-harvest losses (70%), and poor market services (48.5%), but the farmers also added presence of middlemen (6.5%) as another challenge.
Possible strategies for addressing these challenges that were presented by household heads in the survey included joining marketing groups, improved roads (especially the feeder roads to assist in reducing post-harvest losses), contractual agreements, and improved market infrastructure. Figure 5.2 show the results.

![Figure 5.2 Strategies to improve vegetable marketing by percentages](image)

**Figure 5.2 Strategies to improve vegetable marketing**

Figure 5.2 shows that 95% of sampled household heads perceived that joining a marketing group was one strategy that could enhance vegetable marketing by reducing transaction costs, and, thus, improve vegetable prices. Following this, 87% perceived improved roads to be a good strategy, 50.5% for contractual agreements, and 47.5% for improvements in marketplace infrastructure.

### 5.5.4 Transaction Costs

Researchers have identified transaction costs as one major reason why smallholder farmers fail to participate in markets (Makhura et al., 2001; Wickramasinghe & Weinberger, 2013). Availability of market information, reductions in losses of fresh vegetables that occur while transporting produce to markets, and contractual agreements can drastically reduce transactions costs. The results in Figure 5.3 indicate that the sources of market information in order of importance were others farmers (84.5%), buyers (69.5%), extension staff (68.5%), the radio (32.5%), mobile phone (32%), newspapers (26.5%), television (22.5%), and middlemen (15%). The fact that fellow farmers were the most important source of information indicates the importance of linkages among the farmers in, for example, forming farmer groups. Middlemen were the least important source of information.
Further breakdown of this market information shows that 94.5% of market information that the household heads received was about prices of vegetables, 91.5% was about the quality of product demanded, 83.5% was on time of sale, 83% was on who the buyer was, and 40% was on quantity demanded. These results indicate that the majority of farmers were interested in searching for information on prices, rather than in the quantity that customers demanded.

Moreover, 91% of household heads perceived losses of fresh vegetables while being transported to the market as being significant. Additionally, 24.5% had signed contracts with their buyers (which shows a low rate of contractual agreement), although 50.5% perceived it to be an important strategy in improving vegetable marketing.

5.5.5 Collective Action

Collective action in this study was mainly represented by membership in marketing groups. Results indicate that 59.5% of sampled household heads were members of a marketing group. Table 5.7 shows that the length of time in years that the household heads were involved with marketing groups varied from two months to 12 years, with a mean of 1.5 years.

Table 5.7 Length of time in years in marketing groups by household members

<table>
<thead>
<tr>
<th>Time in years in marketing groups</th>
<th>Number of farmers</th>
<th>Length of time in marketing groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>119</td>
<td>Min 0.17 Max 12 Median 0.75 Mean 1.49 StDev 1.87</td>
</tr>
</tbody>
</table>

“Note: all survey respondents (n=200)”.
Household heads who were not members of any marketing group gave various reasons for why they had not joined a group. A small proportion (13.5%) indicated that one of the key reasons for not joining a group was a lack of groups in the locality where they lived.

Other reasons included being too busy to participate in group (12.5%), lacking the joining fees (9.5%), fear about mismanagement of members’ resources by the group leaders (3.5%), and uncertainty in groups arising from conflicts that have the potential to lead to the group’s disintegration (2.5%).

5.5.6 Market Access

The survey results indicate that the minimum distance to the nearest important market was 6km, the maximum was 45km, and the mean was 32km, which means that people were having to travel some distance to get to an important market as they defined it. However, the minimum distance to an all-weather road from the farm gate was 0.25km, the maximum was 8km, while the mean was 2.3km—in other words, all-weather roads were relatively prevalent in most areas. Both these results can be expected given that the district is situated close to important urban and peri-urban markets.

However, 43.5% of household heads cited road conditions as being poor, 39% thought that the roads were in average condition, and 17.5% described the roads condition as good. In real terms, the general conditions of trunk roads that connect major towns in the country have greatly improved in the recent years and the district roads were in relatively better condition than in other districts in the country (Ministry of State for Planning, 2009), although the conditions of feeder roads that connect households to the main roads did appear to need improvement.

In terms of vehicle ownership, only 11.5% of sampled households were found to own vehicles. Figure 4.5 presents the household heads’ preferred modes of transport when transporting vegetables to markets. We can see that, with 85.5%, transporting vegetables to the market using public transport, it was the most popular mode of transport. Motorcycles were preferred by 13% of household heads, mainly to transport vegetables along the feeder roads from the farm gate to the main road. Another 9.5% of household heads preferred to use their own vehicles, and 5% of household heads used transport means provided by buyers.
5.5.7 Costs of accessing markets

Table 5.8 shows the mean cost in Kenya Shillings incurred by household heads for a single visit to the market. We can see that the most expensive way to access market was by using a private vehicle (KSh1,613). Other average market charges were KSh178.5 for entering the market, KSh94 for the stall, KSh12.7 for using public toilets, and KSh284.6 for parking for household heads transporting vegetables using their own vehicles.

Table 5.8 Mean transport and market charges

<table>
<thead>
<tr>
<th>Type of transport and market charges</th>
<th>Number of farmers</th>
<th>Cost (KShs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Public transport</td>
<td>175</td>
<td>397.5</td>
</tr>
<tr>
<td>Hired transport (individual)</td>
<td>10</td>
<td>1290</td>
</tr>
<tr>
<td>Own transport</td>
<td>22</td>
<td>1613</td>
</tr>
<tr>
<td>Market entry charges</td>
<td>200</td>
<td>178.5</td>
</tr>
<tr>
<td>Charges for display stall</td>
<td>199</td>
<td>94</td>
</tr>
<tr>
<td>Charges for using public toilets</td>
<td>198</td>
<td>12.7</td>
</tr>
<tr>
<td>Parking fee per day</td>
<td>13</td>
<td>284.6</td>
</tr>
</tbody>
</table>

“Note: all survey respondents (n=200)”.

Figure 5.4 Household heads’ preferred modes of transport
5.5.8 Institutional services

Advisory services that Agricultural Extension staffs provide were an important avenue for linking household heads with new or improved farming technologies: 74.5% of sampled households indicated that they had access to agricultural extension services. The results in Figure 5.5 show that, out of the households accessing extension services, 51.5% responded that they were visited regularly, 22.5% responded that they were visited but that they were not sure how frequent the visits were, and 26% responded that they were never visited. Regular visits by extension staff are important to disseminate information on the latest farming technologies for improved vegetable production and marketing.

![Access to extension services](image)

**Figure 5.5 Access to extension services**

Results show that 39% of household heads indicated that they accessed various types of credit. Figure 5.6 presents the types of credit they accessed. Out of the household heads that were accessing credit, 31.5% accessed credit in the form of seeds, 22.5% in the form of fertiliser, 20% in the form of finances, and 7.5% in the form of farm equipment. Access to credit in the form of seeds and fertiliser was occasionally facilitated by the government in, for example, subsidising the price of seeds and fertiliser to assist farmers to recover from natural calamities such as droughts and floods. Credit in the form of finance and farm equipment was mainly facilitated by the private sector.
These descriptive statistics overviewed the survey data collected on socio-economic, institutional, transaction costs, collective action, and infrastructural factors that impacted on smallholder farmers in this region and, as such, provide the contextual situation for the inferential analyses that investigated the data to answer Research Propositions 3 and 4.

5.6 Inferential analyses, results, and discussion

Multiple regression was used to predict the factors influencing the degree of land fragmentation, farm capitalisation, market access, and market charges (i.e., the dependant variables identified above). Three out the four variables (i.e., farm capitalisation, market access, and market charges) contained skewed data and were transformed using the logarithmic (Log$_{10}$) method to reduce skewness and to improve the normality of errors (Emerson & Stoto, 1983; Howell, 2007; Tabachnick & Fidell, 2007).

The two variables representing farmers’ attitude toward markets and farmers’ attitude toward market access and charges were also skewed and were logit transformed to allow for a linear relationship between the explanatory variables and the coefficients (Emerson & Stoto, 1983; Howell, 2007; Tabachnick & Fidell, 2007). Multiple regression was then used as with the other four variables mentioned above.

To fit the multiple regression models, the model started by including all the 19 explanatory variables in Table 5.2. The first step in the analysis was to carry out a backward elimination process to remove the explanatory variables that were significant at probability level p > 0.05 (i.e., a strong presumption against the null hypothesis or, in other words, that they were not involved in predicting the dependant variable) (Howell, 2007; Tabachnick & Fidell, 2007). Next, a stepwise regression to fit the regression models for dependent variables using the

Figure 5.6 Type of farming credit that household heads accessed

![Type of farming credit](chart.png)
remaining explanatory variables was carried out to select the explanatory variables that were significant at probability level p<.05 and were involved in predicting the dependent variables.

Logistic regression was then used to estimate the factors influencing the presence of land fragmentation and choice of marketing outlets. The two variables were skewed and, hence, they were logit transformed similar to the two variables representing farmers’ attitude. To fit the logistic regression models, the process of stepwise forward selection with backward elimination using the Hosmer-Lemeshow goodness-of-fit test was used (Hosmer & Lemeshow, 2000). In this case, the model started with no explanatory variables, then the variables with the least probability value that were significant at probability level of p< 0.1 were added. Lastly, the variables that were significant at p > 0.05 were eliminated and the remaining variables were used to fit the model. The same 19 explanatory variables used in the multiple regression (Table 5.2) were also used in logistic regression.

5.6.1 Results for identifying smallholder market orientation’s determinants

Analysis included the presence and degree of land fragmentation, farm capitalisation, and attitude toward markets.

(1) Factors influencing the presence and degree of land fragmentation

When land fragmentation was computed as an index and multiple regression used to estimate the determinants of land fragmentation, the residual plots pointed to a failure of model assumptions that the data were normally distributed, with approximately 40% of households having no land fragmentation and the other 60% having various degrees of fragmentation.

Therefore, determinants of land fragmentation were examined using two dependent variables: (1) the presence of land fragmentation representing the 60/40% split of the sample into fragmented and non-fragmented land as a dichotomous dependent variable, and (2) the degree of land fragmentation (using the original land fragmentation index) representing the 60% of the sample with various degrees of land fragmentation as a normally distributed dependent variable.

A two-step process was used to examine factors that influenced land fragmentation. The first step modelled the presence or absence of fragmentation using logistic regression. The second step modelled the degree of fragmentation if present.
Presence or absence of land fragmentation: The fitted model showed a significant lack of fit as measured by the Hosmer-Lemeshow test, and further investigation showed a distinct threshold in land size, whereby less than one acre of land was rarely fragmented and above it was almost certain to be fragmented. The stepwise selection process was then repeated after adding a simple classification of land size (< 1 acre, ≥ 1 acre).

The results presented in Table 5.9 show that land size and selling a specialised crop such as tomatoes significantly and positively influenced the presence of land fragmentation,

Table 5.9 Factor influencing the presence of land fragmentation

<table>
<thead>
<tr>
<th>Explanatory variable (P)</th>
<th>Coefficient estimates CE</th>
<th>Standard error</th>
<th>Factor=($e^{\text{PCE}}$)</th>
<th>Wald Chi-Square</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-2.2038</td>
<td>0.3785</td>
<td></td>
<td>33.9079</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Land size ≥ 1 acre (yes/no)</td>
<td>4.3711</td>
<td>0.5192</td>
<td>79.128</td>
<td>70.8831</td>
<td>&lt;.0001**</td>
</tr>
<tr>
<td>Sell tomatoes (yes/no)</td>
<td>1.7616</td>
<td>0.5421</td>
<td>5.821</td>
<td>10.5603</td>
<td>0.0012**</td>
</tr>
</tbody>
</table>

R²=0.5321

“Note: all survey respondents (n=200)”.

The model had strong a R² of 53.2%, which suggests that it had strong predictive power.

If the land size was ≥ 1 acre, the odds of land being fragmented to any degree increased by a factor of 79.1. This can be explained by the fact that farmers with larger farms were able to fragment their land and hence have more fragments. The findings are consistent with Key et al. (2000), who found that land holding is directly associated to a farmer’s ability to produce marketable surplus because a farmer produces more output when the land is larger than when it is small (Montshwe, 2006).

If households sold tomatoes, the odds of land being fragmented increased by a factor of 5.8. If the land size was more than one acre and farmers sold tomatoes, the odds of land being fragmented increased by a factor of 460.6 relative to a small plot with no tomatoes. This can be explained by the fact that tomatoes are high-value vegetables and, if well managed, they fetch higher prices than other vegetables such as kale; hence, the farmers with larger farms fragmented their land in order to have a plot to produce more tomatoes. This finding is related to Alene et al.’s (2008) and Key et al.’s (2000) findings, who found that output price can be an incentive for farmers to supply more to the market.

The degree of fragmentation if present: the model used data from the 60% of households that had some degree of land fragmentation. Multiple regressions were estimated using the
variables selected after the backward elimination process. The residual plots were checked and found to be valid.

Table 5.10 shows the results of the two variables selected; land size was found to significantly and positively influence the degree of land fragmentation, while access to credit was found to significantly and negatively influence the degree of land fragmentation.

Table 5.10 Multiple regression estimates of determinants of degree of land fragmentation

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>Coefficient estimate</th>
<th>Standard error</th>
<th>t-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.55530</td>
<td>0.01675</td>
<td>33.15</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Land size (acres)</td>
<td>0.05106</td>
<td>0.00716</td>
<td>7.13</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Credit</td>
<td>-0.04937</td>
<td>0.01996</td>
<td>-2.47</td>
<td>0.0148</td>
</tr>
</tbody>
</table>

Number of observations=200

$R^2=0.308, R^2(adj)=0.296, f$-statistic=25.84, probability (f-statistic)=0.0001

*p-value = * significant at 5% level; ** significant at 1% level

*No transformation of coefficient estimate because the dependent variable was normally distributed and was not Log_{10} transformed.

“Note: all survey respondents (n=200)”.

The model on determinants of degree of land fragmentation had strong a $R^2$ of 30.8% and adjusted $R^2$ of 29.6 % implying strong predictive power.

An increase of land size by one acre increased the degree of land fragmentation by a factor of 0.05. Land size below one acre was rarely fragmented but, when it reached one acre and above, it was very likely to be fragmented. Smallholders indicated that larger land sizes could be more easily partitioned into plots that could be used to sustain economically viable enterprises compared to smaller pieces of land.

Farmers in possession of larger farms sizes are able to access credit facility as opposed to farmers with small farms. Hence the farmers having access to credit reduced land fragmentation by a factor of 0.05: in other words, farmers with access to credit were 0.05 times less likely to have to break up their land.

This result suggests that access to credit is critical in addressing the phenomenon of decreasing agricultural land sizes in Kenya due to land fragmentation, especially in high agricultural potential areas that are also densely populated. The fragmentation and change of land use from agricultural purposes to residential purposes due to farmers’ perceiving subsistence farming as unprofitable would not occur if farmers accessed credit to assist them produce marketable surplus of high-value crops such as vegetables in small parcels of land.
Other negative impacts of unprofitable subsistence farming such as rural-urban migration which leads to abandonment and renting out of fragmented land would also be minimised.

(2) Factors influencing farm capitalisation

Data on farm capitalisation per acre were skewed; hence, they were transformed using the logarithmic (Log 10) method to improve the normality of errors. The transformed data was then used for analysis. The residual plots were checked and found to be good. Figure 5.7 presents histograms for the skewed and transformed data.

![Histograms for Raw and Transformed Farm Capitalisation data](image)

**Figure 5.7** Histogram for farm capitalisation raw skewed data (left) and farm capitalisation Log10 transformed data (right)

Table 5.11 presents the results of multiple regressions to estimate the determinants of farm capitalisation per acre: age, price of tomatoes, contractual agreements, and membership in marketing groups significantly and positively influenced farm capitalisation. In contrast, household size and land size significantly and negatively influenced farm capitalisation.
### Table 5.11 Multiple regression estimates of determinants of farm capitalisation

<table>
<thead>
<tr>
<th>Explanatory variable (P)</th>
<th>Coefficient estimate (CE)</th>
<th>Standard error</th>
<th>Factor=$\left(\log_{10}\frac{PCE}{P}\right)$</th>
<th>t-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.6662</td>
<td>0.1495</td>
<td>-</td>
<td>31.22</td>
<td>0.001</td>
</tr>
<tr>
<td>Age</td>
<td>0.010396</td>
<td>0.003247</td>
<td>1.02</td>
<td>3.20</td>
<td>0.002</td>
</tr>
<tr>
<td>Household size</td>
<td>-0.06509</td>
<td>0.02078</td>
<td>0.86</td>
<td>-3.13</td>
<td>0.002</td>
</tr>
<tr>
<td>Land size (acre)</td>
<td>-0.25492</td>
<td>0.02384</td>
<td>0.556</td>
<td>-10.69</td>
<td>0.001</td>
</tr>
<tr>
<td>Tomatoes’ price (KSh X 1000s)</td>
<td>0.10216</td>
<td>0.04211</td>
<td>1.27</td>
<td>2.43</td>
<td>0.016</td>
</tr>
<tr>
<td>Contracts</td>
<td>0.16041</td>
<td>0.07368</td>
<td>1.45</td>
<td>2.18</td>
<td>0.031</td>
</tr>
<tr>
<td>Marketing group</td>
<td>0.16041</td>
<td>0.05845</td>
<td>1.45</td>
<td>2.74</td>
<td>0.007</td>
</tr>
</tbody>
</table>

Number of observations=200

$R^2=0.476$, $R^2(adj)=0.46$, t-statistic=29.28, probability (t-statistic)=0.000

p-value = * significant at 5% level; ** significant at 1% level

“Note: all survey respondents (n=200)”.

The model had strong a $R^2$ of 47.6% and adjusted $R^2$ of 46% suggesting strong predictive power.

The age of a household head significantly and positively influenced farm capitalisation, with an increase in age by one year showing an increase in farm capitalisation by a factor of 1.02. This finding is likely explained by the fact that older farmers usually have accumulated farm investments over the years, whereas their younger counterparts have not. This finding is similar to other studies that suggest that older farmers may take farm capitalisation decisions more easily than their younger counterparts because older farmers might have accumulated capital. They may also have long-term relationships with their clients or preferential access to credit due to their age, availability of larger land sizes and larger family sizes that can provide cheap labour (Sall et al., 2000; Adegbola & Gardebroek, 2007).

An increase in household size by one member decreased farm capitalisation by a factor of 0.86. This finding is explainable by the fact that, apart from consuming more output, maintaining a large household requires larger amounts of financial resources, which diminishes the amount that can be re-invested as farm equipment. This finding is similar to Alene et al.’s (2008) and Astewel’s (2010) findings: they state that a negative sign on household implies that a larger household is likely to consume more output, which leaves smaller proportions for sale.

Land size owned by a household significantly and negatively influenced farm capitalisation. An increase by one acre of land decreased farm capitalisation by a factor of 0.56. This finding can be explained by the fact that larger per capita land size will result in low farm capitalisation density since the equipment will be spread out over large farm sizes.
Farmers who get a high price for tomatoes have a higher likelihood to invest in farm equipment by a factor of 1.3. This finding can be explained by the fact that output price seems to be an incentive for farmers to supply more produce to the market, and when farmers receive high prices for their produce, they are able to generate adequate financial resources, which they can invest in farm equipment (Alene et al., 2008; Key et al., 2000).

Farmers who are more capitalized have a higher likelihood to be selected into contracts by a factor of 1.5 than less capitalized farmers. Contractual agreements lower transaction costs by reducing the time used to search for markets and negotiation and, thus, the farmers would view it positively. This finding is supported by Jari and Fraser (2009), who showed that there is an increase in formal market participation with contractual agreements. The finding suggests that a smallholder farmer’s capacity to invest in farm equipment is enhanced by improved earnings from the markets via having ready markets for their produce and decreased transaction costs.

Joining a marketing group increased farm capitalisation by a factor of 1.5. This finding can be explained by the fact that joining a marketing group has benefits such as shared information among members and the ability to market produce as a group when an individual cannot provide the quantity of produce demanded in the markets. This latter benefit enhances the sale of fresh produce, which generates financial resources that can be re-invested in farm equipment. These findings are supported by a study by Olwande & Mathenge (2012), who found that being a member of a marketing group increases a household’s access to information, which is important for production and marketing decisions. It also empowers farmers to bargain for better trading terms (Kirsten & Vink, 2005).
(3) Factors influencing farmers’ attitude toward markets

Data on the farmers’ attitude toward markets was skewed; hence, they were logit transformed to improve the normality of errors. The transformed data was then used for analysis. Figure 5.8 presents histograms for the skewed and transformed data.

Histograms of Raw and Transformed “Attitude towards markets” data

![Histograms of skewed and logit transformed data](image)

Figure 5.8 Histogram of skewed data on attitude toward markets (left) and logit transformed data (right)

Table 5.12 presents the results of the multiple regression to estimate attitude toward markets’ determinants. The table reveals that two variables (tomatoes’ price and distance to the nearest important market) significantly and positively influenced farmers’ attitude toward markets.

Table 5.12 Determinants of attitude toward the importance of markets

<table>
<thead>
<tr>
<th>Explanatory variable (P)</th>
<th>Coefficient estimate (CE)</th>
<th>Standard error</th>
<th>Factor=$e^{pCE}$</th>
<th>t-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>1.23182</td>
<td>0.41560</td>
<td>-</td>
<td>2.96</td>
<td>0.0034</td>
</tr>
<tr>
<td>Tomatoes’ price (KShX1000s)</td>
<td>0.28989</td>
<td>0.13049</td>
<td>1.34</td>
<td>2.22</td>
<td>0.0274</td>
</tr>
<tr>
<td>Distance to market (Km)</td>
<td>0.03888</td>
<td>0.01216</td>
<td>1.04</td>
<td>3.20</td>
<td>0.0016</td>
</tr>
</tbody>
</table>

Number of observations=200
$R^2$=0.063, $R^2$(adj)=0.054, f-statistic=6.67, probability (f-statistic)=0.0016

p-value = * significant at 5% level; ** significant at 1% level

“Note: all survey respondents (n=200)”.

The model on determinants of importance of markets had a poor $R^2$ of 6.3% and adjusted $R^2$ of 5.4% indicating a weak predictive power.
Tomatoes’ price significantly and positively influenced farmers’ attitude toward markets. An increase in tomatoes’ price by KSh1000 increased the odds of farmers having a positive attitude by a factor of 1.3. Similar to findings in Table 5.11, this finding can be explained by the fact that, when farmers receive high prices for their produce, they are incentivised to supply more produce to markets (Alene et al., 2008; Key et al., 2000) and they are able to generate adequate financial resources to invest in farm equipment.

Distance to the nearest important market significantly and positively influenced farmers’ attitude toward markets, and an increase of distance to the market by 1 kilometre increased the odds of a farmer developing a positive attitude by a factor of 1.04. This finding can be explained by the fact that the further away a market from a household, the higher the feeling of commitment the household head had to experience to participate in it. This is because Market access has been measured through transport costs.

5.6.2 Results for identifying smallholder market participation’s determinants

Analysis included factors effecting market access, market charges and farmers’ attitude toward market access and charges.

(1) Factors influencing market access

Data on market access data were skewed; hence, they were transformed using the logarithmic (Log 10) method to improve the normality of errors. As with the other data sets with skewed raw data, the transformed data showed an appropriate distribution and could be used effectively for analysis (Figure 5.9).

![Histograms of Raw and Transformed data for Market Access](image)

**Figure 5.9** Histogram of skewed data on market access (left) and Log10 transformed data (right)
Table 5.13 show the results of multiple regressions to determine factors influencing market access. An examination of the residual plots indicated a good fit. Five variables (i.e., years of schooling, land size, distance to the nearest important market, distance to the nearest all-weather road, and vehicle ownership) significantly and positively influenced market access, while owning livestock and losing produce during transportation to markets significantly and negatively influenced market access.

Table 5.13 Multiple regression estimates of determinants of market access

<table>
<thead>
<tr>
<th>Explanatory variable (P)</th>
<th>Coefficient estimate (CE)</th>
<th>Standard error</th>
<th>Factor = (Log (_{10} ) PCE)</th>
<th>t-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.1860</td>
<td>0.09501</td>
<td>-</td>
<td>44.2</td>
<td>0.001</td>
</tr>
<tr>
<td>Years of schooling</td>
<td>0.007621</td>
<td>0.003777</td>
<td>1.02</td>
<td>2.02</td>
<td>0.045</td>
</tr>
<tr>
<td>Land size (acres)</td>
<td>0.04092</td>
<td>0.01290</td>
<td>1.1</td>
<td>3.17</td>
<td>0.002</td>
</tr>
<tr>
<td>Livestock ownership</td>
<td>-0.10182</td>
<td>0.03098</td>
<td>0.79</td>
<td>-3.29</td>
<td>0.001</td>
</tr>
<tr>
<td>Produce loss</td>
<td>-0.19339</td>
<td>0.04991</td>
<td>0.64</td>
<td>-3.87</td>
<td>0.001</td>
</tr>
<tr>
<td>Distance to market (km)</td>
<td>0.005685</td>
<td>0.002239</td>
<td>1.01</td>
<td>2.54</td>
<td>0.012</td>
</tr>
<tr>
<td>Distance to all-weather road (km)</td>
<td>0.03589</td>
<td>0.01073</td>
<td>1.09</td>
<td>3.35</td>
<td>0.001</td>
</tr>
<tr>
<td>Vehicle ownership</td>
<td>0.61111</td>
<td>0.4664</td>
<td>4.08</td>
<td>13.10</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Number of observations=200
R\(^2\)=0.545, R\(^2\)(adj)=0.528, f-statistic=32.82, probability (f-statistic)=0.000

*p-value = * significant at 5% level; ** significant at 1% level

“Note: all survey respondents (n=200)”.

The model had a strong R\(^2\) of 54.5% and adjusted R\(^2\) of 52.8% which suggests that it had strong predictive power.

Household heads’ schooling significantly and positively affected farmers’ commitment to participate in markets. An increase in schooling years by one year increased the commitment to participate in markets by a factor of 1.02. This finding can be explained by the fact that farmers with some form of formal education can better understand the technical aspects of the information they receive from various sources; hence, they are able to make informed decisions faster than farmers with no formal education. This finding is supported by Alene et al., (2008), who show that education has a positive effect on market participation because it enhances one’s skills and ability to use market information, which may, in turn, reduce marketing costs and make it more profitable to participate in the market.
The land size a household owned significantly and positively influenced farmers’ commitment to participate in markets. An increase in land size by one acre increased farmers’ commitment to participate in markets by a factor of 1.1. This can be explained from the point of view that farmers with larger farm sizes have the capacity and the flexibility of choice to produce a variety of crops and achieve the quantities the market demands; hence, they are stimulated to participate in the markets more often than farmers with smaller land sizes. This finding is supported by Heltberg & Tarp (2002), who show that market participation is significantly affected by farm size per household, which positively influences the volumes sold when it’s larger.

Ownership of livestock significantly and negatively influenced farmers’ commitment to participate in markets. The presence of livestock decreased farmers’ commitment to participate in markets by a factor of 0.79. This finding can be explained by the fact that, apart from providing alternative sources of income (which decreases farmers’ interest in participating in markets), owning livestock such as dairy cattle and poultry in Kiambu West District is time and capital intensive, which leaves farmers with less time to produce crops and visit markets to sell crops.

Losing produce during transportation to markets significantly and negatively influenced farmers’ commitment to participate in markets. When produce loss was significant, it reduced farmers’ commitment to participate in markets by a factor of 0.64. Produce loss increases transaction costs, which reduces farmers’ profits and their capacity to sell in the markets more frequently.

Distance to the nearest important market significantly and positively influenced farmers’ commitment to participate in it. An increase by one kilometre increased farmers’ commitment to participate in markets by a factor of 1.01. This finding at first seems at odds with common sense, but it is explainable by the fact that household heads living further from the markets needed to develop more commitment to participate in them. Furthermore, the condition of the roads was described as being good or fair by approximately 56.5% of the household heads, which indicates that many farmers in the study district could access markets easily.

Distance to all-weather roads significantly and positively influenced farmers’ commitment to participate in markets: an increase by one kilometre increased farmers’ commitment to participate in markets by a factor of 1.1. This finding can be explained in the same way as
distance to markets; that is, when the distances covered to reach all-weather roads are relatively short (Table 5.4) and the costs of accessing markets are subsequently less, farmers can more easily participate in them. Other studies support this finding: they indicate that poor infrastructure has a negative influence on market participation since the majority of smallholder farmers in developing countries are located in remote areas with poor infrastructure and, hence, fail to participate in the market due to the high transaction costs involved (Goetz, 1992; Key et al., 2000; Makhura et al., 2001; Omamo, 2007).

Owning a vehicle significantly and positively influenced farmers’ commitment to participate in markets by a factor of 4.1. This finding is explainable from the point of view that a farmer owning a vehicle reduces the time it takes them to transport fresh vegetables to the markets, which reduce the produce they lose caused by deterioration in the absence of cooled transport (as was the case in Kiambu West District) and the loss caused by mechanical damage when vegetables are transported using public transport. This, in turn, increases the farmer’s profit and, hence, incentivises them to participate in the markets. The findings are supported by studies conducted by Key et al. (2000) and Jagwe (2010), who found that owning transport equipment has a positive impact on market participation by reducing the cost of transporting output from farms to markets.

(2) Factors influencing market charges

As with other data collected and discussed, the raw data were skewed but were transformed logarithmically to improve the normality of errors. Table 5.14 present the results of the regression model to estimate factors that influence market charges. Residual plot examination indicated a good fit.

Land size, owning livestock, distance to all-weather roads, and owning a vehicle were the four variables that significantly and positively influenced farmers’ commitment to participate in markets. Also, the variable on the number of persons involved in farm labour significantly and negatively influenced farmers’ commitment to participate in markets.
### Table 5.14 Multiple regression estimates of determinants of market charges

<table>
<thead>
<tr>
<th>Explanatory variable</th>
<th>Coefficient estimate (CE)</th>
<th>Standard error</th>
<th>Factor $=\log_{10}(PCE)$</th>
<th>$t$-statistic</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>4.22186</td>
<td>0.05075</td>
<td>-</td>
<td>83.19</td>
<td>0.001</td>
</tr>
<tr>
<td>Labour (no.)</td>
<td>-0.07523</td>
<td>0.02334</td>
<td>0.84</td>
<td>-3.22</td>
<td>0.001</td>
</tr>
<tr>
<td>Land size (acre)</td>
<td>0.02499</td>
<td>0.01166</td>
<td>1.06</td>
<td>2.14</td>
<td>0.033</td>
</tr>
<tr>
<td>Livestock ownership</td>
<td>0.07174</td>
<td>0.02908</td>
<td>11.18</td>
<td>-2.47</td>
<td>0.015</td>
</tr>
<tr>
<td>Distance to all-weather road (km)</td>
<td>0.040322</td>
<td>0.009161</td>
<td>1.1</td>
<td>4.40</td>
<td>0.001</td>
</tr>
<tr>
<td>Vehicle ownership</td>
<td>0.41437</td>
<td>0.04287</td>
<td>2.6</td>
<td>9.67</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Number of observations=200  
$R^2=0.386$, $R^2(\text{adj})=0.370$, $f$-statistic=24.41, probability ($f$-statistic)=0.000  
$p$-value =* significant at 5% level; ** significant at 1% level

"Note: all survey respondents (n=200)".

The model on determinants of market charges had a strong $R^2$ of 38.6% and adjusted $R^2$ of 37% showing that it had strong predictive power.

The number of people involved in farming labour significantly and negatively affected farmers’ commitment to participate in markets. Increases of labour by one person reduced farmers’ commitment to participate in markets by a factor of 0.84. This finding can be explained by the fact that the more labour required, the greater the pressure on farmers’ financial resources, which would reduce profit and make it difficult to raise enough resources for other expenses. This is because land size and hence surplus is already controlled for, therefore more labour means more labour per unit of land (production) to feed.

Land size significantly and positively influenced farmers’ commitment to participate in markets. An increase of land size by one acre increased farmers’ commitment to participate in markets by a factor of 1.1. This finding is explainable when considering that farmers with larger farm sizes are more likely to produce higher volumes of commodity to sell to the market, which increases their profits and the ability to raise market charges.

Owning livestock significantly and positively influenced farmers’ commitment to participate in markets by a factor of 11.2. This finding is not surprising because selling livestock and livestock products such as milk and eggs provides extra financial resources to a household, which makes it possible for farmers to meet other financial obligations. Livestock and livestock products in Kenya’s Kiambu West District experience high demand due the proximity of nearby urban markets in the capital city Nairobi and peri-urban markets around Nairobi.
Similar to market access (Table 5.13), distance to all-weather roads and vehicle ownership also significantly and positively influenced farmers’ commitment to participate in markets by a factor of 1.1 and 2.6, respectively (see Figure 5.14).

(3) Factors influencing farmers’ attitude toward market access and charges

As with other data collected and discussed, the raw data on farmers’ attitude toward market access and charges was skewed and were logit transformed to improve the normality of errors. Table 5.15 shows the results of the regression model to estimate the factors that influenced farmers’ attitude toward market access and. Residual plot examination indicated a good fit.

The results showed that farmers’ attitude toward market access and charges was significantly and negatively influenced by distance to all-weather roads.

Table 5.15 Determinants of attitude toward market access and charges

<table>
<thead>
<tr>
<th>Explanatory variable (P)</th>
<th>Coefficient estimate</th>
<th>Standard error</th>
<th>Factor=(e^{\beta_SE})</th>
<th>t-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.58189</td>
<td>0.19992</td>
<td>-</td>
<td>12.91</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Distance to all-weather roads</td>
<td>-0.17498</td>
<td>0.07302</td>
<td>0.84</td>
<td>-2.40</td>
<td>0.0175*</td>
</tr>
</tbody>
</table>

Number of observations=200
R²=0.028, R²(adj)=0.023, f-statistic=5.74, probability (f-statistic)=0.0175

*p-value = * significant at 5% level; ** significant at 1% level

“Note: all survey respondents (n=200)”.

The attitude toward market access data were logit transformed with a poor R² of 2.3%, which suggests that it had little predictive power.

Farmers’ attitude toward market access and charges was significantly and negatively influenced by distance to all-weather roads. An increase of distance by one kilometre decreased the odds of farmers having a positive attitude by a factor of 0.84. This finding is explainable from the fact that distances farmers travelled to participate in markets and the condition of the roads influences transport costs. Most of the feeder roads connecting farms to all weather roads in Kiambu West District were observed to be earth roads. Therefore, although the distances required to connect to all-weather roads were not long (see Table 5.4), the roads’ condition was more likely to increase transport costs and discourage farmers from participating in markets, especially during the rainy season.

This argument is supported by the results that 43.5% of household heads perceived the road condition in the district as poor. Moreover, several studies have found that the distances from
farm to markets to be the key constraint to market participation (Goetz, 1992; Montshwe, 2006; Omiti et al., 2009)

**Factors influencing choice of marketing outlets (traditional or supermarkets)**

As Section 5.2 indicates, this analysis was conducted with data collected at household level and the stepwise forward selection process with backward elimination using the Hosmer-Lemeshow goodness-of-fit test to evaluate the final model. From the initial 19 explanatory variables (Table 5.4), four variables were selected (contractual agreements, tomatoes’ price, number of persons involved in farm labour, and owning a vehicle to estimate the determinants of farmers’ choice of marketing outlets.

The dependent variable was whether farmers will supply a certain proportion of their vegetables to the supermarkets. This dependent variable that measured farmers’ willingness to supply vegetables to markets was discrete; hence, ordinary least squares regression could be used to fit a linear probability. However, linear probability is generally heteroskedastic and may predict probability values beyond the 0 and 1 range. Therefore, in this instance, the logistic regression model was used to estimate the factors that influenced farmers to supply vegetables to supermarkets (Stynes & George, 1984; Greene, 1997).

Table 5.16 presents the logistic regression results. The dependent variable is whether farmers will supply a certain proportion of their vegetables to the supermarkets and the model includes four different explanatory variables. The results show that farmers’ likelihood to supply to a supermarket was significantly and positively influenced by tomatoes’ price, contractual agreements, and owning a motor vehicle, and that it was significantly and negatively influenced by the number of people involved in farming.
**Table 5.16 Factors influencing supply to the supermarket**

<table>
<thead>
<tr>
<th>Explanatory variable (P)</th>
<th>Coefficient estimates (CE)</th>
<th>Standard error</th>
<th>Factor=($e^{\text{CE}}$)</th>
<th>Wald Chi-Square</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-3.04</td>
<td>1.1782</td>
<td>-</td>
<td>6.65</td>
<td>0.0099</td>
</tr>
<tr>
<td>Contracts</td>
<td>3.59</td>
<td>0.6682</td>
<td>36.2</td>
<td>16.48</td>
<td>&lt;.0001**</td>
</tr>
<tr>
<td>Tomatoes’ price</td>
<td>0.00178</td>
<td>0.000529</td>
<td>5.9</td>
<td>11.36</td>
<td>0.0008**</td>
</tr>
<tr>
<td>Labour</td>
<td>-1.82</td>
<td>0.8832</td>
<td>0.16</td>
<td>7.40</td>
<td>0.0065**</td>
</tr>
<tr>
<td>Vehicle ownership</td>
<td>1.92</td>
<td>0.9116</td>
<td>6.8</td>
<td>4.44</td>
<td>0.0351*</td>
</tr>
</tbody>
</table>

R$^2$=0.301

*Note: all survey respondents (n=200)*.

The model on factors influencing supply to the supermarkets had a strong R$^2$ of 30.1%, suggesting that it had strong predictive power.

Farmers selected by supermarkets and offered contracts were attracted to supply the supermarkets with vegetables. Farmers who had signed contracts with buyers increased their odds of supplying the supermarkets by a factor of 36.2. This finding is explainable when one considers that contractual agreements minimise the likelihood of buyers dishonouring agreements, which motivates farmers to supply their produce to them.

Tomatoe price significantly and positively influenced farmers’ choice of marketing outlets. An increase in price by 1000 KShs per crate increased farmers’ odds of supplying the supermarkets by a factor of 5.9. This finding can be explained by the fact that farmers are likely to choose and supply the market that gives higher prices. The findings are supported by those of Zuniga-Aria & Ruben (2007), who stated that farmers’ choice of marketing outlets is influenced by the price they receive from selling their produce. The number of people involved in farming labour significantly and negatively influenced farmers’ choice of marketing outlets. An increase of labour by one person decreased the odds that farmers would supply the supermarkets by a factor of 0.16. This is explainable by the fact that increasing costs of labour will result in a reduction of financial resources necessary to produce commodity that meets the standards required by the supermarkets.

Owning a vehicle significantly and positively influenced farmers’ choice of market outlets. Owning a vehicle increased farmers’ odds of supplying the supermarkets by a factor of 6.8. This finding is explainable by considering that, when farmers transport fresh produce to markets using their own vehicles, they maintain their produce’s quality by arranging it in
such a manner that reduces transport damage. The time savings farmers experience also assists them to preserve their produce’s quality.

As such, in summary, these analyses indicated that Proposition 3 was supported that the degree of positive or negative impact can be quantified. The analyses also indicated that Proposition 4 was supported.
5.6.3 A framework on smallholder farmers’ potential to explore new markets

To answer RQS 3 and 4, a framework (Figure 5.10) that incorporated the results of the inferential analyses and represents smallholder farmers’ potential to explore new markets was developed by using the explanatory variables that were found to be significant in the inferential data analysis (see Sections 5.6.1 to 5.6.3).

The explanatory variables that significantly and positively related to the dependent variables were construed to be increasing the potential to explore new markets, while those found to be significantly and negatively related to the dependent variables were presumed to decrease the potential to explore new markets. Some variables had both a positive and negative influence (e.g., land size, owning livestock, and distance to all-weather roads); that is, they both increased and decreased farmers’ potential to explore new markets at the same time based on the dependent variables that were being estimated. Policy issues that need to be addressed are those variables that negatively impacted farmers’ potential to explore new markets.

Figure 5.10 shows the factors that increase and decrease smallholder farmers’ potential to explore new markets, and illustrates how these factors are linked to each other and the three components of the study (market orientation, market participation, and choice of market outlets) in identifying smallholder farmers’ potential to explore new markets. This study showed those factors that decreased smallholder farmers’ potential for exploring new markets on the left-hand side of the diagram. The factors that increased their potential to explore new markets are shown on the right-hand side of the diagram.
**Figure 5.10** Factors influencing smallholder farmers’ potential to explore new markets

Table 5.17 classifies the factors in Figure 5.10 in terms of their importance in contributing to either the increase or decrease in smallholder farmers’ potential to explore new markets. This classification was created from the derived factor values identified in the regression results (Tables 5.9 to 5.16) with categories identified as having (low \(0 \geq 1\)), medium \((1 \geq 10)\) and high \((>10)\) importance.
### Table 5.17 Framework for identifying the potential to explore new markets by smallholder farmers

<table>
<thead>
<tr>
<th>Determinants</th>
<th>Increase potential (ranking importance in brackets)</th>
<th>Decrease potential (ranking importance in brackets)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+++ = high, ++ = medium, + = low</td>
<td>+++ = high, ++ = medium, + = low</td>
</tr>
<tr>
<td><strong>Smallholder market orientation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Presence of land fragmentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Increasing land size (acres) (+++)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Degree of land fragmentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Land size (+)</td>
<td>Credit (+)</td>
</tr>
<tr>
<td>3. Farm capitalisation (farm equipment)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Age (+)</td>
<td>Household size (+)</td>
</tr>
<tr>
<td></td>
<td>Tomatoes’ price (+++)</td>
<td>Land size (acres) (+)</td>
</tr>
<tr>
<td></td>
<td>Contracts (++)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Marketing group (++)</td>
<td></td>
</tr>
<tr>
<td>4. Attitude toward markets (farm equipment)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tomatoes’ price (++)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distance to market (km) (+)</td>
<td></td>
</tr>
<tr>
<td><strong>Smallholder market participation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Market access</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Years of schooling (+)</td>
<td>Livestock ownership (+)</td>
</tr>
<tr>
<td></td>
<td>Land size (acres) (++)</td>
<td>Produce loss (+)</td>
</tr>
<tr>
<td></td>
<td>Distance to market (km) (+)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distance to all-weather road (km) (++)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicle ownership++</td>
<td></td>
</tr>
<tr>
<td>2. Market charges</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Land size (acres) (++)</td>
<td>Labour (no. of persons) (+)</td>
</tr>
<tr>
<td></td>
<td>Livestock ownership (+++)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distance to all-weather road (km) (++)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicle ownership (++)</td>
<td></td>
</tr>
<tr>
<td>3. Attitude toward market access &amp; charges</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Choice of marketing outlets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicle ownership (++)</td>
<td>Labour (no. of persons) (+)</td>
</tr>
<tr>
<td></td>
<td>Tomatoes’ price (++)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contracts (+++)</td>
<td></td>
</tr>
</tbody>
</table>

*Note: all survey respondents (n=200)*

**Summary**

In summary, this chapter answers Research Questions 3 and 4: that is, it identified the determinants that affected smallholder farmers’ potential to explore new markets (RQ3) and shows that it is possible to create a framework that can help identify key issues that need to be addressed at the policy level (RQ4).
Chapter 6. Summary and conclusions

6.1 Introduction
The research problem that this research addressed was complex: it involved issues of poverty and dependence by smallholder farmers in Kenya, and the Kenyan Government’s aspiration to develop a more market-driven commercially based agricultural economy that focuses on those smallholder farmers. Unfortunately, the interaction of these issues at the smallholder farmer level has not created the forward momentum that the government had hoped for in terms of sustainable development despite trying several different strategies. This research investigated two of these strategies that are being used in Kenya to determine why smallholder farmers were not progressing with agricultural development.

6.2 Research summary
The research examined how smallholder farmers in Kenya’s Kiambu West District sold their horticultural produce to markets, to which markets they sold to, and what affected their market accessibility. Smallholder farmers’ key determinants in exhibiting the potential for exploring new and sophisticated markets for their produce was also investigated, and a new framework for investigating smallholder farmers’ potential to supply new markets was developed.

The overarching research contribution of the dissertation is; “whether it’s possible to develop a framework that reflects the dynamics of commercialization taking place in a region by providing key elements driving the potential of smallholder vegetable farmers in Kenya’s Kiambu West District to explore new markets”.

To address this contribution the following research questions were developed to drive the study:
RQ (1). How is the value chain approach among smallholder farmers in the two Kenyan value chains (kale and coriander) examined in this study perceived by farmers?

RQ (2). What are the components in the business environment that affect farmers and undermine their access to markets?

RQ (3). What are the main factors determining the potential to explore new markets in SME farmers?
The research was conducted using a multilevel approach with two distinct but linked studies. The first study—a value chain approach study—investigated the linkage of SME farmers producing vegetables to different markets. This study was based on the theory that rural development can best be achieved in the context of market-based rewards, which can only occur if supply is linked to the demands of consumers through markets (Porter, 1985; DFID, 2008; Webber & Labaste, 2009). This study addressed Research Questions 1 and 2.

The second study—a commercialisation approach study—examined what the key determinants were for smallholder farmers to explore new and sophisticated markets for their produce. This study used modified market orientation and market participation frameworks that originally came from Kohli and Jawaorski (1990), Goetz (1992), Gebremedhin and Jaleta (2010), and Moyo (2010), Wickramasinghe and Weinberger (2013) to better target smallholder farmers as a specific cohort. This study addressed Research Questions 3.

6.2.1 Value chain approach study findings

Horticulture value chains in this part of Kenya tended to be short and relatively unsophisticated. Moreover, many farmers also “packed” their produce and “distributed” it themselves with whatever means was at their disposal (hessian bags for packaging and cooling fresh produce and bicycles or motorbikes for transport). As such, there was no real “value chain” and certainly little value addition taking place. Additionally, it was found that a lack of infrastructure (e.g., farm sheds, refrigeration, and transport and market infrastructure) contributed to farmers’ reluctance to develop further than their own limited means allowed.

As for RQ1, farmers indicated that the value chain approach that the Kenyan Government’s NALEP Programme was promoting was not that effective in linking farmers to markets. The results found farmers’ education and the stage of value chain they were involved in were the key determinants of their attitude toward the value chain approach’s effectiveness.

It was found that, as farmers’ education level increased, so did their perceived effectiveness of the value chain approach, which suggested that farmers with more education were more open to process change and new ideas and were more confident about implementing them. Other studies support these results: they show that education increases a farmer’s capacity to receive, decode, and understand information, which allows them to make informed decisions about whether they need to adapt to change to increase their production levels.
As for RQ2, results on farmers’ access to markets showed that the supermarket was the most sensitive market segment to the constraints in the farmers’ business environment compared to the other market segments (i.e., the wholesale, retail, and final consumer segments). Interestingly, the results also showed that chain actors who were marketers of any sort scored much lower than chain actors who were not involved in marketing on the attitude toward the effectiveness of the value chain approach. The key findings that emerged were that the most important constraints affecting the chain actors when marketing their produce were economic and social environment factors. Economic environment factors dominated and were represented by limited credit facilities, fluctuations in market prices, costs of joining the value chains, inputs costs, and market access costs. Social environment factors affecting the farmers were represented by lack of relationships and coordination in the chains. Thus, chain actors who were already marketers had managed to overcome these challenges by themselves and did not see a more holistic value chain approach as being useful to them. Non-marketeers, on the other hand, were more constrained by the socio-economic challenges they faced and, thus, perceived that an integrated and collaborative value chain approach was more useful in terms of enabling their endeavours.

Overall, these findings in general indicated (as supported by studies elsewhere (OECD, 2009)) that the value chain approach has not effectively addressed the marketing challenges facing farmers and, thus, was not facilitating their access to modern markets (MOA, 2009).

6.2.2 Commercialisation approach study’s findings

Commercialisation can occur in any production scale (small, medium, or large) and types of crops (food or cash crops) as long as certain crops are produced for the market (Poulton et al., 2008); that is, commercialisation is market orientated/driven. As such, the idea of creating a framework of key determinants of a smallholder’s potential to explore new markets was useful as a way of reflecting on the dynamics of commercialisation taking place in a region.

The framework to identify smallholder farmers’ potential to explore new markets as a pathway toward commercialisation was developed using the factors or determinants that were found to be statistically significant, either positively or negatively, in influencing the dependent variables being used as a proxy for market orientation and market participation. The underpinning reasoning for using these proxies was that studies on market orientation and participation indicate that the stronger the market orientation and market participation, the greater the likelihood that a household will be more open to exploring new markets. This
was reflected in the calculations of smallholder market orientation and participation indices (SMOI and SMPI, respectively) shown in Table 5.19 and Figure 5.11.

The addition of factors from choice of market outlets contributed from the value chain approach study described in Chapter 4 enabled a more robust and generalizable model/framework.

As for RQ3, Figure 5.10 and Table 5.17 present the study’s key findings. We can see from Table 5.17 which determinants positively and negatively affected farmers’ potential to explore new markets. For example, factors that were found to be positive drivers in exploration of new markets were land size, tomato sale/crop specialisation, age, tomatoes’ price, contracts, marketing groups, distance to markets, education, distance to all-weather roads, vehicle ownership, and livestock ownership. Negative drivers in exploration of new markets were household size, land size, livestock ownership, produces loss, distance to all-weather roads, and farm labour.

Some variables had both a positive and negative influence on farmers’ potential to explore new markets at the same time based on the dependent variables that were being estimated.

We can also see from Table 5.17 which of the determinants had the greatest positive or negative impact. For example, larger farm sizes of more than 1 acre, owning/keeping livestock, and contractual agreements had the greatest positive impact, while a larger household size, produce loss during transit to markets, more people providing farm labour, and distance to all-weather roads (which were mainly earth roads) had the greatest negative impact.

**Implications for policy development and practice**

To transform smallholder farmers from subsistence to commercial farming in Kenya, the government needs to formulate new policies or streamline the existing ones to support the agricultural sector and the actors involved.

This study’s results showed that it was indeed possible to create an evidence-based framework to identify smallholder farmers’ potential to explore new markets as a pathway toward commercialisation. Moreover, the results showed that the greater the market orientation/market participation, the higher the probability of a smallholder farmer to explore a new market.
As for RQ3, the results showed that Policy makers should focus on implementing policies that tackle the weaknesses and constraints first, and then foster the strengths and opportunities that positively influence market orientation.

**In order to tackle weaknesses and constraints and also foster strengths and opportunities, potential policy developments include:**

(1) Policy measures to reduce the intensity of land fragmentation especially in high agricultural potential areas such as Kiambu West District should be put in place. This includes measures that support producers to farm sustainably and profitably to prevent further change of land use from agricultural to residential or commercial purposes.

(2) Policy strategies to improve physical infrastructure especially the ‘feeder’ roads connecting farms and villages to all-weather roads should be put in place to reduce transportation costs to the markets as well as post-harvest losses and hence encourage farmers to participate in markets particularly during the rainy season.

(3) Policy measures to promote agricultural and agribusiness education perhaps both from a formal qualification perspective and informal knowledge transfer through improved extension services within the Ministry of Agriculture and private sector extension providers should be formulated.

(4) Policy strategies that support investments in programmes that reduce poverty in rural areas by creating off-farm employment opportunities so that household members who cannot be absorbed in agricultural labour can find off-farm employment should be implemented. This will greatly reduce pressure on limited household financial resources derived from farming activities which is exerted by increasing household sizes and labour.

(5) Policy developments that will facilitate smallholder farmers to access credit to purchase farm equipment in order to increase production of marketable surpluses should be put in place.

(6) Policy strategies that facilitate contractual agreements between producers and buyers are critical in ensuring ready market for farmers’ produce and reduced effects of market price fluctuations.
Sustained economic growth of the country through implementation of sound policies will reduce the dependence on external development partners. As discussed in Chapter 1, dependence on foreign aid is an important issue in developing countries that must be addressed to ensure long term sustainability. While the role of development partners and the amount of development expenditure in the agriculture sector has increased over time, the external support remains unstable due to donors’ changes of policies and priorities which do not help long term strategic development.

Ideas for policy development that have come out of this project could facilitate the transformation from subsistence-commercialised agriculture by enhancing the existing policies and as such could also reduce the dependence on foreign aid as is required for the country to be self-sustainable in the long term.
6.3 Contribution to knowledge associated with commercialisation of smallholder farmers

In recent years, researchers have paid much closer attention at the horticultural industry in developing countries such as Kenya, particularly in its transformation from subsistence to commercial agriculture and its potential to contribute to household income and export earnings. The literature contains numerous studies on market participation on selected crops and livestock enterprises in Kenya (Olwade & Mathenge, 2012; Mathenge et al., 2010; Omiti et al., 2009; Renkow et al., 2004; Kennedy & Cogill, 1987; Bellemare & Barrett, 2006), but modest research has been conducted to attain a comprehensive analysis of factors influencing smallholder farmers’ potential to explore new markets as a pathway toward their commercialisation (especially with kale and tomato crops, which have high popularity among urban and peri-urban Kenyans). One explanation factor for the lack of comparative analyses is the limited range of available data (Segre, 1999).

However, this study contributes to the knowledge about transforming subsistence farming to commercialised farming by developing a framework that comprises the key factors that either increase or decrease smallholder farmers’ potential to explore new markets in Kenya’s Kiambu West District. Other researchers could also test this framework in other regions of Kenya and other developing countries where subsistence farming is practised.

6.4 Implication for future research

This study examined whether it is possible to develop a framework that reflects the dynamics of commercialisation taking place in Kenya’s Kiambu West District by providing the key drivers of smallholder vegetable farmers’ potential to explore new markets.

Note, however, that this study’s findings are based on a short time span of data (data used in this research were collected over a period of two lots of three months). This timeframe was not really sufficient to observe changes in the rural society over an extended period of time. Therefore, a longitudinal study (in which data is gathered for the same subjects repeatedly over years or even decades) to examine changes in farmers over time is suggested. This is important when studying development issues that have a long lifecycle (Hynes 2008).

However, to understand how well the framework developed in this study performed, it is necessary to further test it statistically in future research in a regression model. The technique suggested in Chapter 5 (Table 5.18) is useful in testing for moderation and mediation.
between the Independent Variables (IVs) (which comprised both qualitative and quantitative IVS) and Dependent Variables (DVs) in the framework. This will assist in examining the strength of the relationship between any two variables consisting of an IV and a DV, as well as explain the relationship between any two variables consisting of an IV and a DV. Examples of possible qualitative and quantitative Moderators, Mediators, Independent and Dependent variables derived from the framework in Figure 5.10, which can be used to test the framework are presented in Table 5.18.

### 6.5 Conclusions

As identified above, this research addresses the problem of moving subsistence-based smallholder vegetable farmers toward a more market-driven commercialised agricultural approach that could move them out of long-term poverty and dependency on government (and often foreign government) aid. The study’s results contribute to the commercialisation literature by developing a framework comprising the key factors that either increase or decrease smallholder farmers’ potential to explore new markets in Kenya’s Kiambu West District, which can also be tested in other regions of developing countries where subsistence farming is practised.

In Kenya, the value chain and commercialisation approaches have created a change in the way extension services to smallholder farmers are provided and the attitude toward farming in the entire agriculture sector. Although other measures are being implemented to reduce poverty and food insecurity among smallholder farmers, the value chain and commercialisation approaches have provided another dimension of thinking by farmers, private and public stakeholders in the agriculture sector, which focus on commercialising smallholder farming systems. One key strategy the Kenyan Government has taken to reduce poverty and ensure equitable distribution of national resources to all regions of the country is its implementation of a new constitution in 2011 that established 47 counties across Kenya, which has stimulated agricultural and other development projects in rural areas. The country’s new way of thinking with the value chain and commercialisation approaches also emphasises farming as a business and not simply for subsistence.
References


Donor Committee for Enterprise Development. (2006). *Value chains, linking producers to the markets*.


Appendix 1

2011 Questionnaire for focus group participants in the value chain analysis exercise

Step 1: Prioritising value chains for analysis

Procedure for prioritising value chains

(1) Determine criteria and build understanding of priorities (e.g., potential of value chain to improve smallholder farmers’ livelihoods and market demand potential).

(2) Determine the weighting of criteria with:

   (a) A simple numeric (e.g., 1, 2, 3, 4, 5), where a criterion’s importance is directly proportional to the numeric value attached to it.

   (b) A proportional method, where all the criteria have a combined weight of 100% and the relative importance of each is determined by the proportion of the total weighting that is assigned to it.

(3) Identify a list of potential products in the study site.

(4) Rank products to prioritise two value chains most appropriate for study.

Questions guiding the discussion on prioritisation of value chains

(1) What are the key criteria on which to base the selection of values chains to be analysed?

(2) Which value chains are most important to analyse? (List about 5)

(3) Which of the value chains have the highest potential to improve the livelihoods of the poor (e.g., low entry barriers in terms of knowledge and finances)?

(4) Which value chains have the highest market potential (e.g., strong domestic and / or international demand and involve a large number of people)?

Step 2. Questions guiding discussion on mapping the key issues in selected value chains

(a) Mapping core processes, actors and activities undertaken by chain actors from the core processes
(i) What are the core processes in the value chain from inputs to raw material through to final consumption of the end product?
(ii) Who are the key actors in these processes based on their activities along the chains?
(iii) What specific activities are undertaken by these actors from the core processes?

(b) Mapping margin distribution along the value chains

(i) What are the units of sales volumes and selling prices (e.g., bags, bunches)?
(ii) What are the variable costs incurred by each actor in the chains?
(iii) What are the revenues earned by each actor along the chains?
(iv) What is the net profit for each actor along the chain?
(v) Are the margins shared equitably between the actors in the chains?

(c) Mapping constraints affecting the chain actors

(i) What are the key constraints that exist at various levels in the value chains?
(ii) Which of the constraints can be solved by the smallholder farmers on their own as individuals or through collective action?
(iii) Which constraints are beyond the smallholder’s capacity and therefore require external assistance from the government and other development agencies?

(d) Mapping the role of governance in the value chain, represented by both formal and informal rules and regulations that affect the chain actors

(i) What system of coordination exists in the value chains to meet business objectives related to quality, quantity and consistency leading to compliance with food quality standards?
(ii) Which are the lead firms or lead actors in these value chains?
(iii) Is coordination generally based on formal arrangements (e.g., contracts), or is coordination informal?
(iv) What are the rules and regulations, both official and unofficial, that actors involved in the value chains must comply with in order to participate in the value chains?
(v) Where do these rules and regulations originate from, and how are they enforced?

Thank you for your time and for the information you have provided.
Appendix 2

2011

CONFIDENTIAL

Survey questionnaire for agrifood value chain participants

Section A: Biographic characteristics of the study sample

Please provide information on the following questions.

AQ1. Respondent’s gender (observe and tick)
   a) Male (1)   b) Female (2)

AQ2. In which of the following age groups do you fit?
   a) (1) 16 - 25 years   d) (4)<65 years
   b) (2) 26 - 45 years
   c) (3)46 - 65 years

AQ3. What is your highest academic achievement?
   a) No formal education (1)  b) Post - secondary education (4)
   b) Primary school (2)
   c) Secondary school (3)

AQ4. For how long have you been participating in a value chain?
   a) >2 years (1)  d) 7 - 10 years (4)
   b) 2 - 5 years (2)
   c) 7 years (3)

AQ5. At what stage of the value chain do you participate as an actor?
   a) Input provider (1)  e) Retail marketer (5)
   b) Producer (2)  f) Consumer (6)
   c) Intermediary Trader (3)
   d) Wholesale marketer (4)

AQ6. What activities are you involved in at the stage of VC where you operate?
   a) Input provision (1)  d) Retail marketing (5)
   b) Production (2)  e) Purchasing (6)
   c) Intermediary trade (3)
AQ7. Has your participation in the value chain resulted in better financial conditions for you and your family?

   a) Yes (1)  b) No (2)

AQ8. If yes, in what ways has your socio-economic status improved?

   a) Increased income from my business (1)  c) Improved farming technology (3)
   b) Increased knowledge and skills (2)

AQ9. What other issues may have contributed to socio-economic growth in this area other than participation in a VC?

   a) Interventions by programs (1)  d) Foreign investment (e.g., exporters) (4)
   b) Private sector interventions (2)
   c) Non-governmental organisations (NGOs) (3)

AQ10. What is your opinion of the following statement: “A ‘value chain approach’ in SME farming has resulted in socio-economic growth and reduction of dependency syndrome among the SME farmers in this area”.

Strongly disagree (1)  strongly agree (10)
Section B: The following questions are expected to answer the research question; how effective is the value chain approach as promoted by NALEP in addressing key VC issues?

BQ1. How effective do you think the VCA framework used by NALEP is in promoting the following issues in the Value Chain that you are participating in?

<table>
<thead>
<tr>
<th>Key VC components promoted by NALEP</th>
<th>Not effective (0)</th>
<th>Slightly ineffective (1)</th>
<th>Effective (2)</th>
<th>Slightly effective (3)</th>
<th>Extremely effective (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Governance (e.g., contracts) (BQ1a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Building relationships, linkages and trust (BQ1b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Increasing profits while decreasing costs of production (BQ1c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Equitable income distribution along the chain (BQ1d)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>e. Equitable employment distribution along the chain. (BQ1e)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

BQ2. How effective do you think the VCA framework used by NALEP is in promoting opportunities for upgrading the Value Chains?

<table>
<thead>
<tr>
<th>Chain upgrading opportunities</th>
<th>Not effective (0)</th>
<th>Slightly ineffective (1)</th>
<th>Effective (2)</th>
<th>Slightly effective (3)</th>
<th>Extremely effective (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Knowledge (facts) (BQ2a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Skills (competence) (BQ2b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Technology (BQ2c)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Support services (BQ2d)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BQ3. What is your opinion of the following statement: “The value chain approach as promoted by NALEP has been effective in addressing key issues in VC participation”.

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BQ4. What are the other agencies that are involved in the promotion of the VCA as collaborators or stakeholders together with NALEP?

| a) Other government departments (1) | d) Foreign agencies (4) |
| b) Private organisations (2)       |                          |
| c) NGOs (3)                        |                          |
Section C: The following questions are expected to answer the research question: “What are the capabilities within commodity chains that are necessary to launch smallholder farmers into modern markets?”

CQ1. Who is involved in capacity/capability development in the value chain in which you are participating?

- a) Government extension services (1)
- b) Private organisations (2)
- c) NGOs (3)
- d) Foreign agencies (4)

CQ2. What is the source of the farm inputs that you use?

- a) Own stock (1)
- b) Agrovet shops (2)
- c) Market (3)
- d) Other (0)

CQ3. During the production process, which of the following practice(s) is/are important to you? (Answer yes or no for each (Y or N)).

- a) Planting clean / certified planting materials or improved livestock breeds (1)
- b) Correct spacing and seed rate or correct livestock stocking rate in a specified area (2)
- c) Timely planting (3)
- d) Manure and fertiliser application (4)
- e) Pest control (eg: weeds, insects, diseases) (5)
- f) Proper harvesting procedures (6)
- g) Proper post-harvest handling (7)
- h) Other (0)

CQ4. How do you market your products?

- a) In bulk (1)
- b) Pieces (2)
- c) Other (0)

CQ5. How do you package your produce for sale?

- a) Gunny bags (sisal) (1)
- b) Gunny bags (synthetic) (2)
- c) No packaging (3)
- d) Other (0)
CQ6. Where do you store your produce before sale?

| a) Enclosed places/containers (1)        | c) Cooled storage facilities (3) |
| b) Open places/containers (2)            |                                 |

CQ7. How do you transport your produce to the market?

| a) Covered trucks and pickups (1)        | c) Cooled transport facilities (3) |
| b) Open trucks and pick-ups (2)           |                                 |

CQ8. What distance is your produce transported before reaching the selling point?

| a) Less than 5 Km (1)                   | d) 20 - 30 Km (4)                |
| b) 5 - 10 Km (2)                        | e) 30 - 50 Km or more (5)        |
| c) 10 - 20 Km (3)                       |                                 |

CQ9. Which segment of the market/consumers frequently demands your produce? (Answer yes or no for each (Y or N)).

| a) Supermarkets (1)                     | d) Final consumers (4)           |
| b) Wholesale market (2)                 | e) Export market (5)             |
| c) Retail market (3)                    |                                 |

CQ10. How frequently do you sell your produce?

| a) Once per week (1)                    | c) ≤ Once per month (3)          |
| b) Once per fortnight (2)               |                                 |

CQ11. What is your opinion of the following statement? “Participating in a value chain has reduced my dependence on handouts and subsidies from government and other sources”.

Strongly disagree (1) strongly agree (10)
Section D: The following questions are expected to analyse the question of whether the environment under which SME farmers operate (policy, social, economic, and physical environment) enhances or hinders their value chain participation and access to markets.

DQ1. Are there issues in the surrounding environment that affect your business?

a) Yes (1)  

b) No (2)

DQ2. What are some of the policy decisions that affect your business as an SME farmer?

<table>
<thead>
<tr>
<th></th>
<th>Does not affect (1)</th>
<th>Rarely affect (2)</th>
<th>Grossly affect (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Government rules and regulations (DQ2a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>Government taxes and levies (DQ2b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>Land tenure system (DQ2c)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DQ3. What are some of the social issues that affect your business as an SME farmer?

<table>
<thead>
<tr>
<th></th>
<th>Does not affect (1)</th>
<th>Rarely affect (2)</th>
<th>Grossly affect (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Lack of established relationships and linkages in the VC (DQ3a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>Lack of trust among VC actors (DQ3b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>Low educational levels (DQ3c)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>Limited health facilities (DQ3d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>Limited business knowledge (DQ3e)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td>Inadequate electrical power supply (DQ3f)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g.</td>
<td>Inadequate water supply (DQ3g)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DQ4. What are some of the economic issues that affect your business as an SME farmer?

<table>
<thead>
<tr>
<th></th>
<th>Does not affect (1)</th>
<th>Rarely affect (2)</th>
<th>Grossly affect (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Availability of quality inputs (DQ4a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>Cost of labour (DQ4b)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td>Limited credit facilities (DQ4c)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td>Cost of inputs (DQ4d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e.</td>
<td>Costs of joining a Value Chain (DQ4e)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f.</td>
<td>Fluctuations in market prices (DQ4f)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g.</td>
<td>Access to markets (DQ4g)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h.</td>
<td>Knowledge of market demand (DQ4h)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i.</td>
<td>Roads conditions (DQ4i)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DQ5. What are some of the physical environmental issues that affect your business as an SME farmer?

<table>
<thead>
<tr>
<th></th>
<th>Does not affect (1)</th>
<th>Rarely affect (2)</th>
<th>Grossly affect (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Soil condition (DQ5a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td>Small land size (DQ5b)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thank you for availing your time and for the information you have provided.
Appendix 3

Survey questionnaire

Questionnaire number…………………………………
Location  ............................................................
Sub - Location……………………………………………
Name of enumerator……………………………………..
Name of farmer…………………………………………

A. Household demographic Characteristics

A1. Age of the household head in years?..............

A2. Gender / sex of household head? Male =1, Female = 0..............

A3. What is the educational status of household head? Tick as appropriate

<table>
<thead>
<tr>
<th>No formal education</th>
<th>Primary level</th>
<th>Secondary level</th>
<th>Tertiary level</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
</tbody>
</table>

A.4. How many years of schooling? .................years

A.5. What is the total number of permanent household members? ..............

A.6. What is the number of persons involved in farming labour?......................

B. Wealth ranking factors

B.1. Farm size owned (ha/ acres).................

B.2. Do you own any farm equipment? Yes=1; no=0
B.3. If yes, what types of equipment do you own and what is the estimated value? (Tick as appropriate)

<table>
<thead>
<tr>
<th>Type of equipment (system)</th>
<th>Tick as appropriate</th>
<th>Approximate value (KSh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)Simple farming implements (e.g. hoe, wheelbarrow, machete etc)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)Water tank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3)Borehole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4)Furrow (cost of digging the furrow)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5)Bucket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6)Hosepipe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7)Drip</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8)Sprinkler</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green house</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(9)Farmer constructed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(10)Company constructed (e.g., Amiran)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
B.4. What is the proportion of land cultivated using to each farming equipment/system?

<table>
<thead>
<tr>
<th>Type of equipment (system)</th>
<th>Area cultivated using each equipment/system (acres or hectares)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Simple farming implements (e.g., hoe, wheelbarrow, machete, etc.)</td>
<td></td>
</tr>
<tr>
<td>Irrigation system</td>
<td>(2) Water tank</td>
</tr>
<tr>
<td></td>
<td>(3) Borehole</td>
</tr>
<tr>
<td></td>
<td>(4) Furrow</td>
</tr>
<tr>
<td></td>
<td>(5) Bucket</td>
</tr>
<tr>
<td></td>
<td>(6) Hosepipe</td>
</tr>
<tr>
<td></td>
<td>(7) Drip</td>
</tr>
<tr>
<td></td>
<td>(8) Sprinkler</td>
</tr>
<tr>
<td>Greenhouse</td>
<td>(9) Farmer constructed</td>
</tr>
<tr>
<td></td>
<td>(10) Company constructed</td>
</tr>
</tbody>
</table>
B.5. How important do you think the following equipment would be to increasing your production of marketable surplus?

<table>
<thead>
<tr>
<th>Type of equipment (system)</th>
<th>Extremely high(5)</th>
<th>High(4)</th>
<th>Not sure(3)</th>
<th>Low(2)</th>
<th>Extremely low(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple farming implements (e.g., hoe, wheelbarrow, machete, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation system</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water tank</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borehole</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Furrow</td>
<td></td>
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<td></td>
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<tr>
<td>Bucket</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hosepipe</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Drip</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Sprinkler</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green house</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmer constructed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Company constructed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B.6. Do you own livestock? Yes=1; no=0

B.7. If yes, what is the total number of livestock owned?

<table>
<thead>
<tr>
<th>Livestock type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Cattle</td>
<td></td>
</tr>
<tr>
<td>(2) Sheep</td>
<td></td>
</tr>
<tr>
<td>(3) Goats</td>
<td></td>
</tr>
<tr>
<td>(4) Pigs</td>
<td></td>
</tr>
<tr>
<td>(5) Poultry</td>
<td></td>
</tr>
<tr>
<td>(6) Other</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>
C. Land fragmentation for major crops in the district

C.1. Complete the following table for each type of crop

<table>
<thead>
<tr>
<th>Item</th>
<th>Enterprise</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maize(1)</td>
</tr>
<tr>
<td>Area of plot cultivated</td>
<td></td>
</tr>
</tbody>
</table>

(record acres/ha)

D. Marketing outlets and Packaging

D.1. Do you sell your surplus vegetables in the markets? Yes=1; no=0

D.2. If yes, what percentage of your vegetables do you sell in the following market outlets?

<table>
<thead>
<tr>
<th>Market</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Local/traditional</td>
<td></td>
</tr>
<tr>
<td>(2) Local /modern(supermarket)</td>
<td></td>
</tr>
<tr>
<td>(3) Regional / Export market</td>
<td></td>
</tr>
</tbody>
</table>

D.3. How much crop do you produce per year and what price do you receive when you sell in the following marketing outlets?

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Unit of sale e.g., bags, bunches, kg, crates</th>
<th>Amount produced per year (Kg)</th>
<th>Amount sold per year (Kg)</th>
<th>Price per unit (KSh) Traditional market</th>
<th>Amount produced per year (Kg)</th>
<th>Amount sold per year (Kg)</th>
<th>Price per unit (KSh) Super market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kale</td>
<td>Kg</td>
<td>(1.1)</td>
<td>(1.2)</td>
<td>(1.3)</td>
<td>(1.4)</td>
<td>(1.5)</td>
<td>(1.6)</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>Medium crate=13.5 Kg</td>
<td>(2.1)</td>
<td>(2.2)</td>
<td>(2.3)</td>
<td>(2.4)</td>
<td>(2.5)</td>
<td>(2.6)</td>
</tr>
</tbody>
</table>
D.4. What are the challenges that you face when selling your vegetables? (Tick as appropriate)

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Tick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation costs(1)</td>
<td></td>
</tr>
<tr>
<td>Post-harvest Losses(2)</td>
<td></td>
</tr>
<tr>
<td>Low prices(3)</td>
<td></td>
</tr>
<tr>
<td>Inadequate market services(4)</td>
<td></td>
</tr>
<tr>
<td>Other (specify) (5)</td>
<td></td>
</tr>
</tbody>
</table>

D.5. What do you think should be done to improve vegetable marketing? (Tick as appropriate)

<table>
<thead>
<tr>
<th>Improvement</th>
<th>Tick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved road conditions(1)</td>
<td></td>
</tr>
<tr>
<td>Improve market place condition (e.g., infrastructure) (2)</td>
<td></td>
</tr>
<tr>
<td>Contract Signing (3)</td>
<td></td>
</tr>
<tr>
<td>Formation of marketing Groups(4)</td>
<td></td>
</tr>
<tr>
<td>Other (specify) (5)</td>
<td></td>
</tr>
</tbody>
</table>

D.6. Do you package your vegetables before sale? Yes=1; no=0

D.7. If yes what type of packaging do you use and what is the average cost per unit? (Tick as appropriate)

<table>
<thead>
<tr>
<th>Type of packaging</th>
<th>Description</th>
<th>Value (KSh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Hessian bags (90 or 50 kg bag made from (natural) sisal material)</td>
<td>one 90kg bag</td>
<td></td>
</tr>
<tr>
<td>(2) Synthetic bags (90 or 50 kg bag made from synthetic material)</td>
<td>one 90 kg bag</td>
<td></td>
</tr>
<tr>
<td>(3) Crates (Small, Medium and Large synthetic crates)</td>
<td>one medium crate</td>
<td></td>
</tr>
<tr>
<td>(4) Baskets (small, medium, and large baskets made from sisal, banana leaves or synthetic material)</td>
<td>one medium basket</td>
<td></td>
</tr>
</tbody>
</table>

D.8. If you do not package your produce, what are the reasons for not packaging? (Tick as appropriate)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Tick</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unavailability of packaging materials(1)</td>
<td></td>
</tr>
<tr>
<td>High prices(2)</td>
<td></td>
</tr>
<tr>
<td>Not demanded by customers(3)</td>
<td></td>
</tr>
<tr>
<td>Lack of Time(4)</td>
<td></td>
</tr>
<tr>
<td>Other (specify) (5)</td>
<td></td>
</tr>
</tbody>
</table>
D.9. How important do you think the following types of packaging would be in increasing your sale of vegetables by maintaining the quality of vegetables?

<table>
<thead>
<tr>
<th>Type of packaging</th>
<th>Extremely high(5)</th>
<th>High (4)</th>
<th>Not sure(3)</th>
<th>Low(2)</th>
<th>Extremely low(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hessian bags (sisal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>synthetic bags (plastic)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crates</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Synthetic/plastic)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baskets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
E. Transaction costs

E.1. Do you access market information? Yes=1; no=0

E.2. If yes, what are the sources of information? Tick as appropriate

<table>
<thead>
<tr>
<th>(1) Extension staff</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(2) Other farmers</td>
<td></td>
</tr>
<tr>
<td>(3) Radio</td>
<td></td>
</tr>
<tr>
<td>(4) Newspaper</td>
<td></td>
</tr>
<tr>
<td>(5) Television</td>
<td></td>
</tr>
<tr>
<td>(6) Mobile phone</td>
<td></td>
</tr>
<tr>
<td>(7) Buyers</td>
<td></td>
</tr>
<tr>
<td>(8) Other (specify)</td>
<td></td>
</tr>
</tbody>
</table>

E.3. What kind of information do you receive?

<table>
<thead>
<tr>
<th>Prices (1)</th>
<th>Time of sale (2)</th>
<th>Buyer (3)</th>
<th>Quantity demanded (4)</th>
<th>Quality demanded (5)</th>
<th>Other (specify) (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

E.4. How would you rate the produce loss experienced through transportation? Significant=1; non-significant=0.................

E.5. Have you signed contractual agreements guaranteeing ready market with buyers such as supermarket, restaurants, wholesalers or agents of foreign companies? Yes=1; no=0

F. Collective action

F.1. Are you a member of a marketing group? Yes=1; no=0.............

E.2. If yes how long have you been a member?......................years or months

F. 3. If no, what are the reasons for not joining a group?
No group in the area(1)  Lack of joining fee(2)  Too Busy(3)  Mismanagement of group resources(4)  Conflicts in the group(5)  Other (specify)(6)

G. Access to markets—distances and preferred mode of transport

G.1. What is the distance to the most important market?........................Km

G.2. What is the distance to the nearest all-weather road?....................Km

G.3. How would you rate the general state of the roads? Tick one

<table>
<thead>
<tr>
<th>(1)Good</th>
<th>(2) Average</th>
<th>(3) Poor</th>
</tr>
</thead>
</table>

G.4. Do you own a vehicle? Yes=1; no=0.........................

G.5. What is your preferred mode of transport for your produce to the market? Tick as appropriate

(1) Own transport vehicle
(2) Hired vehicle (pooled)
(3) Hired vehicle (individual)
(4) Buyer transport
(5) Public transport
(6) Motor cycle
(7) Bicycle
(8) Donkey cart
(9) Human portage
(10) Other (specify)
H. Market access, transport type, and market charges

H.1. What do you understand by the term demand for commodity?

(Sales, order) =1  (Don’t know) =0

H.2. Do you pay for services related to type of transport and market charges? Yes=1; no=0..............

H.3. If yes, what is the estimated value of transport type used and market charges? (Tick as appropriate)

<table>
<thead>
<tr>
<th>Type of marketing services</th>
<th>Tick as appropriate</th>
<th>Value (KSh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport to the market</td>
<td>(1)Public transport</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2)Hired pooled transport</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3)Hired transport (individual)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4)Own transport</td>
<td></td>
</tr>
<tr>
<td>(5)Market entry charges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6)Charges for selling space / stall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7)Charges for use of public toilets (water and sanitation services)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8)Parking charges per day</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

H.4. How often do you sell your produce in the markets per year? (Tick one)

(1) 98/year  (2) 48/year  (3)24/year  (4)12/year

H.5. How important do you think the following services would be to increasing your selling of produce to the market?
<table>
<thead>
<tr>
<th>Type of service</th>
<th>Extremely high (5)</th>
<th>High(4)</th>
<th>Not sure(3)</th>
<th>Low(2)</th>
<th>Extremely low(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement of road conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Improved market place infrastructure (e.g., roads, electricity, water, stalls)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water and sanitation services (e.g., clean toilets, clean drinking water)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security in the market place</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate parking space</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**J. Institutional services**

J.1. Are you visited by agricultural extension providers? Yes=1; no=0...............

J.2. If yes, how often were you visited in the last one year? (Tick one)

<table>
<thead>
<tr>
<th>(1)Regularly</th>
<th>(2)Not sure</th>
<th>(3)Never</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

J.3. Do you access credit for farming (e.g., seeds, fertiliser, finances)? Yes=1; no=0.............

J.4. If yes, what type of credit did you receive in the last one year? (Tick as appropriate)

<table>
<thead>
<tr>
<th>(1)Finances</th>
<th>(2)Seeds</th>
<th>(3)Fertiliser</th>
<th>(4)Farm equipment</th>
<th>(5)Other (specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

J.5. Do you have access to cold storage facilities Yes=1; no=0
J.6. If yes what type of cold storage facility do you have access to and what is the average value? Tick as appropriate

<table>
<thead>
<tr>
<th>Type of storage</th>
<th>Description</th>
<th>Tick</th>
<th>Value (KSh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)Shed/barn</td>
<td>shed cooled by sprinkling cold water on fresh produce</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2)Fridge</td>
<td>Electric fridge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3)Public/private cooled shed (charges/day)</td>
<td>Cooled shed serving fresh produce farmers in a locality</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

J.7. How often do you access the cooled storage in a year? (Tick one)

<table>
<thead>
<tr>
<th>1) 98/year</th>
<th>2) 48/year</th>
<th>3) 24/year</th>
<th>4) 12/year</th>
</tr>
</thead>
</table>

J.8. How important do you think access of the following storage facilities would be to increasing your production of marketable surplus?

<table>
<thead>
<tr>
<th>Type of storage</th>
<th>Extremely high(5)</th>
<th>High(4)</th>
<th>Not sure(3)</th>
<th>Low(4)</th>
<th>Extremely low (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shed/barn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fridge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public/private cooled shed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

J.9. Do you have access to cooled transport? Yes=1; no=0
J.10. If yes what transport facility do you have access to and what is the approximate value? Tick as appropriate

<table>
<thead>
<tr>
<th>Type of transport</th>
<th>Description</th>
<th>Tick as appropriate</th>
<th>Value (KSh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Human portage</td>
<td>Vegetables covered in hessian material carried by a farmer to the market (cost of a meal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Donkey cart</td>
<td>Vegetables covered in hessian material transported to the market using a donkey cart (cost of a meal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Bicycle</td>
<td>Vegetables covered in hessian material transported to the market using a bicycle (cost of a meal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Motorcycle</td>
<td>Vegetables covered in hessian material transported to the market using a motorcycle (cost of fuel to the market)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Motor vehicle</td>
<td>Vegetables covered in hessian material transported to the market using own motor vehicle (cost of fuel to the market)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Public transport</td>
<td>Vegetables covered in hessian material transported to the market using public transport (charges by public transport)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

J.11. How often do you access the cooled transport in a year? (Tick one)

<table>
<thead>
<tr>
<th>Frequency</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) 98/year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) 48/year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) 24/year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) 12/year</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

J.12. How important do you think access of the following transportation means would be to increasing your production of marketable surplus?

<table>
<thead>
<tr>
<th>Type of transport</th>
<th>Extremely high(5)</th>
<th>High(4)</th>
<th>Not sure(3)</th>
<th>Low(2)</th>
<th>Extremely low(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human portage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Donkey cart</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicycle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motorcycle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor vehicle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thank you for availing your time and for the information you have provided