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Rural Logistics for Smallholder Farmers to Meet New Agricultural Market Demands

A planning framework for improving the efficiency of transport services in the high value agricultural sub-sector, replicable in other values chains

Project AFCAP/GEN/060: Work Package 3 (Deliverable 5) Report

Kenya Network for Dissemination of Agricultural Technologies [KENDAT]
International Forum for Rural Transport and Development (IFRTD)
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The programme is currently active in Ethiopia, Kenya, Ghana, Malawi, Mozambique, Tanzania, Zambia, South Africa, Democratic Republic of Congo and South Sudan and is developing relationships with a number of other countries and regional organisations across Africa.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

CP:	Collection Point
CV:	Commercial Village
CVM:	Commercial Villages' Models
FCI:	Farm Concern International
FWG:	Farmers Welfare Groups
GAP:	Good Agricultural Practice
GDP:	Gross Domestic Product
HCDA:	Horticultural Crops Development Authority
HGV:	Heavy Goods Vehicle
ICTs:	Information Communication Technologies
IMT:	Intermediate Means of Transport
KHE:	Kenya Horticultural Exporters
KShs:	Kenya Shillings (***1US$ = KShs 85 Nov 2012***)
LGV:	Light Goods Vehicle
MGV:	Medium Goods Vehicle
NGO:	Non-Governmental Organization
SF:	Small Farmers
VCD:	Value Chain Development
WDR:	World Development Report

1 Introduction

In recent years a renewed focus on agriculture has been evident in policy and development agendas for the African continent. However there is a dearth of knowledge on the inter-linkages between production, agro-industry and markets, as well as the potential and capacities for developing these (Kormawa et al. 2012)

Some 450 million smallholder farmers around the world face poor marketing linkages. Additionally the farming practices are characterised by low productivity due to dependence on family labour, lack of access to resources and inputs such as seeds, fertilizers, irrigation equipment and machinery. Smallholders remain dispersed and non-aggregated (DGDA, 2012).

To feed 9.3 billion people by the middle of this century, the world will need to raise global food production by around 70 per cent. The irony is that the majority of people currently suffering chronic hunger are the rural poor who work in agriculture, working in the fields, transporting crops, looking after animals or catching fish. A food-secure world requires that those currently living in rural poverty become able to produce agricultural surpluses, allowing them to sell the excess for income, to invest in better agricultural practices and to insure against the bad seasons that will inevitably come, from time to time. Despite this situation, a recent report by an engineering society in UK noted that despite the world discussion about producing 70 per cent more food by 2050, only a half of this figure (35 per cent) would be needed if there was progress in the reduction of post-harvest losses, a good fraction of which can be associated to the poor transport infrastructure and generally poor logistical efficiency

The significance of agriculture to the Kenyan economy and its links to agro-industry have important implications for the country's realization of development objectives, most notably the Millennium Development Goals (MDGs) and the associated Kenya's Vision 2030. As the dominant economic activity in the country, agriculture is the main source of the country's economic growth, export earnings, employment generation, and is a source of food security and a stimulus to the generation of off-farm employment. In addition it is a major source of raw materials for the manufacturing sector with 33 per cent of the manufacturing sector output derived from agricultural output (Onjala 2010).

Today, the high value agricultural sector in Kenya is dominated by horticulture. The horticulture sector is the new ground for high value crop enterprises that can propel smallholder farmers from subsistence to commercial farming within short periods of time. It is here where crops can be planted and sold within two to three months. Demand for good quality horticultural produce is increasing globally, but the small holder farming system is constrained by opaque trading and transport chains that run from farm level to regional, national and even international markets.

The challenge is how to get the perishable produce to the market in good quality and on time. The tendency is a broker will arrive at the farmer's gate and collect everything, hopefully on time, but at a comparatively low price. The latter can be partly explained through high transport costs. The broker must accommodate the cost of reaching small holder farmers in their various locations transporting the produce via poor roads, police road-blocks, while ensuring the produce gets to the market at the right temperature, with a reasonable shelf-life. Regardless of the various challenges, the small holder system is handling some 95% of the horticultural produce grown in Kenya.

Large scale horticultural producers contribute only 5% of the total produce. Typically large scale producers are located in areas with good road access, apply high capacity refrigerated vehicls, and are able to operate at lower transport costs. Additionally, they are able to invest in high quality grading and cooling shed and apply relevant phyto-sanitary standards that allow for export.

This study focused on the horticultural sector. The crops chosen for the study were those that would help the researchers understand logistical operations from the 1st mile (from farm to collection point) and the various intermediate logistical stages leading up to national or international markets. The study showed that the logistical and transport characteristics can be divided into the following four operational characteristics:

- The 'fragmented' local and national market chains where traders buy from various farmers and sell to various markets. Here there is no enduring relationship between the farmers, the traders and the market as the system operates opportunistically.
- The medium scale farmer cum trader who buys from organized/contacted farmers in produce bulking groups and sells to local niche market in form of supermarkets of for local processing.
- The medium scale farmer cum trader who buys from farmers for direct export to small importers in foreign locations.
- The large scale farmer who has own farms and who may have ties with the smallholder farmer or approach them only in times of general shortage of supplies.

This report attempts to use the lessons learnt about the way logistical and transport services are organized, to establish a framework that can build understanding and structure into the operations. The report does so with an aim of establishing a reference that planners and investors in the horticulture sector can use. The understanding highlighted in this report is going to be used to develop a reference manual for use by value-chain planners, regulators and investors targeting the high-value agricultural sector and involving smallholder farmers. Indeed, in a world of changing nutritional habits, rising world population, declining land, water and other resources, it is the smallholder in tropical lands that is in focus in today's development interventions that hope to sustainably supply high quality fresh produce to the growing urbanized populations.

2 Background on agricultural Value Chains

2.1 High value agricultural logistic chains

This chapter describes the main components of logistic chains used to transport high value agricultural products from the producer to the consumer. First, the emerging markets for high value products in Kenya are described, then the key components of logistic chains are defined before the requirements to satisfy the new markets are analysed.

2.1.1 Emerging markets for high value agricultural products

In Sub-Saharan Africa the largest share (72%) of the produce marketed is sold on domestic markets, while 24% is exported to Europe and 3% to other African Countries (Staats et al 2007, p.44). However, this picture changes rapidly: In the past decade new markets for high value produce have proliferated in many Developing Countries, which are changing the demand for agricultural produce. High value products are demanded by overseas exporters and increasingly by domestic supermarkets in developing cities. This is stimulated by an increasing domestic income and fast urbanization.

The overall agricultural contribution to Kenya's GDP is 36%. The sector generates foreign exchange earnings amounting to Kshs 91 billion, with daily exports of 1,200 metric tonnes. Additionally, the sector grows at 15 – 20 % annually. Horticulture plays a pivotal role in the sector, and is ranked the highest contributor to the Gross Marketed Production in Kenya. Horticulture has only been beaten by the combined income of the primary coffee, tea and sisal in the last 7 years (Kenya Bureau of Statistics: Economic Survey, 2011).

Participation in modern Supply Chains can increase farmer income by 10% to 100% as examples from Guatemala, Indonesia and Kenya show (WDR 2008, p.127). In Kenya, three quarters of the fruit and vegetable export production came from smallholders. However, smallholders are disadvantaged, since they typically face high transaction costs and low bargaining power in factor and product markets. Vorley (2001) describes the proliferation of buyer driven supply chains as detrimental to smallholder farmers. Reardon (2007) argues that in the processing sector, supermarkets tend to source as much as possible from medium and larger growers. However, governments can improve smallholders' access to modern Supply Chains through the strengthening associations and cooperatives for producers, marketers and traders.

French Beans Production in Kenya

In the year 2010, out of the 55841 MT of french beans produced, only 34% were exported for the value of Ksh. 4.4 billion. In 2011, french beans accounted for 29% of Kenya's total earnings from vegetable exports. The huge disparity between the domestic (Kshs 1.6 billion) and export (Kshs. 4.4 billion) values are due to the farm gate prices offered to farmers by exporters. The main importing countries for Kenya's green beans are UK, France, Germany, Holland, Belgium and South Africa.

The fresh bean production is mainly dominated by smallholder farmers, estimated at 50,000 growers, who are mainly households with less than 2 acres of land. They cultivate the land, mainly using family labour. Households also provide labour in the large farms and are compensated through wages. They gain from fresh bean cultivation through the employment and income earned from the sale of the crop. This also contributes to food security of these households. A typical farmer growing bean makes an average profit of US$750 (Ksh.60,000) per year. Small holder farmers grow horticultural products because they are profitable, earning up to seven times more income than maize.

Most of the farmers are organized in groups and are bound by regulations forbidding sale to the local market. Others have contracts with companies that may not permit sale of their produce outside the contract.

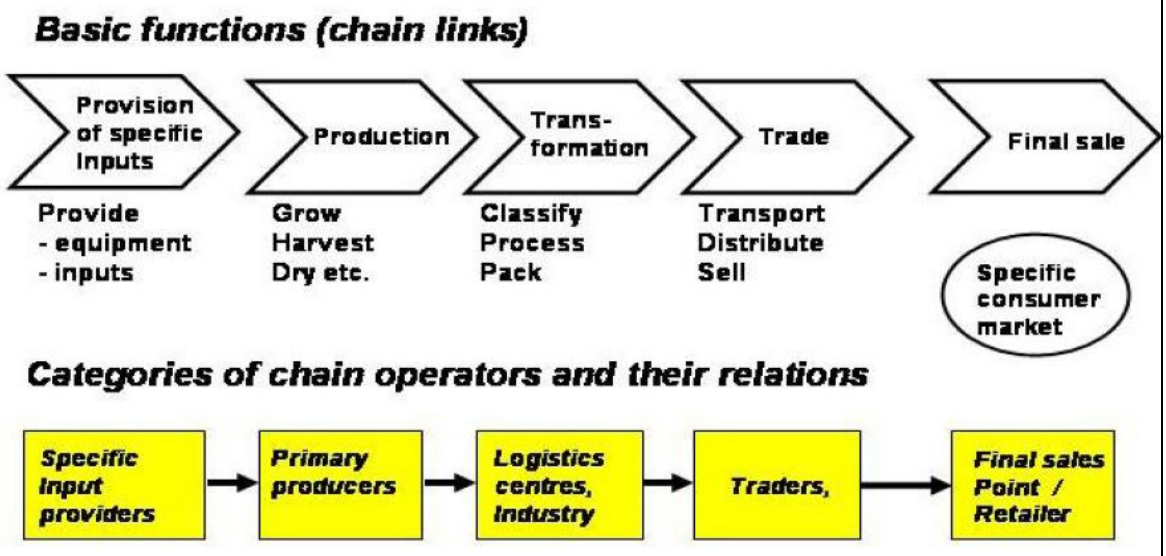
The fresh bean industry in general employs 45,000 to 60,000 people, of whom an estimated 60 per cent are women, in commercial farms, processing, and logistics operations. It is estimated that nearly half or 44 per-cent of Kenya's smallholder households are managed by women. Women are active at every point in the food chain and are often responsible for the household farming activities under which most of the green bean farms fall. At the pack houses, gender roles become distinct again with women dominating handling sorting, grading and quality control. Men will often do manually demanding tasks like land preparation, irrigation, spraying, loading and offloading trucks.

Source: SNV 2012

2.1.2 Key components of a modern logistic chain

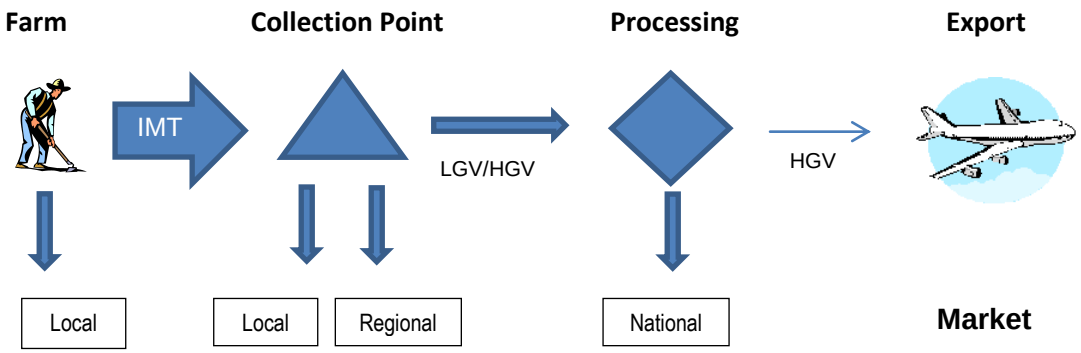
Transport and organised logistics chains are important components in the development of viable agri-businesses for small holder farmer. Currently, the spatial dispersal of small scale rural farms and the accompanying poor transport access is a major barrier to the efficient integration of rural farmers into the emerging value chains. A precondition for marketing of high-value products is transport efficiency and proper management of various activities within the supply chains. This includes local transport services for load consolidation, handling, packaging and outward transport to final markets. The new markets demand high quality, timely deliveries and innovative upstream and downstream practices.

The structure and components of a modern supply chains, is depicted in Figure 1below, while the typical logistical system of the small holder producer is shown in Figure 1b.



Source: Springer-Heinze 2008, p 56

Figure 1b: Typical logistical system for small holder farmers



The new markets create diversified business opportunities for developing countries, not only in supplying to final markets, but also through intermediate value adding activities such as cold storage, processing, washing, pro-packing, mixing, labelling and bar-coding. In general, more value is added when exporting products through transport, handling and packaging than by farming activities.

2.1.3 Requirements for growing agribusiness

Producers, transporters, traders, wholesalers and exporters have to meet a large number of requirements:

- high quality produce in respect of appearance, taste, and smell;
- food safety, i.e. free of physical, chemical and microbiological contamination;
- differentiated and innovative packaging, and
- customised products that meet lifestyle choices and preferences (health foods and fair trade products).

For long complex chains logistical requirements include packing houses, refrigerated transportation, cold storage/warehousing and containerisation. Pre-cooling prior to shipment is needed to prevent quality loss and wilting. Packaging is used to i) protect produce from mechanical injury, contamination and disease, ii) display produce and therefore facilitate marketing and iii) increasing the efficiency and ease of handling, transport, storage and distribution. Pack line operations include dumping, pre-sorting, cleaning, washing, sizing, and waxing.

An important precondition for marketing of these new products is the compliance with national and international quality standards related to food production, transport, processing, packaging, warehousing and retail marketing.

2.1.4 Key ingredients that determine chain efficiency

The main requirements of logistic a chains are presented in the preceding section and are further summarised in Table 1. Generally speaking international markets generate the highest profits but require not only large scale investments but also profound knowledge about all ingredients of the logistic chain.

	Local Market	National Market	International Market
Production	Production standards are according to agronomic and other information or technology support available, often dependent on buying company, hence destination market. Sorting and grading leaves waste at farm or lowest quality later disposed to the local market as highest quality heads to international markets.		
First Mile	Very occasionally will have an off-farm charcoal cooler used only if transport does not show-up on the day of harvest. Usually not cooled. Accessibility during harvesting is essential, high transport costs per ton-km. Means of transport include humans and IMT and road condition greatly determines prevailing costs, especially where collection meets rainy and wet conditions.		
Beyond the 1st Mile	Local means: IMTs (Motorbikes gained recent prominence), pick-up and larger trucks depending on weights and destination. No cooling.	Heat insulated trucks, air vent cooling or overnight transport.	Heat insulated trucks, air vent cooling or overnight transport. Refrigerated transport and pre-cooling amy be apllied by large scale marketers.
Grading facilities	Local casual sorting and grading at on-farm loading spot. Sheds are rare.	Local casual sorting and grading at on-farm loading spot. Sheds are rare, except for French Beans or other international market crops.	Modern sorting, grading and packaging facilities usually large table-tops next to cold storage facilities and the airport.
Storage	Ventilated sheds and Charcoal coolers	Charcoal coolers and refrigerated warehouses	
Packaging, Processing	Gunny bags, cartons, nets, wooden and plastic crates. Bulk packing cushioned or covered by green and dry leaves on open or closed trucks.	Gunny bags, cartons, nets, wooden and plastic crates. Bulk packing cushioned or covered by green and dry leaves on open or closed trucks. Possible value addition grading or ripening. Packed by single produce or ready-to-eat or cook mixes (stir fry) and branded into pellets according to supermarket customer specifications.	Packing by customer specification. Beans may have chopped or whole ends, in small or large branded pellets, pre-boiled and bottled or canned according to international standards. Packed by single produce or ready-to-eat or cook produce mixes (stir fry) and branded into pellets according to supermarket customer specifications.
Quality Standards	No formal quality standards. Sensitive customers pushing for quality at the open-air market place may dictate quality, by casual selection of the seller where poor quality may remain unbought at day end	Kenyan-GAP[1] Standards, exist in books but are scantily enforced. Occasional sampling by KEPHIS[2] but no traceability regulation in place or possible. Traceability possible for largescale suppliers to niche (supermarket) markets.	International Standards, Kenya-GAP under occasional sampling by KEPHIS, Global-GAP under regular inspection by international country of destination. Strict traceability regulation in place and applied.

Table 1: Main requirements for logistic chains

[1] GAP = Good Agricultural Practice

[2] KEPHIS = Kenya Plant Health Inspection Service. A Government mandated body.

2.2 Engaging smallholder farmers in high value agriculture

A debate that occupies many sessions of researchers' conference rooms is whether it is possible to advance the agriculture-centred economies of sub-Saharan Africa by engaging smallholder farmers more intensely. Indeed it is the wish of some schools-of-thought that as urbanization takes the toll; smallholders will somehow vanish as land is consolidated for viable commercial production. The basic realization however is that smallholder farmers are the best quality growers of delicate fruit and vegetable crops that do best under mixed crop systems in small blocks of land where profitable organic farming has a chance. It can therefore be argued that smallholder farmers are here to stay and the policy challenge is to accelerate commercialisation of smallholders and help link them to dependable markets.

Tis study showed that there are pockets where smallholders have been supported by agribusiness entrepreneurs of all sizes to farm effectively with greatly improved incomes. Under such farming conditions farmers have successfully embraced the farming of high value crops like french beans and grown themselves out of poverty.

Smallholder farmers typically grow under rain-fed conditions dominated by many production and transport handicaps, even where market exists. The development of an internationally competitive agro-processing sector in Kenya, backed by an efficient production and transport system is constrained by a wide range of factors, including the small scale of operations, which limits the technology that can be used, along with poor access to raw materials resulting in low levels of capacity utilization. Furthermore, the seasonality of raw material production affects agro-industrial productivity negatively. This problem could be alleviated by increased vertical integration, whereby local processing would provide semi-processed products while final processors transform them further into end products. This approach is being adopted for the mango where farmers deliver to factories that produce puree for other factories that are producing fruit juices.

Diversification through using materials procured from different cropping seasons could also improve the rate of utilization of existing processing capacity (JICA & MoTI 2008). This also calls for improving the storage system for agro-products to ensure products are available throughout the year across seasons. This will also reduce the on-farm wastage, which is currently a major challenge.

2.2.1 Land and farm productivity

Agricultural productivity depends on the health of the soil, hence the land in which farming activities are conducted. The land may be owned or be under long-term lease by farm household. It may be on short term hire varying between a year and any agreed period of time between parties. It is often the case that land under short term hire may not be managed as well as that on longer term lease or owned by the farmer. Land under production may have access to irrigation water, good proximity to the road, near agro-input suppliers, accessible to agronomists, inclusive

of complementary animal and crop production, powered by mains or renewable energy power sources or even none of these.

A farmer may be lucky to have access to farming knowledge and experience brought by family members, Government extension agents, NGO support, a marketing company with extension service wing or even a value addition plant near the farm. All these factors determine the land and farm productivity.

It is not unusual for a smallholder farmer in Kenya or elsewhere in Africa to be a non-starter or even to lose 100 per cent of her high quality and expensively grown and harvested (high-value) produce to:

- Lack of information and training on how to grow a good yield,
- Lack of quality seed, other inputs or agronomic support, hence low quality produce,
- Poor and unpredictable climate and weather conditions,
- General lack of access to or market overall or over-supply,
- Low volumes uneconomical for the buyer to make the journey,
- Inaccessible location especially in the rainy season,
- Poor timing or a no-show of the buyer's transport vehicle, and
- Spoilage due to lack of cooling and other facilities at farm level.

During the study reported here, it has proved difficult to generate accurate comparative figures in terms of unit production costs and even yields. It has also been difficult to generate quantitative figures in terms of cost of inputs by farm or farmer.

Typically a smallholder farmer will combine manure and inorganic fertilizers in ways that vary from one season to another, depending on availability of funds and even the inputs themselves. It is not unusual for a smallholder farmer to plant without both the organic and inorganic fertilizer even where she knows the yield will be grossly affected. Factors dictating this are highly variable, from low working capital, rain failure, or late delivery of subsidised fertilizer from Government.

On the other hand the large scale farmer is likely to deliver lower quality but consistent and predictable yields compared to a smallholder. This farmer is most likely to be growing purely inorganically, all year under irrigation and with the aid and backing of many pieces of equipment, professional personnel and infrastructure

2.2.2 From farms to markets

This study tries examined the processes that link small holder farmers to markets. Key factors that contribute to the disconnect between small holder farmers and the markets are:

- High cost of production per unit, a situation that renders the first part of the chain the value chain highly uncompetitive.
- Logistical and transport activities that are grossly expensive within 1st mile of the production chain.
- Competition from foreign products that are landing as a half and even a third of the local price.

Smallholder farmers are disadvantaged in the high value crop farming scene mostly because of unpredictable market demand. Unlike large-scale farmers who generally have credible volumes sought by markets, smallholders often farm on a market that may or may not come about. Indeed farmers on rain-fed agriculture plant and harvest at the same time to overload markets and bring the farm-gate price tumbling down.

There have been several Government, private sector, NGO and even farmers initiative to build predictability of the market situation. These efforts include:

- Establishing farmers groups to enhance the development of a critical mass where farmers sell together, hence the ability to attract buyers from near and far.
- Bulking crop from many smallholder farmers by entrepreneurs with good market connections,
- IT and mobile telephony support to inform farmers of market prices, hence best markets to target like conducted by the Kenya Agricultural Commodity Exchange (KACE, see www.kacekenya.co.ke)

Farmers selling together are able to establish group leadership that can engage buyers and their agents towards improved farm-gate prices. Farmers like those in commercial villages are assisted in various ways including use of certified seeds and selling by weight rather in undefined bag-loads. They can gain much more than a good price since, as they get organized and structured, more development supporters from research, micro-finance and others do come in.

It is not clear if farmers, especially those not in organized groups have gained a great deal from capacity to check prices of their commodities on the mobile phone and other places like the internet. Knowing that produce has a better price in a different distant market may help the bargain with the broker but it does not give the farmer the broker choice, hence the market of destination.

2.2.3 Social and financial capital

Social capital is the idea of farmers not working alone but exploiting the power of relationships to work together as a group and even groups. This study came across many farmer groups, many of them highly organised and able to develop a negotiating platform. A case in point is the Kangai Tisa who farm together under cropping schedules and input support structures set-up between them and the buyer. This group has prospered and even grown funds to build a local hospital, in partnership with the buyer.

Finance capital is about farmers being able to access money to purchase capital equipment as well as meeting recurrent expenses, covering inputs, labour, fuels, repair and maintenance etc. Credit for low income persons needs risk management tools. Farmers are not going to be innovative if there is no safety net (Sorensen, 2010). Credit by itself cannot support rural agricultural development. Putting in place shared risk mechanisms and diversified loan portfolios are some of the conditions that encourage better development and more viable finance in the agricultural sector (Sidibe, 2007).

With the development and proliferation of microfinance institutions (MFIs), there has been increased access to finance, especially by the micro enterprises. A challenge however remains that the MFIs are not able to provide credit that enables microenterprises to graduate. The enactment of the Microfinance Act in the country, which brings in the regulation of the MFIs, while at the same time bringing discipline in their activities, is an important step in increasing access to financial services, especially by small firms in the sector (Kormawa et al. 2012).

The microfinance institutions have also come up with innovative ways of providing credit to farmers, thus overcoming the challenge arising from traditional approaches to credit provision. While the official financial institutions established to provide credit to farmers, such as the Agricultural Finance Corporation (AFC), were not able to meet the credit needs of small-scale farmers due to lack of collateral, the MFIs have come up with innovative approaches of providing credit to farmers for specific commodities using the produce as a collateral. They also introduced insurance in the package to ensure repayment. Dairy and horticulture are sectors that these innovations continue to target.

2.2.4 Key logistical and agribusiness attributes

Kenya has immense agricultural potential, especially in the production of fruits and vegetables, but, because this is not matched by proportionate processing and marketing capacity, farmers incur heavy post-harvest losses. This makes agro-industry a priority sector for industrialization, spearheaded by horticulture which also provides opportunities for increased foreign exchange earnings through non-traditional exports and value-adding activities. (Kormawa et al. 2012)

It is noteworthy that one of the factors to which the success of the horticultural sector can be attributed is the investment in infrastructure and logistics for air freight for perishable products as

well as safety and quality assurances. The establishment of the Kenya Plant Health Inspectorate Services (KEPHIS) has played a key role in supply control and in the establishment of traceability systems. In addition, the upgrading of packaging house facilities, like improved water sanitation and advanced cold treatment and cold storage systems, have been undertaken by private enterprises in fresh produce export, enabling them to meet the demand for high quality fresh produce like salads and other semi-prepared vegetable products in the UK (FAO 2008).

The main strength of fruit and vegetable processing is its access to abundant locally-grown raw materials, though wastage rates are very high due to limited processing capacity. Wastage in the mango industry has been estimated at a quarter of total production (JICA and MoTI 2008). This study reported transit losses of produce as high as this 40 per cent.

Into the near future key agribusiness advancement will rely on public private partnerships (PPPs). The potential benefit of partnerships has become increasingly recognised especially with the gradual convergence of interests between public sector development agencies and the corporate world (UNIDO 2002). Partnerships can facilitate upgrading efforts where stakeholders such as governments, final goods producers, suppliers, industry associations, research institutions, and civil society organizations work together. Within a partnership, each partner plays within their comparative advantage towards sustainable success (McCormick & Atieno, 2003).

Other key agribusiness attributes and actions for success in Kenya are such as:

- Clear policy and strategies that target the much needed agricultural production potential;
- Improving the quality of raw materials through modern farm husbandry techniques;
- Increasing profitability in agribusiness to attract greater investment by actors all along the value chain.
- Overall reduction of the cost of doing business through an enabling environment, established proactively by government via the Kenya Private Sector Alliance (KEPSA) and other bodies;
- Ensuring the compliance of fruit and vegetable products with sanitary and phyto-sanitary, social, environmental, and traceability requirements;
- Advancing technology on farms and in value addition activities such as processing, packaging, and labelling;
- Investing in improving infrastructure to reduce transportation costs and investing in industrial parks and clusters;
- Increasing investment in skills development institutions, the KEBS, and agricultural training institutes and extension services;

- Developing initiatives at national, regional and global levels that will involve a wide range of government ministries and public and private sector institutions, as well as donors and international lenders. The Ministry of Trade and Industry„

As this study shows, the key issues to be addressed are poor infrastructure to reduce transportation costs and perishability, as such losses make the sector grossly uncompetitive.

3 High value chain types and their performance

3.1 Overview on the researched products

Six logistic chains were studied as listed in Table 1. In order to understand the performance of the value chains, the typical profiles for the four commodities was undertaken, and a general characterization arrived at as follows.

Table 2: Logistic chains studied

	Marketer	Destination	Region	Product	Farm scale
1	Meru Greens Ltd	National Canning Factory for export	Meru	French Beans	Smallscale
2	Kangai Tisa	Export Market	Mwea	French Beans	Smallscale
3	Goshen Farm	Export Market	Mwala	French Beans	Mediumscale
4	SUNRIPE Ltd	Export Market	Naivasha	French Beans	Largescale
5	Mt Kenya Gardens Ltd	National Niche Market (Supermarket)	Meru	Banana	Smallscale
6	Commercial Villages: Farm Concern International	National Market	Nyeri	Onions	Smallscale
7	Uncoordinated brokerage market	Local, Regional and National Market	Kinangop	Potatoes	Smallscale

3.1.1 French Beans

This chain is geared primarily for export market though a growing proportion of the produce is now finding its way into the domestic supermarkets. When assessed on the size of operations, three types of players were found in this chain. These are: large scale established exporters, emerging medium size exporter, and small scale farms model.

a. *Established large scale exporter*: Will typically have a centrally coordinated, capital intensive chain, consisting of own large scale farms, on-farm sorting out yards, own transport (refrigerated) and cooling plants near the airports. One such chain represented in this study is SUNRIPE Company Limited. SUNRIPE has a 500 acre farm in Naivasha region where a diverse collection of horticultural crops are grown primarily for the export market. French beans make up approximately 20% of the total production in the farm. Produce harvested is preserved in on-farm cold rooms to remove farm heat for a few hours before it is collected for the two hour journey to the airport depot.

b. *Medium size emerging exporter*: This chain is made up of new entrants into the French beans export market. They will typically lease medium size farms (between 30-50 acres) and supplement their on-farm produce with produce from contracted small scale farmers in the proximity of their core farms. The upcoming exporters operate own or hire transport or a combination of both. These would typically be Medium Goods Vehicles (MGV). They do not own cooling facilities and so they mostly rely on rented cooling chambers from the government agency, the Horticultural Crops Development Authority (HCDA). The Goshen Farms limited represents this category in the study. Goshen's own two farms supply 80%-90% of the target volume, while the rest comes from the 10 active small scale contact farmers in the proximity of the farms.

c. *Small Scale Farms Model:* Consisting of small scale farmers (farm size 1-2 acres) in one zone supplying to an entrepreneur/company through contract arrangements. The small scale farmers use various low capacity means of transport to take the produce to designated collection points along a rural road. The collection points serve the purpose of load consolidation and also produce sorting and grading. The entrepreneurs organize collection along designated circuits and then on to a central depot where further sorting and packaging may take place before delivery to the final markets. Two such chains were included in this study. These consist of Meru Greens based in Meru and Kangai Tisa based in Mwea. Meru Greens has contracted about 1,500 small scale farmers scattered around a 50km radius The Company is in turn contracted by a factory that cans french beans for export. Kangai Tisa on the other hand is an umbrella organization of thirteen groups with a membership of 30 to 45 farmers each. Each group has a designated assembly and sorting shed from where the French Beans are collected by the Kenya Horticultural Exporters (KHE) with whom the farmers have a contract.

For french beans, it is observed that the large scale chain, SUNRIPE achieves a yield of 6.5 tonnes per acre, way above what is achieved by the medium and small scale producers. SUNRIPE's yield is nearly four times more per acre than the 1.5 tonnes/acre achieved by small scale farmers of Kangai Tisa. This is attributed to the fact that the company uses a mechanized production system, and enjoys economies of scale. In addition, SUNRIPE farms operate as an independent profit centres distinct from the transport and export enterprise. This incentivizes them to maximize their yields in order to optimize profits.

Goshen Farms, a medium size enterprise achieves a yield of 5 ton/per acre, while at the other end of the scale, small holder farmer of Meru Greens and Kangai Tisa achieve a yield that ranges from 1.5 tonnes per acre to 3 tonnes per acre.

Table 3: Production yield characteristics

French Beans					Potatoes	Onions	Bananas
PRODUCTION/ PRICES	**SUNRIPE**	**GOSHEN**	**MERU GREENS**	**KANGAI TISA**			
Farm Size (Acres)	494	32	100[3]	60	Aver =2.5	Aver= 1 acre	Aver 2
Yields in tonnes/acre	6.5	5	3	1.5	Av 1.7	Aver 4	Ave 1.25tons
National average yield/acre	3-4 tonnes/acre				3.5	5	5.7
Total Yield/Year (Tonnes)	3,600	5.6	1194	180	Aver. 4.25 ton/farmer	N/A	N/A
Farm Gate Price (Kshs/kg)	50	40	30	35 - 55	25-30	30	19
National Market Price (kg)	50 – 90				40-45	80-110	60-80
Airport gate price/tonne (kg)	Ranges between KShs 130-230/kgs						

Table 4 below shows that most of the french beans production is geared towards export market. In particular, the large scale producer, SUNRIPE targets their production, almost exclusively for the international market. Only a very small proportion (2%) of their total production ends up in the Kenyan market and mostly by default. Among the medium scale and small scale producers, a good proportion of the produce that does not meet export market standards is sold in the national market.

Table 4: Market Share for French Beans

Market Share	SUNRIPE	GOSHEN	MERU GREENS	KANGAI TISA
% of total yield for international market[4]	73%	65%	30%	60%
% of total yield for National market	2%	20%	60%	30%
% of produce going to waste	25% (est)	15%	10%	10%

[3] 100 small holder farmers with land sizes between ½ - 1 acre

[4] From international sources, current price for French Beans from Kenya range from US$1.3-2.6

3.1.2 Bananas

One Banana value chain was studied. The chain consists of small holder farmers (1-3 acres) organized by Mt Kenya Gardens company, based in Meru. The company collects bananas directly from the farms using company's trucks. The bananas are taken to ripening depots in Meru and Nairobi. The Bananas are then supplied to a contracted supermarket chain distributor.

Mt Kenya Gardens has a general outreach of about 180 contract farmers with an average land size of 2 acres in the area studied. On average farmers get a yield of 1.25tonnes/month. Not all the farmers are active throughout the year, so the company typically collects 50 tons per month from the farmers.

The banana chain study focuses on the national niche market. The average price for bananas at the farm gate is Kshs 19.00 per kg, while at the national markets, the price ranges from Kshs 60-80 per kg.

3.1.3 Onions

This chain was studied within the framework of Commercial Village Models (CVM) promoted by Farm Concern International (FCI). The CVM model organizes small scale farmers in a village into a federation of commercial farmers working together to achieve leverage in the market. The onion's value chain studied was in Embaringo area of Nyeri County. The small holder farmers - with average of one acre - operate a coordinated production and marketing system that connects them to a range of onion traders from different markets who collect from designated points along a circuit and transport to various regional and national markets. The model enables farmers to sell to the traders offering the most competitive value. In addition, it allows them to achieve economies of scale in joint purchase of inputs, peer extension services, production and pooled marketing.

In the study area, onions are grown on farms that are on average less than 1 acre. The average production is 7 tonnes per acre, with one yearly production cycle.

Onions is another crop whose demand continues to grow very rapidly in Kenya. It is also becoming an important source of cash income for small scale farmers as it fetches relatively higher prices than the staples that have been grown under subsistence tradition. Farm gate prices for onions average Kshs 30 per kg, while at the national level, the price ranges from Kshs 80-110 per kg

3.1.4 Potatoes

One potato value chain was studied in the Kinangop area. This product line represents a fragmented value chain with uncoordinated production and marketing systems consisting of individual small and medium scale farmers, brokers, transporters and traders supplying local, regional and national markets. The chain studied is characterized by low technology, low value addition and an arbitrary packaging and pricing system. This chain is dominated by middle-men who supply different markets depending on prevailing prices.

Potatoes are produced on small holder farms with an average size of 2.5 acres for the area studied. Yields per acre range between 0.8-1.2 tons per acre.

Potatoes, like the onion value chain is characterised by many buyers who come to the farm gate and transport to various national markets. Farm gate prices in Kinangop ranged between Kshs 25-30 per kg while national prices varied between Kshs 40-45 per kg.

3.2 Transport and Logistical performance

3.2.1 Logistic Chains for smallholder farmers

The above products were analysed from the point of view of the structure of their logistics chain. The chains may be distinguished by the number of producers and their transport stages. Figure 1 to Figure 5 are chains used for the collection of French Beans, bananas and onions from small scale farmers.

- The transport of French Beans (Figure 1) by Kangai Tisa is the classical model for a high value product, which is transported by IMT to the grading shed, stored there in a charcoal cooler, transported by LGV to Nairobi, graded again and exported by plane to Europe.
- Meru Greens needs four stages to transport its products -ultimately canned French beans to the international markets.
- Mt Kenya gardens collects bananas from small holder farmers. Bananas are not only graded but as well undergo a ripening process before they are transported by heavy goods vehicle to Nairobi.
- The transport of onions (Figure 4) produced by a cooperative requires only two transport stages, since no grading is needed and the product is directly transported to regional or national markets.
- A mixed transport chain is represented in Figure 5, which depicts the uncoordinated collection of potatoes by private brokers. In the dry season, when roads are passable, the potatoes are collected directly on the field by Light Goods Vehicle (LG) and transported to regional and national markets. However, during rains farmers have to transport their products to their homesteads by headload, IMT or tractors, where they are collected by the informal traders.

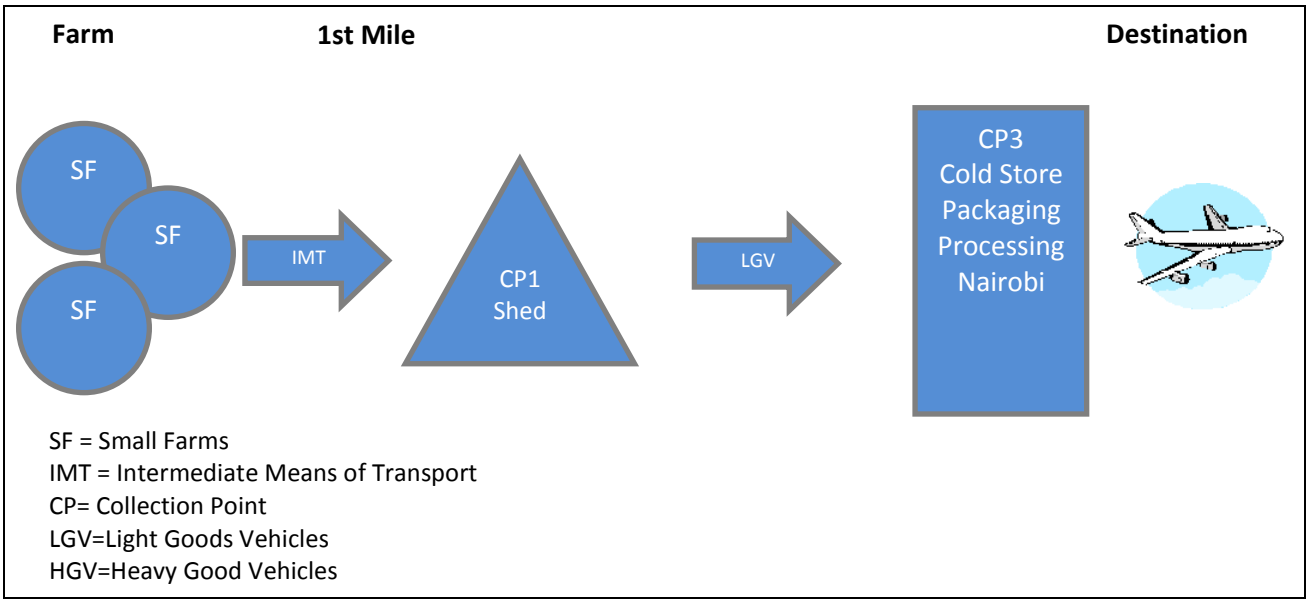


Figure 1: Three-stage transport chain for French Beans with Kangai Tisa

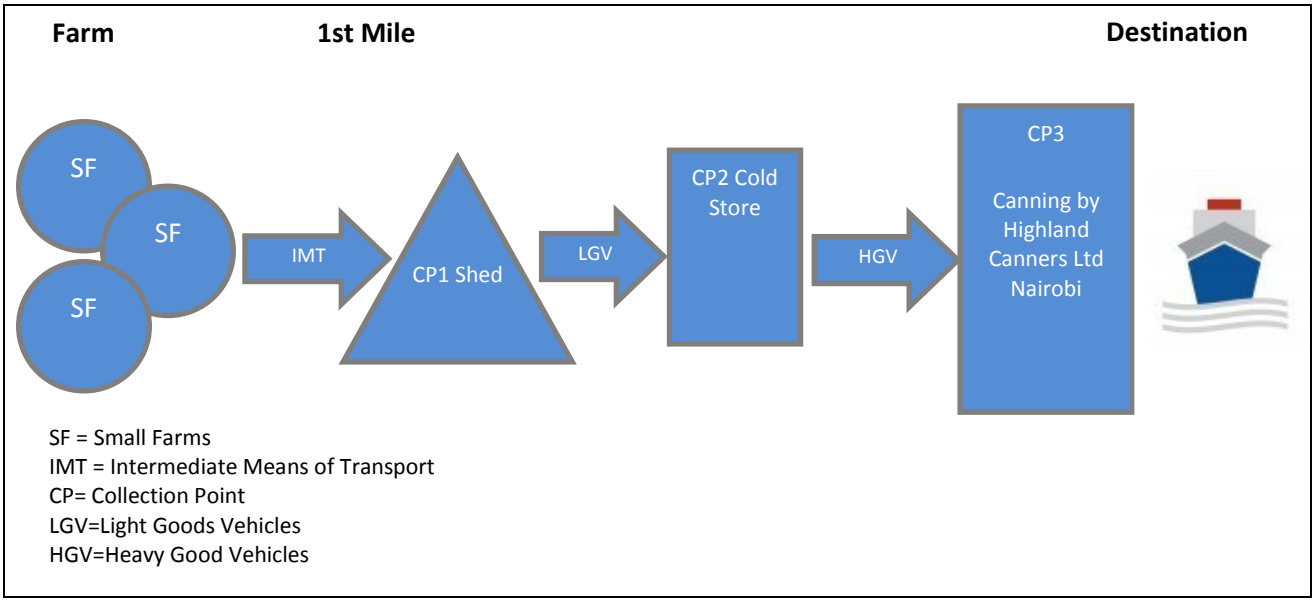


Figure 2: Four-stage transport chain for French Beans with Meru Greens

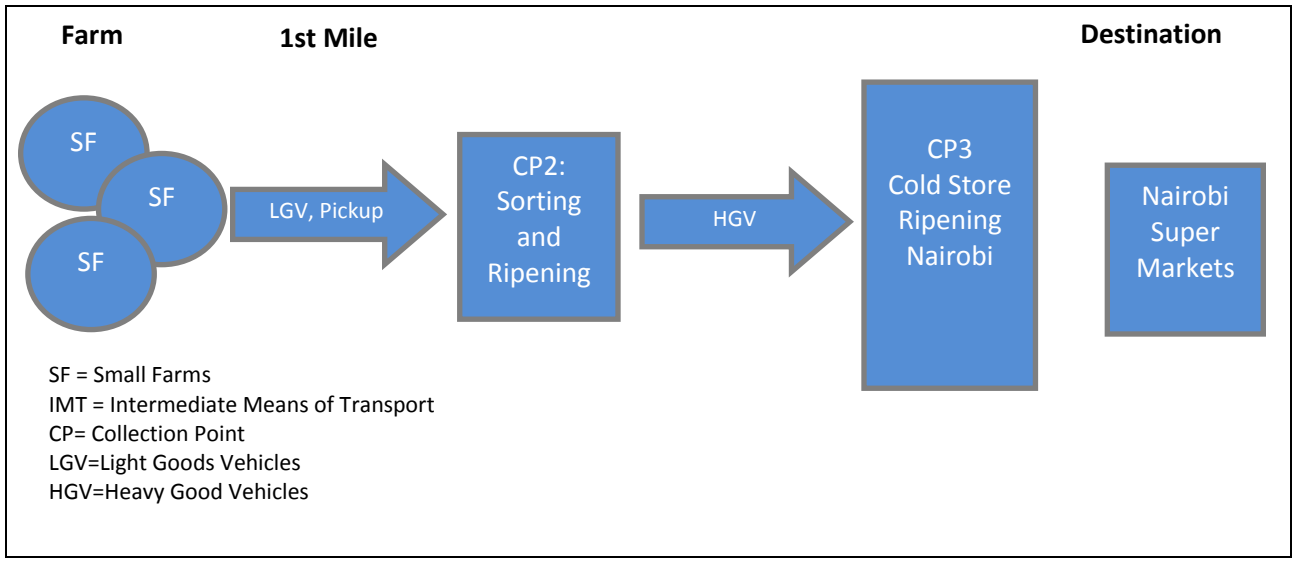


Figure 3: Three-stage transport chain for bananas of Mt Kenya Garden

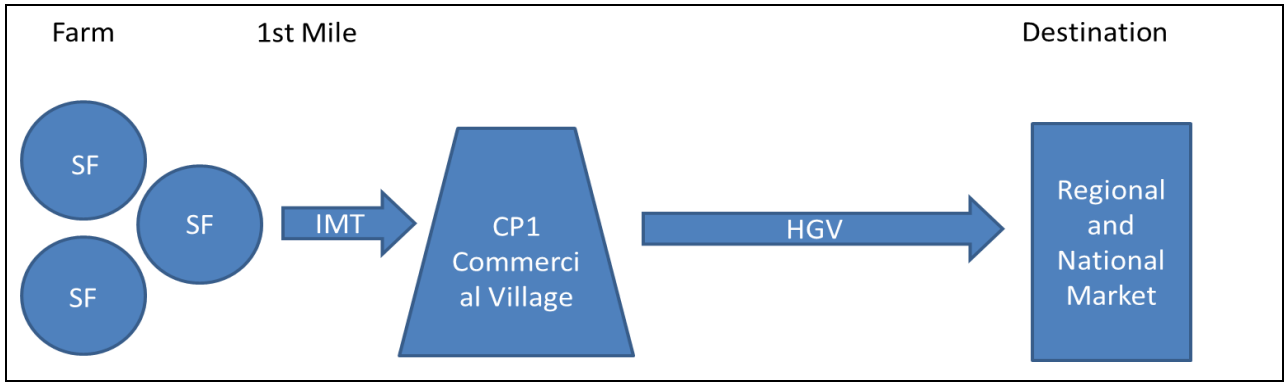


Figure 4: Two Stage Chain for onions produced by a cooperative in Nyeri (FARMCONCERN)

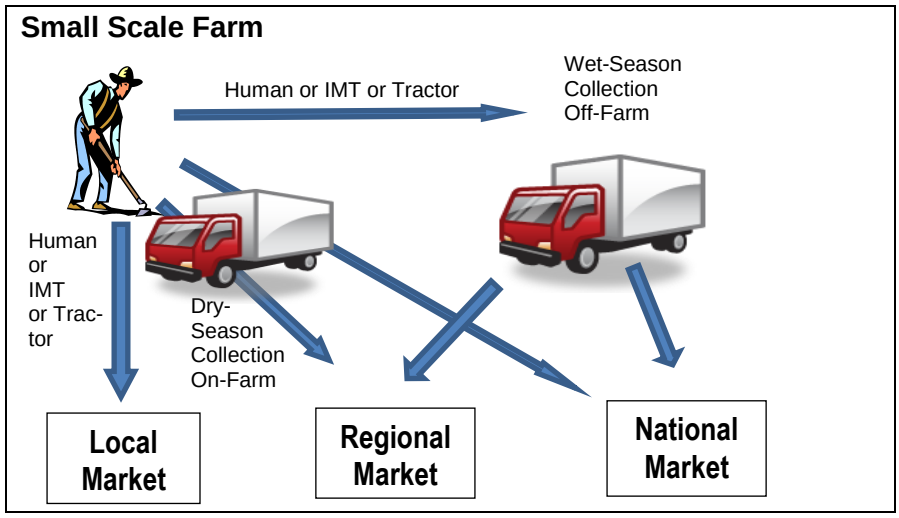


Figure 5: Mixed chain for uncoordinated broker-market for potatoes in Kinangop

3.2.2 Logistic Chains for medium and large farmers

Two value chains (Figure 6 and Figure 7) are provided by a medium and a large scale farms:

- The medium sized Goshen Farm (Figure 6) transports its french beans to grading sheds on the farm from where the products are transported by hired HGV to Nairobi. Since the trucks are not cooled transport takes place over night in order to avoid spoilage by heat. HCDA provides cold stores and grading and packaging space for the enterprise that ships its products with the highest quality to Europe and sells the lower quality in Nairobi's supermarkets.
- The large SUNRIPE farm (Figure 7) uses a similar logistic chain as described with Goshen Farm. However, trucks are refrigerated and the company owns its own cold store and packaging/processing units in Nairobi. The location is close to the international airport.

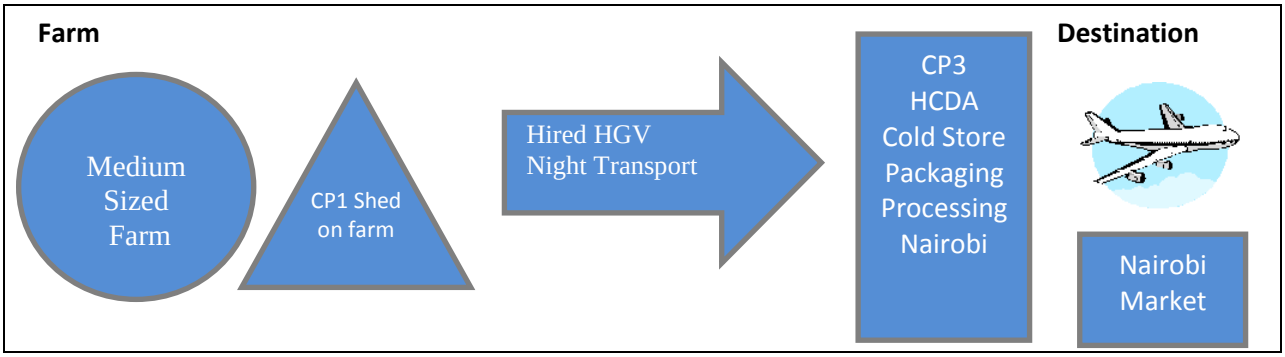


Figure 6: Three stage chain by medium sized Goshen Farm with exports of French Beans

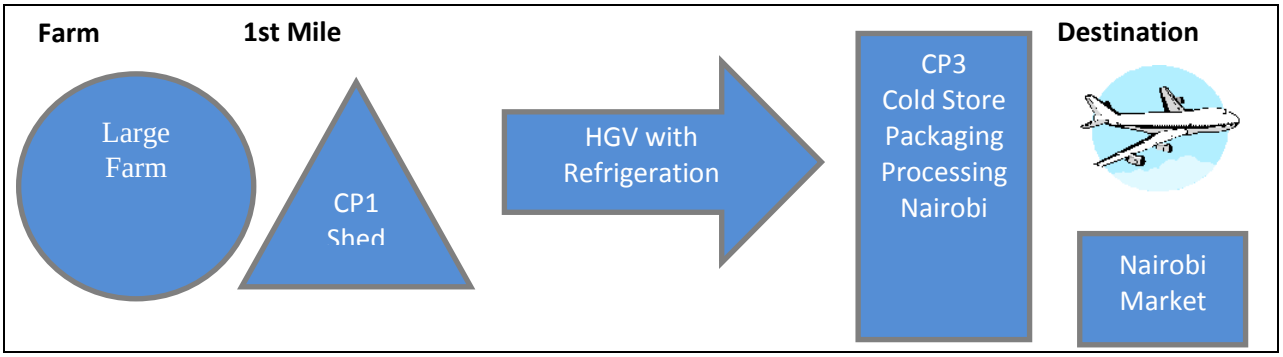


Figure 7: Large farm owned by SUNRIPE, refrigerated logistic chain for French Beans

Overall transport costs are determined by the distance the products have to be carried from the producers to the final consumers, which is shown in Figure 8. The length of the chain ranges between 65 kilometres for potatoes and 380 kilometres for bananas.

The logistics chain can be segmented into 3 parts. This consists of the *first mile*, representing the distance from the farm to a designated collection point or a market hub; a more detailed discussion of the *first mile* can be found in the section that follows. The *second transport* segment consisting of the distance covered by traders or transport companies to consolidate loads along a series of collection points and then onto a secondary market or storage point; and *a third logistic* section that operates after full consolidation of the produce and then onto the regional/national markets/airport termini.

From Figure 8 below the lengths of the various transport segments for the products in the study can be seen. SUNRIPE, a large scale producer has no *first mile* at all as the all the consolidation happens on the farm where produce is picked for direct transportation to the final depot at the airport. Only one company in the study, Mt Kenya Gardens has a second stage chain, which consists of transporting bananas from the *first mile* stage to its ripening depot in a regional hub before transport to the national markets in Nairobi. The chain covers the longest distance at approximately 300 kilometres. The Kinangop potato chain is short covering a distance of 90 kilometres to Nairobi (this distance needs verification)

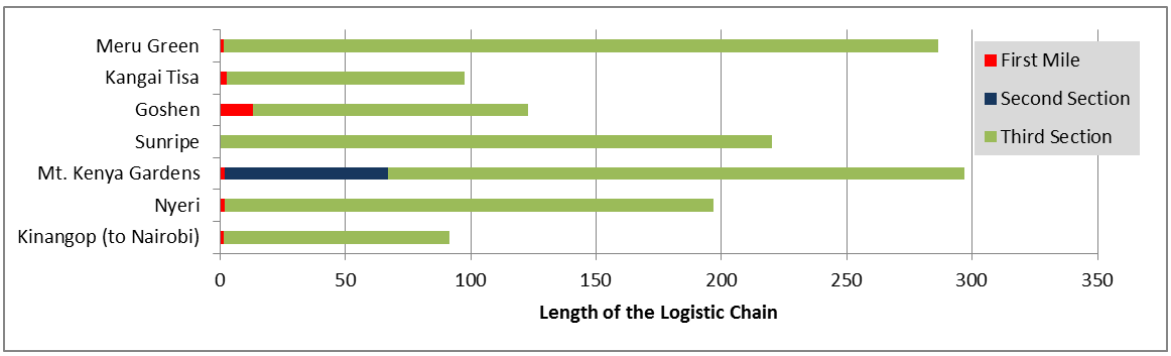


Figure 8: Length of logistics chains

3.2.3 First Mile Operations

The *first mile* is a term that is used analogous to the last mile in distribution systems that are usually the most expensive part of the transport chain. In the case of agricultural transport this term means the very first segment of a journey –in the context of small holder farmers - consisting of individual fragmented volumes transported from the farm to a collection point or a primary market.

In the context of rural transportation studies, the *first mile* is typically the segment beyond the rural road networks where non-motorised transport dominates. In agriculture, *the first mile*

transport is related to the first stage logistics of evacuating agricultural produce from the fields to the nearest commercial interface. The produce is gathered on the farms, and transported to a roadside collection point. Transport in this segment is conducted on local paths and tracks. Means of transport include head loading mainly among women, animal transport, bicycles and lately, motor cycles. Because of the low individual volumes transported and the poor condition of the road infrastructure, the *first mile* is the most inefficient in terms of travel speeds and transport costs.

For the farmers, their contribution to the logistics chain typically ends at the *first mile*. From here the second stage of the chain is taken over by traders, wholesale marketing companies or transport service providers. The second stage of the logistic may be organised as a circuit on routes with several first mile termini. This allows for consolidation of the loads from several collection points before onward transport to regional, national and international markets. Most of the 2nd stage logistics operate along rural access roads. This second stage ends when the freight passes the regional centre from where the third stage inter-urban transport begins.

In the current study, the *first mile* consists of human porterage, donkey carts, bicycles, ox-carts, motorcycles and in some cases, tractors and pick-up trucks. The transport costs on the first mile were closely linked to the mode of transport used as depicted in the Figure 9 below. Human porterage is the most expensive means of transport with hugely variable cost of between KSHS 1000 and 2500 per tonne-kilometre. A tremendous reduction of transport costs can be achieved by substituting human porterage with Intermediate Means of Transport (IMT) such as bicycles and motorcycles. For example in Meru a change from porterage to motorcycle was shown to reduce overall costs by roughly one third; in Mwea (Kangai Tisa) the shift from porterage to oxcart contributed to halving overall transport costs.

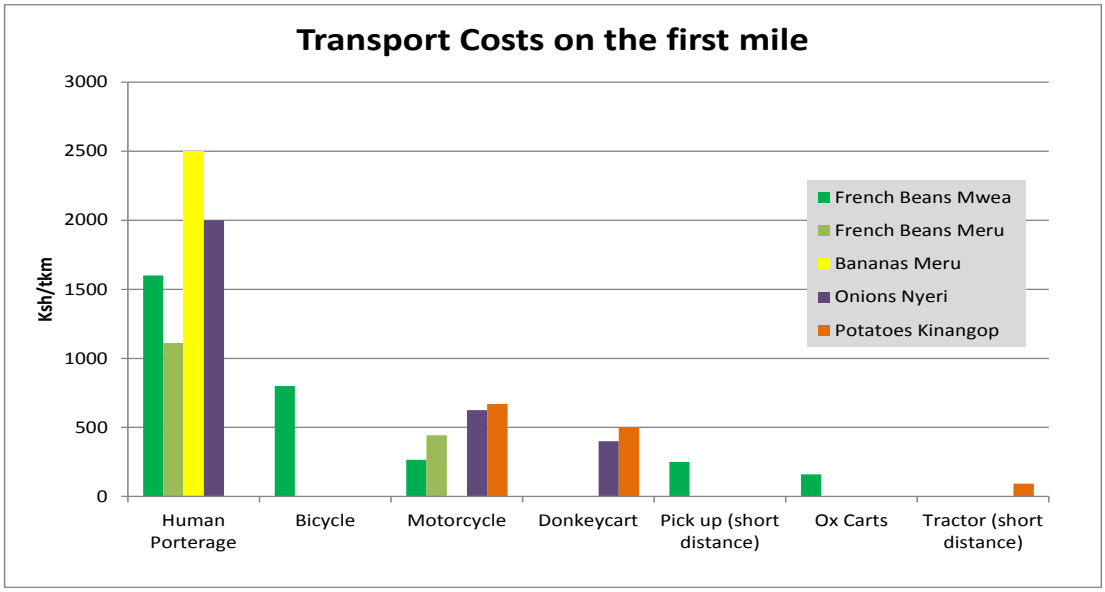


Figure 9: Transport costs on the 1st mile

Donkey or oxcarts are mainly used for larger loads or bulky products, such as onions and potatoes. An exception is Mwea where oxcarts are used to transport french beans. For heavy loads donkey carts and especially oxcarts are much cheaper than motorcycles.

Pickups and tractors are the cheapest means of transport for first mile when fully loaded. However, the constraint is their availability. Since investment costs for these means are high and depreciation is considerable, a constant usage is needed to justify the investments. In rural areas this is often not the case.

From the study, it was observed that there was no human porterage for potatoes owing to their bulky nature. Human porterage for Banana is most expensive, followed by onions, with French Beans being significantly lower.

The average length of the first mile transport segment ranges between 1.5 to 13 km. This makes up only 0.4% to 10.6% of the distance of the entire chain. However, the significance of the 1st mile becomes apparent when transport costs are assessed: the first mile can make up one fifth of the total transport costs of the chain as depicted in Figure 10 and may even rise up to 37%. Even if distances of the first mile are short, its transport costs can make up a considerable share of the overall transport costs. This is consistent with findings from developed countries where freight costs for *last mile* distribution to retail networks can contribute up-to 28% of the total transport costs.

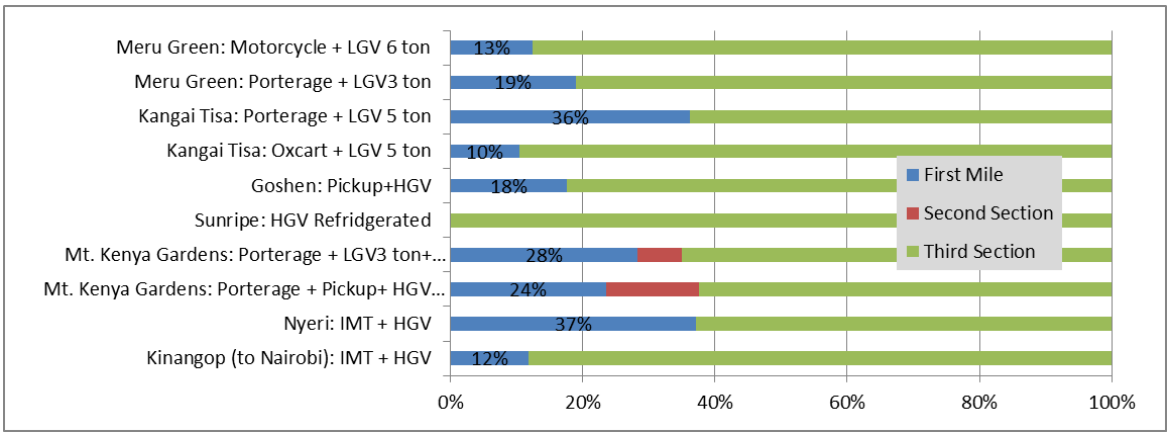


Figure 10: Cost share of transport sections of the logistic chains

The conventional freight logistics planning would only analyse the costs of the motorised chain and try to improve its cost efficiency. From this study, it clear that a wider approach taking into account the entire chain, would help improve the logistics efficiency by reducing the bottlenecks of the first mile transport. The first mile costs are mainly borne by the producers and they can erode the farmer's income significantly

3.2.4 Operations beyond the First Mile

A different picture is produced if long distance transport costs are analysed as presented on Figure 11 below. The graph shows that the payload of the vehicle on the horizontal axis, while the product types are presented in different colours, such as green for beans, yellow for bananas, aubergine for onions and brown for potatoes. The graph shows unsurprisingly, that with increasing payload, unit transport costs decrease. A fully loaded 8-ton HGV (High Goods Vehicle) may cost only a half the transport cost of a one tonne pick-up. The study findings indicate that a full load truck traversing longer distances reduces transport costs. This is for example the case for the large farm SUNRIPE in Naivasha and Meru Greens compared to Machakos (Goshen) and Mwea (Kangai Tisa, 1st Mile case). It is also worth noting that the third stage of the logistics chain is characterised by good quality inter-urban or national trunk roads, thus significantly reducing the transport costs. However, it was noted that during the rains, the HGVs may have difficulties going through rural access roads to collect at the 1st mile. This may increase transport costs significantly.

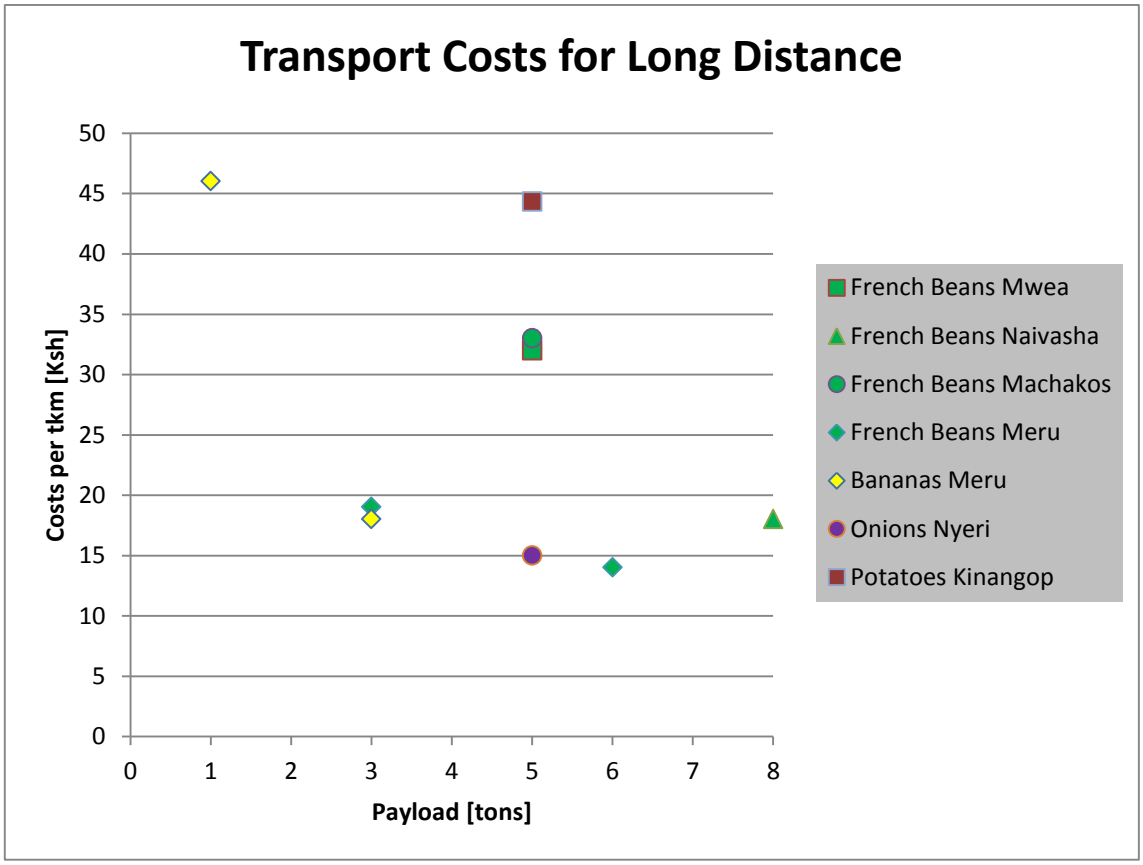


Figure 11: Transport costs for long distance transport

Even though a larger vehicle is used to transport the potatoes from Kinangop, transport costs reported are high. This is attributed to two main reasons

- The roads are generally in a bad condition,
- Transport is conducted by private brokers who operate as quasi monopolies. They charge excessive transport rates to cover for high local running costs and as insurance against volatility and uncertainty of prices at destination markets.

The case of onions in Nyeri where farmers coordinate their production and marketing shows that even in a steep and difficult transport terrain good organisation of the marketing system saves heavy local running for traders and this can drastically reduce the transport cost.

3.2.5 Overall economic performance of the chains

Figure 12 shows how much an exporter has to spend to transport their product to the market. Costs range between 5,000 and 21,000 Ksh per ton transported. Of course this price is dominated by the distance, but here as well the importance of the 1st Mile may be easily perceived.

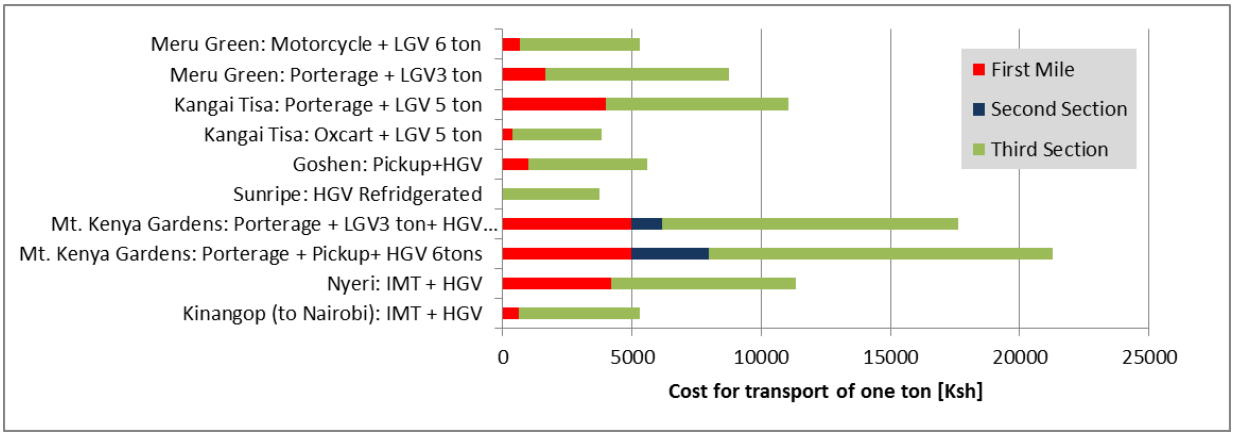


Figure 12: Costs to transport one ton on the logistic chains

However, the cost efficiency of the chains, depicted in Figure 13, gives a better picture of the competitiveness. For the researched chains, it ranges between 16 and 72 Ksh/t-km. Highest specific costs are generated in Mwea for Kangai Tisa, where human porterage makes up 36% of total transport costs. This again demonstrates the importance of the first mile. The graph shows as well, that the choice of the mode on the first mile has a considerable impact on overall costs. For example in Mwea (Kangai Tisa) the shift from porterage to oxcart can half overall transport costs; in Meru the change from porterage to motorcycle can reduce overall costs by roughly one third.

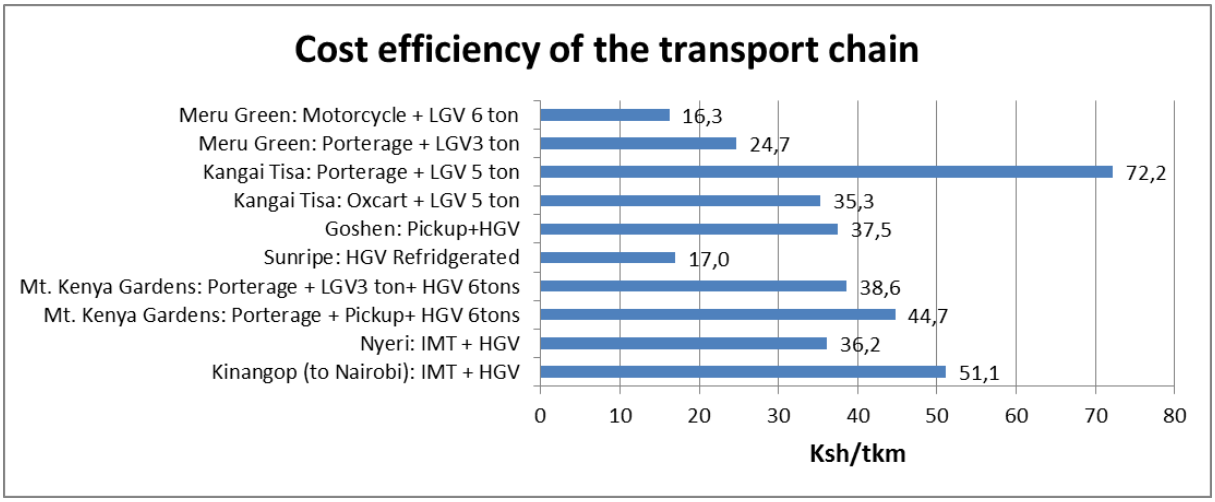


Figure 13: Overall cost efficiency of the chains

The conventional approach would only analyse the costs of the motorised chain and try to improve its cost efficiency. A wider approach taking into account the first mile, finds that costs to transport products to collection points can make up a considerable share and thus influence over-

all costs considerably. These costs are mainly carried by the producers and thus reduce farmer's income significantly.

3.2.6 Value added

The common form of value addition across all the value chains consists of: production, sorting and grading, packaging, processing, transporting plus the profit margins. For onions and potatoes, on farm value addition consists of sorting out into varieties types and sizes, bulk-packaging and transfer to on-farm or roadside collection points. Further transportation is undertaken by the traders who deliver in bulk to various national markets where separate distribution chains take over.

Value addition is described using the example of french beans for consumption on the national market and for export to Europe. The wholesale price for French Beans on the national Kenya market ranges between Kshs 50 and 90 per kg. On the international markets wholesale prices of between Kshs 130 and 210 per kg may be achieved. For the purpose of this study, an average price of 70 Kshs/kg for national markets and 170 Ksh/ kg for export markets has been assumed. Figure 14 below shows the national and international thresholds. Profit margins vary considerably. Clearly, international markets are extremely profitable but only for those that can access it and manage to stick to the stringent Global GAP regulations.

Production costs can be expressed through the farm-gate price, which farmers receive when selling their products at the farm-gate or at the grading shed. For French beans, these prices range between Kshs 30 and 55 per kg as depicted in Figure 14. Transport cost range between Kshs 3.7 and 5.9 per kg. Thus, transport only makes up a small share of the overall costs.

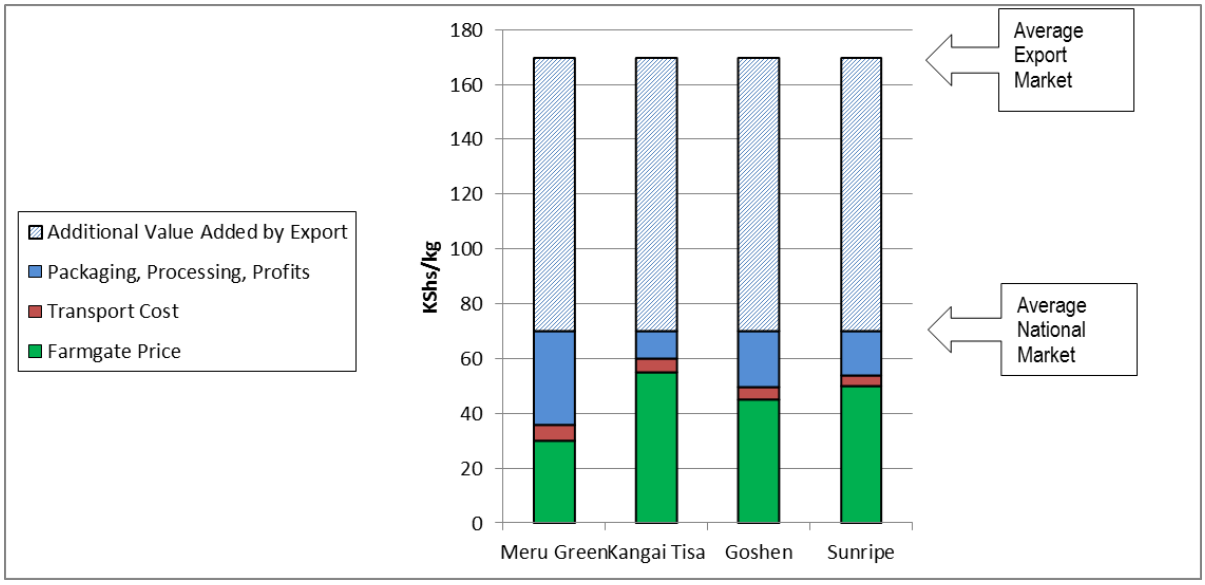


Figure 14: Value added to French Beans from farm to international market.

If export to the national wholesale market at average prices is assumed, the revenues for the farmers amount to between 43% and 79% of wholesale price (Figure 15). Transport cost only amount between 3 and 5%. The remaining items contain the profit margin and the costs of the processing, packaging and grading. These vary between 5% and 16% of wholesale price. Thus, for the national markets profit margins are rather low. The latter rises considerably, if international markets are targeted. Profit margins may increase up to 79%. However, it has to be taken into account, that international markets only accept the highest quality. Even though profit margins seem to be low for the exporters, it is highly profitable to sell lower quality products to the national market instead of throwing it away.

Exporters reported that the international market is far from exhaustion. Thus, business growth for the french bean commodity is only a matter of producing more high quality produce and transporting them to the export hubs.

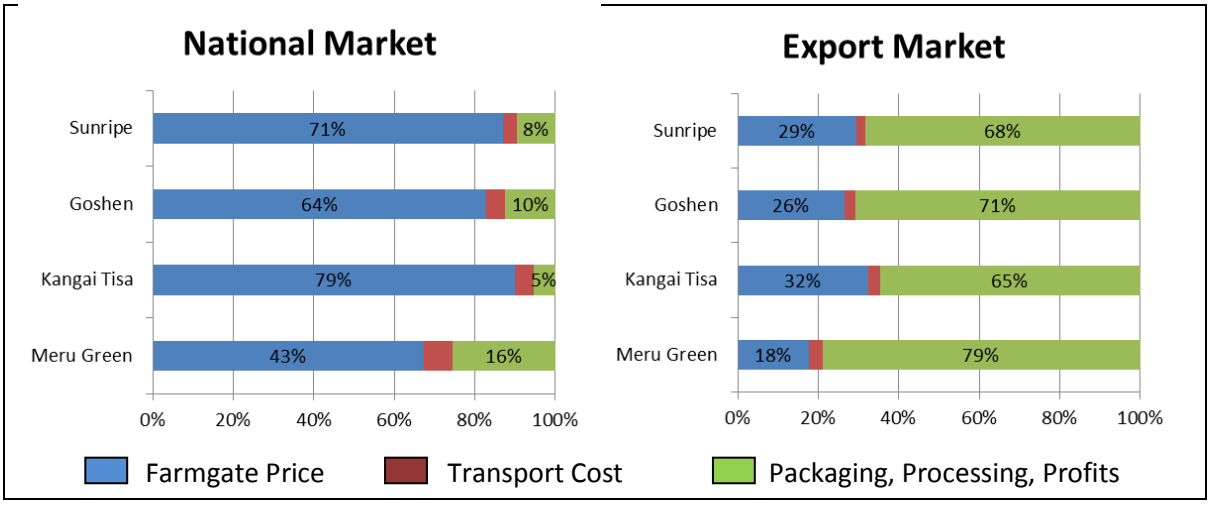


Figure 15: Share of value added for marketing of French Beans

3.2.7 Loss of produce

Experience from other countries shows, that a considerable amount of the products harvested a lost before or during the transport to markets. Diverging reports estimate this amount up to 70%. In the horticultural sector post-harvest losses make up 30-40%, which is mainly due to bad roads and inadequate infrastructure for post-harvest handling of produce.

Theses loses are mainly during are mainly during storage, packaging, transport and marketing (retailing, wholesaling, open market etc). This study tried to analyse the losses, but was not able to quantify losses for all the chains researched. This would require a quantitative survey of regional production, processing and marketing over a longer period, especially taking into account weather and road conditions. Nevertheless, a number of empirical observations shall be presented:

Very little loss is observed in regard to onions, banana and potato value chains as the harvests are not prone to drastic perishability. This is unlike french beans which must be processed or eaten within weeks. Onions if appropriately dried while still on farm and into storage can last up to 6 months if kept away from contact with moisture. Potatoes can be stored up to 8 months if kept under the correct temperature and relative humidity. This is not normally possible for potato farmers in Kenya. After at most 2 months where natural night cold can be used to keep potatoes cool, potatoes in storage begin to shoot and lose moisture, becoming spongy in texture.

On losses companies interviewed reported as follows:

- **Goshen Farm**: On the core farm about 25 % of the produce does not meet the export standard criteria. Out of the 25% that is not exportable, 15% goes to the national market and 10% is "waste", given for free to animal owners who frequent the pack house. Among the small scale farmers contracted by Goshen, between 40- 50% of the produce is lost due to poor handling by the harvesters. Harvesters are paid by the kilo, against a weight received before sorting. A wasteful harvester can harvest the pods which are not ready or those that are over-mature, in the interest of raising more kilos. The harvesting process can also drop many of the flowers, sacrificing the formation of pods in future. This situation was reported by Kangai Tisa small scale farmers, as well.

- **SUNRIPE**: The company loses approximately one quarter of its produce as they have set themselves high standards. They only sell a very small proportion of the non-exportable quality to the local market (2%) with the rest being given away as fodder. Once produce is on the grading table, trimming of the ends can waste another 25% of the produce before packing.

- **Meru Greens**: Only 10% of French Beans is lost. This is because they target primarily the national canning market (60%) that has less stringent market standards.

- **Mt Kenya Gardens:** The company picks fruits from on-farm collection points. They normally will sort produce by grade and assign different prices then leave undersize fruit to the farmer. A farmer may sell such to other buyers who may come around buying 'rejects'. These may end-up in the local or even national market. Damages to fruit during transport may reach 30%, depending on quality of packing (usually in crates), level of maturity or ripeness or the roughness of the road condition.

3.2.8 Gender Dimensions in Value Chains

Women in developing countries are heavily involved in agriculture. Despite this increased involvement, significant gender disparities remain. Typically, women face gender-intensified constraints in the multiple roles they play in the economy – as producers, workers, traders and users

of public services. This limits the opportunities and benefits that women can gain from economic activities and imposes significant development costs on economies and societies.

Meru Greens has contracted about 1,500 small scale French bean farmers scattered in about 50Km radius from its operational base. In Meru Greens the study showed that women play a dominant role. Men tend to play a bigger role in preparation of the land for planting, using oxen or hoes, up to the stage of planting. Women tend to do the seeding of the farms and weeding, men coming in later to lay irrigation lines and to do spraying. Depending on the dynamics of a given family it is not unusual in this region to see a man or two assisting the wife with seeding or weeding.

> The fresh bean industry in general employs 45,000 to 60,000 people, of whom an estimated 60 per cent are women, in commercial farms, processing, and logistics operations. It is estimated that nearly half or 44 percent of Kenya's smallholder households are managed by women. Women are active at every point in the food chain and are often responsible for the household farming activities under which most of the green bean farms fall. At the pack houses, gender roles become distinct again with women dominating handling sorting, grading and quality control. Men will often do manually demanding tasks like land preparation, irrigation, spraying, loading and offloading trucks.
>
> Source: SNV 2012

Kangai Tisa, is an umbrella organization composed of the officials or representatives of thirteen groups of french bean growing farmers in Mwea area. It was noted in Kangai Tisa group that women pick and transport produce to the processing centre. Men operated / owned the ox carts within the area. A large percentage of workers is women. Women tend to plant, weed and harvest french beans. Men tend to participate in land preparation, crop-spraying (using knapsack sprayers) and the highly labour intensive flood irrigation Practice.

Goshen Farm is owned and operated by a young entrepreneur. The picking of French beans within this medium sized farm is carried out by women. When asked about the high numbers of women working the farms, one of the women quipped:

> "Don't you know that nowadays women are the men in their homes? The men come home drunk and sleep under the bed. We have become the bread winners in our homes. We have even taken their side of the bed. These days it is we women who sleep on the side nearer the door. Yes, these days we are the last ones into the bed and the first ones out (in the morning). Often you just leave him snoring because you cannot afford to miss the early morning wholesale market of the day".
>
> Farm working Women in Mwea

SUNRIPE is a large Kenyan owned enterprise with has four large farms in Naivasha area of the Rift Valley in Kenya. SUNRIPE employs 500 people of which women are 80% and men are 20%. The explanation given for the higher percentage of women is because they are more patient and hence handle the delicate produce without damaging it.

Farm Concern International (FCI) is an agricultural marketing organization that endeavours to empower vulnerable smallholder farmers across the value chain, from production to marketing. Women make over 60% of farmers. Men dominate the transport scene while women tend to stay on farm harvesting onions.

Mr. David Kung'u who is in his early 70's has seen it all. He narrated to us how women were taken advantage of in potato transportation in Kinangop area. The traders knew women are not able to carry a 100kg bag of bulky potatoes from the farm to the market. Hence they would not participate in transport due to the heavy nature of the produce. Men came in with tractors, carts and motorbikes. This way men dictated the price, it should be noted they were low prices, hence the women made losses.

Kinangop region has unique characteristics for high potential potato and cabbage farming. Women traders dominate the trading systems for potatoes. Women stay on farm harvesting potatoes while men are involved in transport from farm to collection point.

4 Planning of New High Value Chains

There is recognition that a new business approach is needed to accelerate agricultural development in Africa and other developing countries. Kenya's Vision 2030 positions the agricultural sector as a key driver for delivering the 10 per cent annual economic growth rate. The agricultural sector has set the target of achieving an average growth rate of 7 per cent by 2015. A key thrust of the current Agricultural Sector Development Strategy [2010-2020] is to increase productivity, commercialization and competitiveness of agricultural commodities and enterprises. Currently, many agricultural commodities get to the market through long and crowded value channels, making them inefficient, slow and unresponsive to needs of producers and consumers. Improving the performance and diversifying the range of agricultural value chains is being given emphasis by the Government and various development agencies.

The value chain approach is a business-oriented process aiming at optimizing value at all stages of agricultural commodity starting with the provision of inputs, primary production, transport, processing, trade and consumption. The objective of Value Chain Development (VCD) is to make markets more efficient by overcoming highly fragmented marketing relations, improving access to services, information and inputs, balancing asymmetric distribution of information among the players and consequently reducing transaction costs, wastage rates and assuring product quality.

The decentralization process that is being implemented in Kenya is accompanied with new investment resources in rural areas that can lead to emergence of new markets and development new infrastructure to support improvements in value chain services. There is a recognized risk that as modern markets replaces traditional markets, small retail outlets for small-scale farmers may be reduced. With this comes the risk of increasing poverty, not just for those producers, but for small scale retailers of agricultural commodities. But with the right sort of support, small-scale producers can be efficient and reliable providers of quality produce.

4.1 Key components for value chain development

Value chain information: A starting point for the development of value chains is an information system that enables small scale farmers to be aware of the types and quality of products demanded by the emerging markets. Issues of reliability of supply and quality and safety standards are important pillars of emerging agricultural value chains. Continuous flow of information is important in enabling farmers stay abreast of these market requirements. In addition, farmers need access to information that diversifies their options for collective selling and buying of inputs. This was observed in the case of the onion farmers within the framework of Commercial Village Model (CVM).

Information Communication Technologies (ICTs) are emerging as an important tool for helping develop linkages among the various stakeholders in a value chain. Different types of ICT platforms have different strengths and weaknesses when applied to particular interventions. It is important to evaluate the various platforms that are designed for agribusiness and to identify appropriate ones for different contexts.

Coordination of stakeholders: Efficient value chains require seamless operations at all stages of the chain. This requires all the actors to collaborate and work together. Collaboration is required among policy-makers researchers and practitioners; across different industry sectors; and among government, business and civil society actors. Successful value chains depend on the ability of all chain actors to communicate, coordinate and collaborate

Institutions and policies: he value chain process brings into a play a variety of actors that must work together in a coordinated, predictable and consistent way. Value chains as a business require an environment where it is possible for contracts to be signed and upheld, where innovation is incentivized and opportunities for new investments made possible. This requires development of the necessary enabling policies that can support decentralized capacities for planning and supporting the necessary partnerships needed for value chain development

Investments in core infrastructure and services: Value chain development needs to be supported by backbone infrastructure located in strategic places. This for example may consist of: Good quality and accessible sheds at first mile collection points. These need to have good surfaces for produce grading, cooling using technologies, good sanitary and waste disposal facilities. Good rural roads connecting the first mile circuits are also important. Strategically located cooling facilities at key hubs are also important in ensuring that produce is well preserved before being transported to terminal markets. These investments can be done through public/private partnerships.

A general framework for assessing feasibility is proposed as follows:

Production assessment	Business model assessment	Transport/logistics characteristics
• Agro-ecological zones in the area crop types • Topography • Scale of production (small, medium, large scale) • Farming practices (traditional, transitional, modern) • Input supply system	• Market niche (local, regional, national, international) • Transport costs • Production costs • Marketing costs • Financing models for every stage of the chain (production, value addition, infrastructure etc)	• Transport infrastructure condition including 1st mile accessibility • Overall connectivity of the chain • Location of strategic infrastructure • Length of the logistics chain • Means of transport for different segments of the chain • Product characteristics (bulky, perishable etc

Table 5: General framework for assessing feasibility of Value Chains

4.2 Regional planning framework for agricultural value chains

4.2.1 Regional development policies and institutions in Kenya

Whereas national value chain development focuses on aspects such as improved production, extension services, farmer training, national infrastructure (road/rail network, electricity), marketing infrastructure (on-farm storage, aggregation facilities) and land tenure systems, regional planning for value chains would focus on having an integrated oversight of all these elements and bringing them within a decentralised policy and planning framework in order to optimise the location of relevant investments.

Regional development policy impact on value chains may be complicated by aspects such as the uneven development stages of the various regions / counties in Kenya. There are parts of the country which have high agricultural potential but lack infrastructure. The varying stages of value chain development even for the same crop across the regions implies some producers benefit more than others. There is need therefore to adopt appropriate regional planning strategies aimed at addressing imbalances and especially access to markets including financial resources to support value chain component improvement.

According to UNECA (2009), the improvement of regional integration within and outside national boundaries improves the marketing of agricultural products. This is achieved through greater integration of regional markets, whereby producers, processors and distributors collaborate to manage the commodity delivery systems, and hence counteract the negative impact of imperfect price transmission and poor infrastructure on marketing margins (Conforti and Sarris, 2007). Regional markets also provide opportunities for upgrading and diversification that come with shared facilities such as distribution channels and technical facilities, and the transfer of skills around a cluster of related and mutually reinforcing business units. Regional markets are by themselves closed niches, which not only increase market access for producers, but also expand choice of commodities for consumers within the region. In addition, regional value chains could foster na-

tional and regional food security through the development and management of increased production, transport, storage and marketing of food crops (UNECA, pp: 150-151). The challenge however remains that most smallholder farmers cannot improve without support from institutions (national and international) that recognize their products as key to regional as well as global value chains. In Kenya just like many other African countries, farmers are disconnected from regional and global markets primarily because of the failure to develop agro-industries and agribusinesses and the necessary infrastructure and policies for linking them to the market. Further, UNECA observes that the value of traditional and non-traditional exports to international markets would increase if domestic and intra-regional markets were taken into account, contributing to rapid job creation, food security and poverty reduction.

Developing and improving regional value chains for agricultural commodities would require the building of public-private partnerships to create an environment that is conducive to both the profitability and the security of private investment. Internationally the NEPAD/CAADP framework presents a classic example of a partnership that not only builds markets within sub-regions, but also markets across Africa.

Through CAADP, member countries are able to increase the competitiveness of their production and businesses that are failing to break into regional markets because of infrastructure problems and low volume of primary materials from agriculture. The CAADP framework can provide a basis for equitable and mutually acceptable benefit sharing, which is essential for regional value chain development (Taylor, 2005).

Within national boundaries, multiple stakeholder platforms integrating actors such as the National Agricultural or Horticultural Organisations, farmer associations, cooperatives, financial institutions, market agents (processors, traders and buyers) and service providers such as information and communications companies are needed to support farmer and value chain related activities. Their efficiency and expected contributions are depended on prevailing socio-economic and legal / institutional frameworks. Governments therefore have an important role to play by making it easier for farmers to legally form associations, by introducing the “rules of the game” in terms of transparency and accountability and through capacity-building programs. An even larger role belongs to the producer organizations and NGOs in providing institutional support to the emerging and existing organisations by way of developing business efficiency, financing training and capacity building for members, and developing viable business ventures.

Regional Planning, Agricultural Value Chains, Actors, and Agriculture Sector Development Strategy (ASDS) in Kenya

Under the Agricultural Sector Development Strategy – ASDS (2010–2020), the responsibilities for agricultural development are spread across the sector ministries such as those responsible for roads, local authorities, administration, health, education, trade and industry, and finance. The ASDS uses a sector-wide approach in which government ministries, the private sector and development partners have distinct roles to play at national, regional and sub-regional levels. Collaborating ministries provide an enabling environment for agriculture to thrive through infrastructure development such as roads, electricity, availing appropriate technologies, negotiating favourable trade conditions for Kenya's agricultural produce and ensuring a healthy farming population.

The ASDS is supported by thematic working groups (TWGs) namely; legal, regulatory and parastatal reforms, research and extension, agribusiness, value addition and marketing, inputs and financial services, food and nutrition security policy and programmes, environment sustainable land and natural resources management. TWG members include representatives from the private sector, NGOs and universities, directors / senior Government officers from the sector ministries and development partners. Each TWG is chaired by a representative from the private sector, and convened by directors from the sector ministries. ASCU provides the secretariat.

Actors:

Private Sector Institutions through the Kenya Private Sector Alliance (KEPSA) have been organized along sector boards to mirror the public sector arrangements and engage on issues. Key players within the agricultural sector include KENFAP, which represents agricultural producers, and KNFC, which handles the commercial arm of agriculture through the cooperative movement. Other private sector institutions include processors, marketing agencies and farm input dealers that, through their profit-oriented nature, have survived but can neither be regarded as strong nor organized players. The private sector also plays a key role in providing physical and social infrastructure, production, processing, input and output marketing, imports and exports, providing financial services and goods and services.

Development Partners and Regional Cooperation such as bilateral and multilateral donors supports value chains through financing Kenya's agricultural budget. Development partners continue to play an important role, particularly in spearheading new initiatives and carrying out pilot projects which for example provide innovative extension services and those that emphasize aspects of value addition and market orientation. Kenya is a member of regional and continental cooperation bodies such as the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA). These bodies provide opportunities for expanding Kenya's markets for goods and services. The New Partnership for Africa's Development (NEPAD) and the launching in Kenya of the Comprehensive African Agricultural Development Programme (CAADP) in 2006, a common strategic framework for agricultural policy development in Africa, are important initiatives.

Farmer Organizations

Farmer organizations include cooperatives societies, farmer unions and federations, commodity associations, enterprise-based groups and community-based organizations. These organizations are important economic entities established to enhance farmer representation, to lobby for and advocate on their behalf at various levels, and to make farmer needs and demands known to service providers. These organizations have an impact on the production and marketing systems and therefore play a key role in empowering farmers and allow them to benefit from economies of scale.

Other Non-State Actors

The civil society groups including NGOs, community- and faith-based organisations support farmers and other actors by empowering them to participate more effectively in implementing the Government's agricultural policies and strategies.

4.2.2 Regional planning approaches for Value Chains

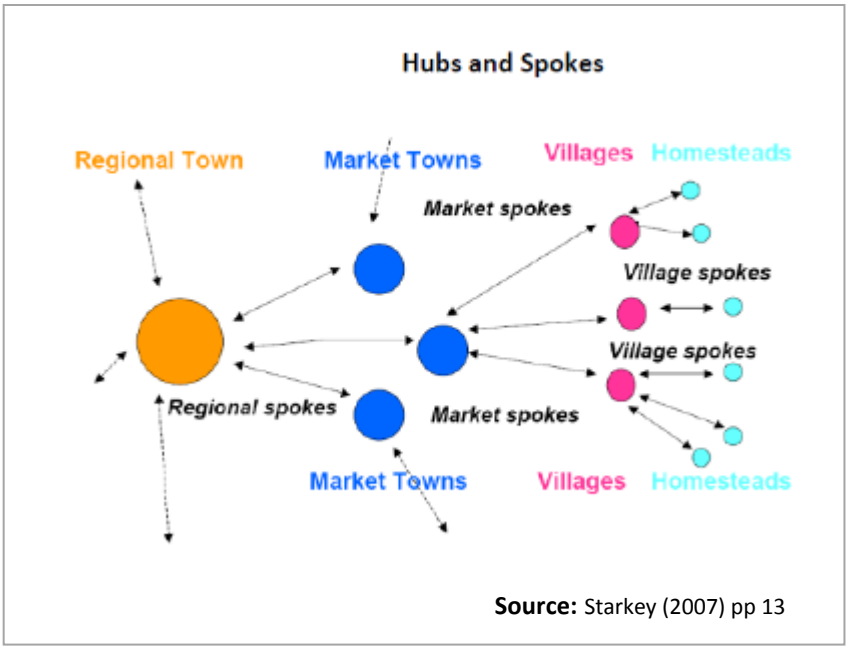
Supply logistics and information flow from consumers (market) to producers are key elements in determining the efficiency of an agricultural value chain. The market for example has very specific requirements that are often not known to many producers. This is particularly so with the international export markets. Unless local enterprises are able to meet market (national and international) requirements, they will remain closed to them. Therefore the compliance with market requirements and demand conditions is an important pre-condition for local enterprises and sectors to successfully integrate themselves into markets and become more competitive. For producers the efficiency of logistic and information systems at local and regional level remains crucial to their competiveness.

Regional planning approaches need to provide infrastructure especially for producers to understand; i) the main market requirements ii) whether they are complying with them, iii) why they do not comply and iv) how they could meet these requirements. The role of various actors (government and non-government) at local and regional level is important. The government may be responsible for providing good road and communication links between producing areas and markets. This may also be extended to markets outside national boundaries. At local level, non-governmental organisations, farmer groups and local government agencies may provide resources to maintain infrastructure serving farmers. Regarding information, the government may develop infrastructure at national level to capture market dynamics and consumer needs and requirements. The Kenya Agricultural Commodity Exchange Limited (KACE) which is a private sector initiative to facilitate competitive and efficient trade in agricultural commodities, provide reliable and timely marketing information and intelligence, provide a transparent and competitive market price discovery mechanism and harness and apply information and communication technologies (ICTs) for facilitating trade and information access and use in Kenya and across East Africa region.

The process of globalization is reducing the gaps that originally existed in many markets by linking local producers to regional and international markets. Farmers and producers have improved market access in addition to competition because foreign goods and services also have free access to Kenyan / African markets. For local products to compete favourably, governments and non-government actors need to address challenges across the agricultural value chains. These may be related to logistics or access to information as mentioned earlier.

Better regional planning and interventions may lead to competitive farmers and agro-processers and better returns. Currently owing to increased competition because of globalization, producers are getting lower returns as they lag behind their competitors in innovation and the ability to set their products apart. According to FAO (2003), the major constraints in Africa are poor infrastructure, limited research and technology which, when improved, could increase producer returns and income from agricultural commodities by lowering production and transaction costs by more than 50 per cent.

The spatial setting and hierarchy of nodes and markets within a region and country provides for the distribution of goods and services for its catchment area. The nodes (villages, markets, towns, cities) are linked by transport networks. These networks facilitate the movement of goods and information across a region. Efficient links and networks lead to better flows of goods and services leading to competitive value chains. Regional planning initiatives require taking into account factors that support efficient flow of goods and services between production points and markets. Starkey (2007) describes the nodes and networks linking them as hubs and spokes (see Figure 16). The hubs are arranged in space depending on their level of provision of goods and services. Nearer the production areas are villages and rural markets from where farmers are able to obtain lower level of goods. Several markets are serviced by a higher order hub, in this case a town. Cities which are higher in the hierarchy serve several regional hubs. However, cities may be described as regional hubs depending on the scale of enquiry.



Source: Starkey (2007) pp 13

Figure 16: Hubs and spokes

National governments may support regional planning through the development of appropriate regional as well as integrated rural development strategies. In South Africa for example, the South African Rural Transport Strategy defines a number of policy actions to achieve better linkages between the hubs and production areas. The Regional Master Plan, in addition provides for i) the endowment of central locations, ii) for their goods and services offered; and iii) for the quality of the transport links connecting the hubs / centres. Table 6 gives an overview on the endowment of central locations as laid down in the South African Rural Transport Strategy. Additionally, transport standards and other technical specifications of rural infrastructures are to be catered for by the central governments. Central government through decentralization and devolution programmes ensures local level planning is carried out by local actors including farmers and civil

society. The participation of local stakeholders, from government, administration, private business and other non-government organizations is essential for the sustainability of the plans.

Central Location	Function	Facilities for Traditional Supply Chains	Facilities for Modern Supply Chains	Communications Facilities
Satellite Centre	Buying point Trans-shipment hub	Short storage facilities Loading facilities	Pre-cooling facilities	Telephone Fax
Multi Purpose Rural Service Centre	Local market Trans-shipment hub	Storage facilities Loading facilities Agricultural Extension Services Logistics Procurement Agency	Processing units Cooling and Refrigeration facilities Packaging houses Container handling	Telephone Fax Internet
Major Rural Service Centre	District market Trans-shipment hub	Additional to the above: Transport brokering service		

Table 6: Central locations and endowment as in the South African Rural Transport Strategy

According to Sieber (2009), at the regional level, conventional and modern transport chains may be planned using the approach of basic access provided by multimodal transport, embedded in the concept of central locations and combined with modern communication infrastructures. Central locations form a system of rural development nodes that serve as rural hubs for trans-shipment (see Figure 17). The first mile is transported by IMT using low cost tracks and roads. In Rural Hubs cargoes are trans-shipped onto motorized goods vehicles, from where they may use well maintained rural roads. The rural hubs are placed in central locations that function as buying points or local markets and provide information, communication technologies (ICT) services for rural producers. In these central locations facilities for cooling, refrigeration, processing and packaging may be provided for modern supply chains. Superior centres may additionally provide transport hiring services. For regional planning an interdisciplinary approach and the involvement of stakeholders, especially the private business sector is essential.

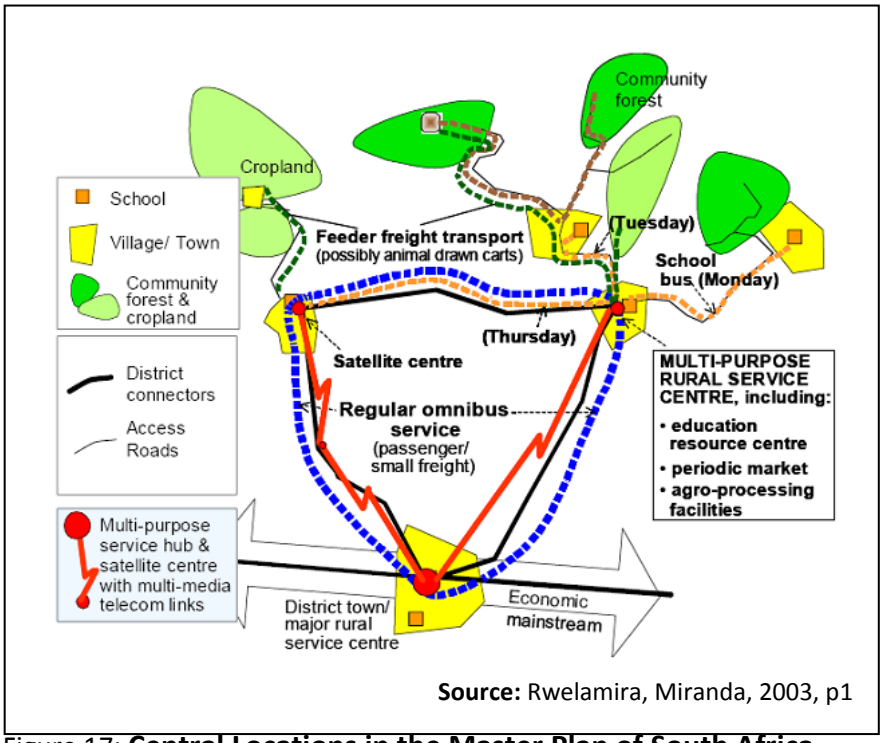


Figure 17: **Central Locations in the Master Plan of South Africa**

4.3 The role of GIS in planning of Logistic Chains

Geographic information system (GIS) tools are useful within agricultural value chains especially where spatial data regarding production and logistical systems are important. Establishing and mapping the spatial location or concentration of farms / production units helps decision makers determine potential volumes and transport requirements. The tools have been used to offer traceability platforms for produce where market actors are able to link source and quality / standards. GIS tools have helped farmers and agricultural chain actors overcome previous constraints such as the dispersion of farms, and the lack of location-specific data for production planning, monitoring and targeting. The lack of this data previously resulted in the inability to forecast farm yields; inaccurate assessment of supply base, over-estimation of farm sizes and ability to target specific farmers facing unique challenges.

Integrating GIS tools in planning value chains offers advantages to planners and policy makers including

1) The optimisation of transport costs by optimal location of facilities (sheds, storage, coolhouses, hubs, etc)

2) The optimal routing of vehicles according to season and product, taking into account trip length, road conditions, vehicle operating costs and quality requirements of the products

3) The optimal location of collection and distribution points for produce and inputs

There is need to conduct an evaluation of existing spatial data sets from government and private sector. This will avoid duplication and cost reduction. Data collection may be localised and facilitated by farmer groups / associations or private sector initiatives which provides a cost effective approach to supplement government initiatives. Additionally, open data sources such as Google earth provide spatial data which is accurate and comprehensive.

Among the data sets that may be developed using GIS tools include the biophysical, socio-economic, and agricultural market data. Biophysical data relates to soil types, vegetation, ground water quality and potential, land-use and climatic data (rainfall, temperature). Socio-economic data especially on existing infrastructure, its quality, efficiency and reliability is important in describing the effectiveness or challenges facing an agricultural value chain. Marketing infrastructure mapping is important for determining the success factors for a value chain.

Level	Data	Significance to Value Chain
Micro (Community)	• Household location • Infrastructure • Farm size and crop types • Extension services • Administrative units • Bio-physical data (soil)	Useful for assessing community assets eg land, needs and challenges, Understanding settlement patterns vis-a-vis existing infrastructures, Understand network efficiency and access by production units, Applicable in situations where planners are deciding where, and on whom, to concentrate efforts. Mapping change over time upon establishing a value chain, Understand potential threats such as natural hazards to value chains and how these are likely to affect production systems.
Meso (Regional)	• Markets • Collection points / centres • Infrastructure • Processing • Extension services • Bio-physical data (Rainfall)	Important in deciding where to concentrate resources to support value chains, Understanding local and regional networks including markets and level of interaction, For decision making where to locate facilities and services (best and worst locations), Examine potential threats from natural hazards and how these are likely to affect especially the logistic systems.
Macro (National)	• Infrastructure • Markets • Bio-physical data • Processing	Understanding regional networks including markets and level of interaction, Examining the distribution of services and production areas at national level to support resource allocation, Monitoring impact of interventions, strategies and policy direction.

Table 7: GIS tools and Spatial Information Development for Agricultural Value Chains

Using GIS to model a value chain involves mapping the entire process. Mapping entails developing a visual representation of the various stages and associated actors along the value chain and the connection between them. The model will illustrate the entire production process from the beginning (producers, raw materials, production, inputs, supplies) to the retailing outlets and final consumer.

An ideal model is expected to provide answers to the following aspects of a value chain;

1) What? (from what into what)

2) Where? (from where to where)

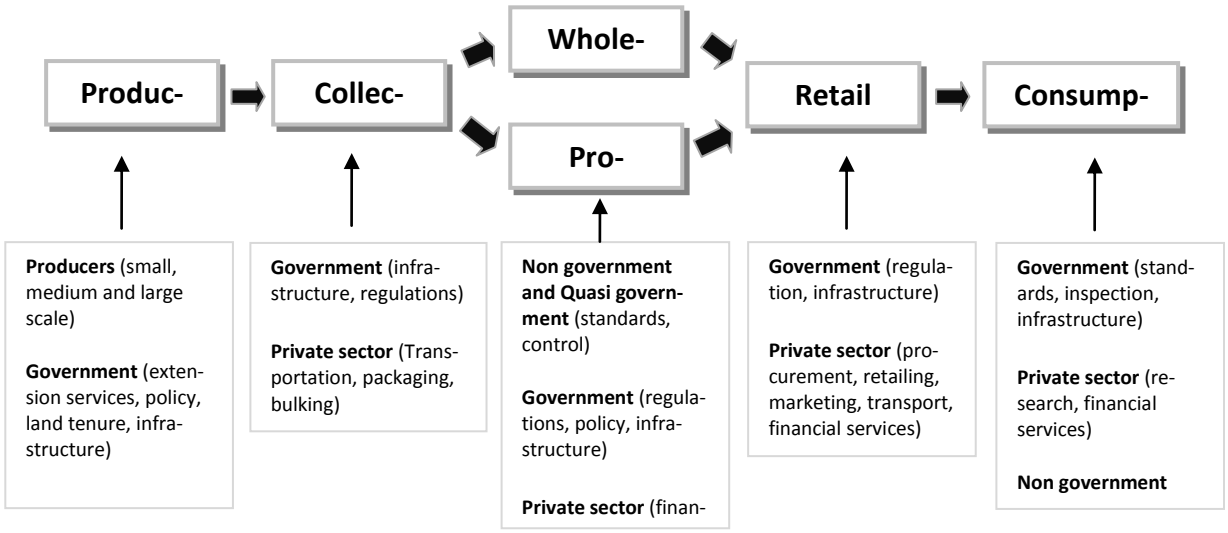
3) How? (the products you produce reach the final consumer)

4) Who? (the roles and structure (economic relationships) between actors in the chain)

5) Why? (why are people / organisations in this value chain, including their roles)

6) What future? (what is changing and what will change in the short or long term?)

The figure below represents a conceptual model of an agricultural produce value chain showing the broad horizontal and vertical linkages. Additionally, the roles of each actor have been outlined.



Porter (1996) distinguishes between primary activities and support activities within a value chain. Primary activities are directly concerned with the production, creation or delivery of a product or service. These activities may include; inbound logistics, operations, outbound logistics, marketing and sales, and service. Each of these primary activities is linked to support activities which help to improve their effectiveness or efficiency. Support activities, which whilst they are not directly involved in production, may increase effectiveness or efficiency (e.g. human resource management). Examples of activities within a value chain which entail support services include; procurement, technology development, research, human resource management, and infrastructure (including planning, finance, quality and standards, and information management).

Processing and packaging activities may be located within production points. This will ensure value addition and potential employment to communities. The location of processing units will depend on quantities produced and availability of road linkages. Processing centres must be located in easily accessible locations, central to majority of the farmers. Suitability of location also depends on the availability of support services such as electricity, water and telecommunications.

4.4 ICTs for Value Chains

There are a wide range of information and communication technologies which include radios, cell phones, electronic money transfer and payment systems, computers, television, internet and the print media. In Kenya and the Eastern Africa region for example, the Esoko5 system offers an agricultural commodity exchange platform. Farmers, buyers, service providers enlisted with the Esoko system are provided with passwords so that they can send targeted messages via SMS to their farmers on mobile phones, Proctor and Lucchesi (2011; pp22). ICT based platforms have been able to provide better support to agriculture value chains in ways such as; supply chain management, financial services and information and agricultural trade services.

ICTS applications have the potential of helping producers and other actors alike to address challenges and improve operations and marketing. Potential applications include;

- Marketing and pricing information systems
- Applications which help entrepreneurs and buyers to manage transactions with the large number of small-scale farmers who supply to them
- Mobile banking such as M-pesa and associated applications that facilitate payments
- Initiatives to expand the reach of farm extension services through phone and mass media
- SMS or text messaging applications for enabling environment advocacy
- Environmental / weather information systems for forecasting and early warning

ICTs have helped to transform agriculture value chains by improving efficiency and information flows. Regarding general youth employment, ICTS have the potential to attract the young generation to the agricultural sector where they are able to provide services and engage in business ventures. Additionally, ICTs offer employment opportunities in the sector that are both attractive to young people and are in demand such as mobile money transfer. ICTs have the potential to improve efficiency by reducing the cost of doing business along the agricultural value chain. It can also facilitate vertical integration and linkages by small-scale farmers and entrepreneurs in value chains.

Government and private sector actors should provide necessary infrastructure such as transmission posts and internet connection such as those provided by the digital villages in Kenya. The liberalisation of the telecommunications sectors has facilitated the private sector to play a greater role in proving ICT access in rural and urban areas alike in the East Africa region**.**

[5] *Esoko is active in 15 countries through different partnership agreements; both public sector agricultural projects and Esoko country franchises). Esoko is regarded as an extension tool to give services to farmers.*

ICTs in Agricultural Value Chains

Example 1; Small Scale Farms Value Chain Model: *Meru Greens French Beans Contract Farmers*
Farmers located more than 0.5km from the collection centre used mobile phones to contact motorcycle operators who provide transport services. Farmers are able to services located far from their production areas.

Example 2; Small Scale Farms Value Chain Model: *Kangai Tisa Farmers Sacco, Kirinyaga District*
Farmers who did not have their own transport means, used mobile phones to contact ox cart owner who provided transportation services. Farmers are able to pool their produce and utilise space available in the carts thereby cut on costs. The ox cart owners are able to coordinate transport services by alerting farmers on pick-up times.

Example 3; Medium Scale Farms Value Chain Model: *Goshen Outgrowers, Machakos District*
The Goshen farm owner and managers use mobile phones to coordinate picking, transport and other farm logistics. Additionally, the Goshen farm management will use mobile phones to communicate with out-grower farmers as well as various suppliers of farm inputs.

Example 4; Uncoordinated Small Scale Farms Value Chain Model: *Potato Growers, Kinangop*
Farmers rely on mobile phones to coordinate with middlemen who organise transport logistics and purchasing of the produce. Additionally, the middlemen are able to use mobile cash payment methods to pay for produce collected from farms.

Source: Field work, 2012

4.5 Legal constraints

The main regulatory body of the horticultural sub-sector in Kenya is the Horticultural Crop Development Authority (HCDA), which was established in 1967 under the Agriculture Act Cap 318. HCDA was originally given authority to fix prices, regulate trade, and operate processing facilities and market horticultural goods. Other relevant institutions include the Ministry of Public Health and Sanitation, Kenya Plant Health Inspection Service (KEPHIS), the Pest Control Product (PCPB) and the Kenya Agricultural Research Institute (KARI). Additionally, the government set up the HCDA with the aim of developing and regulating the industry. HCDA regulates technical and marketing services to the stakeholders in the horticulture industry. It works hand in hand with the Ministry of Agriculture, Ministry of Trade & Industry, enforcing adherence to international standards called the Global Good Agricultural Practice (GAP) and rules and regulations as set by the World Trade Organization (WTO) and the European Union (EU) among others.

HCDA works closely with the primary private sector representative body, the Fresh Produce Exporters Association of East Africa (FPEAK). FPEAK protects the business of privateers including those in the elaborate flower industry.

The horticultural sector is regulated through a number of national legislations that are listed in Annex 2. Plant product control, agricultural export Act, traceability, produce handling and Safe use of pesticides are only to name some of them. HCDA has the task to enforce these regulations, which is practice is often not achieved.

The horticulture sector is faced with challenges emanating from institutional set-up and logistical arrangements. Field observations and key informant interviews for example revealed that the industry faces local and international market challenges such as the poor enforcement of sanitary and phyto-sanitary measures, environmental standards, pesticide use, labour laws, ethical trade practices and public health, among others. HCDA is doing her best to enforce regulation towards full protection of the industry. For example, HCDA is working with the police to make sure horticultural produce is not ferried in filthy gunny bags or plastic bags as can be common. They are making sure trucks used for fresh produce do not ferry chemicals and people as well, a difficult matter to enforce. KEPHIS is supposed to sample marketed produce in search of both microbial and chemical residue situations. While this is easier to do for the niche export market, it is a daunting task for the (95%) of the produce marketed locally.

In recent times HCDA is registering all marketers including brokers. Every fresh produce exporter is supposed to take stock of her farm-level produce suppliers, their farm locations and sizes, in the interest of traceability. Indeed HCDA has a recently developed Exporters Verification list that attaches a weighted value of quality produce and operations to every participating exporter. The template used in this process is included in Annex 2.

Despite the sanitary and phyto-sanitary situation in the market place, small-scale farmers interviewed were not fully aware of the legal implications of wrong use of banned or inappropriate inputs. KEPHIS on the other hand lacked the legal mandate to arrest and prosecute offenders despite its ability to detect and carry out toxicity analysis on crops and equipment for local and export markets.

Indeed the enforcement of GLOBALGAP standards has challenged most smallholders in terms of competitiveness in the horticultural market. Smallholders involved in fresh produce production targeting export markets are amongst the most affected due to the high costs of investing in GLOBALGAP infrastructure, process of compliance and subsequent certification. Over time key importers such as chain supermarkets and exporters of horticultural products find it easier to deal with large scale farms as opposed to smallholders. The legal requirements of the export markets are considered stiff by the small scale farmer who therefore opts to ignore or adopt uncertified practices available in the local market scene.

Where smallholder farmers are willing to comply, they have formed groups to pool resources together for compliance or seek other means to raise the capital for investment in GLOBALGAP infrastructure and facilitate the process of certification.

FPEAK in collaboration with other mentioned stakeholder institutions has been instrumental in establishing the KENYA GAP (Domestic) as well as the KENYA GAP (International) guidelines. They are tailor-made for East Africa but tied to the details of the Global GAP. In recent days these documents have become available in both English and Kiswahili languages.

Legal constraints may also be attributed to the more than 130 statutes that currently govern the agricultural sector. The government has recently consolidated these statutes into four main legislative tools namely; Agriculture, Livestock and Food Authority Bill 2012; Fisheries and Livestock Bill 2012; Crops Bill 2012; and the Agricultural Research Bill 2012. The Agricultural Livestock and Food Authority (ALFA) will repeal 20 statutes including the Agriculture Act, Grass Fires Act, Tea Act, Coffee Act, Sugar Act, Sisal Industry Act, Cotton Act, Coconut Act, and the Pyrethrum Act.

4.6 Challenges to meet quality standards

Consistent quantity and quality of producedepends on many factors including but not limited to:

- Access to research and development, market and other information regarding the crop enterprises of choice,
- Agro-input suppliers, input cost and possible finance arrangements,
- Farmer knowledge of the needs of the end-user of their produce as much as the price, hence the income generated,
- Capacity for the farmer to work closely with suppliers and processors to produce the specific goods consumers want.
- Capacity for the farmer to be in a win-win engagement with other stakeholders in the value-chain.

Today's new markets have stricter quality requirements for food items, especially sanitary and phytosanitary standards that address food safety and agricultural health risks associated with pests, food-borne and zoonotic diseases, and microbial pathogens and other contaminants. Food standards applied in Kenya can be categorized as either mandatory or voluntary, where mandatory standards are set by Governments in the form of regulations, which include technical requirements such as testing, certification and, labeling. Voluntary standards are set through formal coordinated approaches of key stakeholders in the supply chain. Standards can also be categorized as private, national, supranational, and multilateral standards. Private standards are voluntary

and originate from foreign markets targeted by the associations. Such standards include KenyaGAP, Integrated Crop Management (ICM), TNC, and BRC.

In Kenya, a total of 2,569 farms are certified under GLOBALGAP standards and are thus allowed to export its products. With 69 being large scale farms and 207 medium scale farms, the largest majority of certified farms are smallholdings.

KenyaGAP certification acknowledges that exporters are meeting internationally and nationally recognized production practices and standards for fresh produce, and provides customers with a 'guarantee of confidence'. Farmers, as food supply chain operators, ensure food quality and safety through variety and seed selection, soil preparation, crop and pest control management, harvesting methods, sorting, grading, and packing. Presently, there is only one large scale farm and 300 small scale farmers certified und KenyaGAP

In order to satisfy the demand from customers and adhere to the quality standards, the produce have to undergo a number of processes, such as pre-cooling, pack line operations, ripening, degreening or labeling. A well-equipped and hygienically maintained infrastructural base is a pivotal support element of the chain. The technological level must be appropriate to the needs of the target market and the length and complexity of the chain. For simple chains, such as where the producer is within hours of the market, a simple infrastructural base consisting of packing and well ventilated transportation facilities is adequate. Food processors in Kenya apply good manufacturing practices (GMP) through raw material handling and control, product and process management and control including documentation of all work routines, and, human resource management.

4.7 Road condition as a major impediment

Road conditions are a major impediment for efficient value chains. Road conditions determine the cost of transport in various ways, from efficiency of access to wear and tear of transport equipment, people or animal hauliers and goods alike. Especially the first mile, which makes up a large share of the transport volume, may increase overall transport costs considerably.

During rains when HGV are not able to reach the farm on bad roads, transport costs increase significantly, since pick-ups and IMTs, or even human porterage have to be used. This can more than double transport costs. Additional costs can be attributed for transhipping the loads on large vehicles after tarmacked sections are reached.

Mt Kenya Gardens: Bananas are usually picked up by a 8-ton truck. During rains the truck is not able to pass serve the first mile, even though the main feeder roads are tarmacked. Instead a one-ton pickup is used to carry the bananas 65km to Mt Kenya Garden's degreening plant and cold store. The costs on this part of the chain increase by the factor 2.5, entailing an overall increase of transport costs on the whole logistic chain by 16%. Usually this cost increase is handed over to the producer through decreased farm gate prices.

Road conditions are essential for the transport costs. Between 60% and 90% of the roads were in a good condition. The worst conditions were observed in Kinangop area, which has strong impacts on the costs of the transport chain as described below.

The impact of the mode of transport on the overall costs of the logistic chain is depicted in Figure 18. The impact of bad roads on the banana transport with Mt Kenya Gardens is explained in the box above. Good roads would reduce transport costs by 14%.

In Nyeri a big challenge for onion and potato farmers in the region is the poor and deplorable state of access roads. Only the main road from Nyeri to Nyahururu is tarmacked. All other roads are earthen with a few having been converted to all-weather roads by placement of murram. If the roads were in a good state and HGV could reach the fields directly, overall transport costs could decrease by 59%.

However, even with bad roads the choice of a more efficient mode may increase overall transport cost efficiency. For Meru Greens transport with a motorcycle instead of porterage, the overall transport costs for French Beans may be reduced by 18%. If Kangai Tisa would use Oxcarts instead of porterage for the first mile, overall costs decrease by 51%.

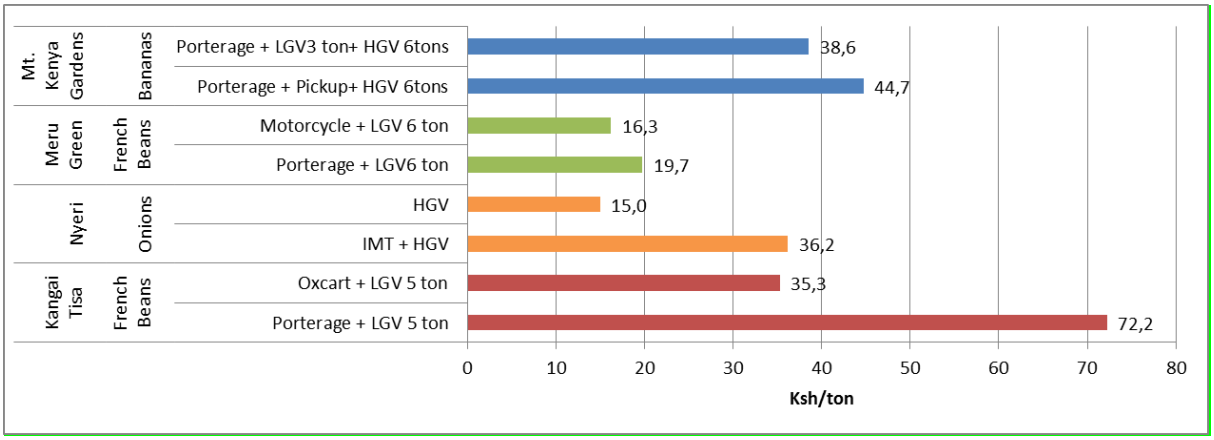


Figure 18: Impact on first mile transport mode on overall chain costs

4.8 Support of the high value farming sector

Poverty indicators in the country show that poverty is higher in rural areas as compared to urban areas, and that the Human Development Index (HDI) scores have also been lower in rural areas of the country (UNDP 2001,2002, 2005). The lack of value addition to agricultural products contributes to food insecurity, especially through increased vulnerability to fluctuations in production. The majority of those employed in agriculture have low incomes, with correspondingly low standards of living. It is possible to significantly increase agricultural productivity by expanding and sustainably integrating smallholder farmers in farmers' organizations and agricultural value chains so that they have greater impact in the marketplace.

Farmers need improved access to services and agro-inputs. Despite increased investments in the agricultural sector over the last few years, the challenges to multiply and scale up the success cases remain considerable. There is persistence of social, economic, political, technological, financial and ecological impediments at all levels. Innovation in establishing market integration for the poor remains a formidable fight.

Poor production technology is another constraint Farmers advancing from subsistence farming to commercial farming need to be hand-held and directed in ways that address all their fears as well as meet their aspirations. The many development support aspects that must come into play are many and multifaceted. All in all if farmers are going to be the true drivers of the advancement process, they must:

- Participate fully, backed by empowerment with self-realization (emancipation) and voice,
- Receive agribusiness training and information back-ups,
- Be helped to understand the power of pooling resources and be party to market-driven value-chain processes,
- Observe local and international Kenya and Global GAP (Good Agricultural Practice) guidelines and compliance

For a complete and agribusiness safety assured process, the following broader aspects and support services need to be articulated and included, namely:

- Accessible and un-limiting input support services that are conveniently located,
- Agronomic, mechanization for crop establishment, harvest and post-harvest handling,
- Climate-smart farming practices including irrigation and use of renewable energy applications,

.

5 THE ROLE OF COOPERATIVES

Agricultural cooperatives play an important role in supporting smallholder farmers and producers to take advantage of opportunities offered in the production, processing and marketing aspects. Through cooperatives, farmers for example are able to access cheaper inputs, credit, training, storage facilities, agro related technology and extension services. Cooperatives therefore have the potential of transforming the agricultural sector and help farmers reap maximum benefits from agricultural value chains. Additionally, through cooperatives, farmers are able to have a representation at all levels of decision making. According to the ILO (2012), cooperatives and farmer organisations give a voice and representation to producers and small enterprises enabling a more informed and empowered dialogue with other value chain stakeholders.

By using collective action, cooperatives enable farmers and producers to address value chain requirements and facilitate market linkages. Through the same platforms, producers can also improve their bargaining power and access to market information. Cooperative members can potentially benefit from networking and collaboration with other farmer groups within and outside their region. Cooperatives are able to facilitate vertical and horizontal linkages for members who would not otherwise access the same as individuals. Vertical linkages may be in the form of accessing buyers and markets actors. Horizontal linkages may be with service providers and policy makers. Many organizations, especially cooperatives, do also provide finance and business services to their members. Alternatively they can help in linking up to existing financial institutions and business service providers to collectively get a better deal for services provided to members.

Cooperatives will continue to play an important role in value chain dynamics such as empowering farmers, enabling them to access the market and financing, as well as services like education for younger farmers. Governments therefore need to support the cooperatives by creating a good environment to let them grow and develop. Given the grass-root origin of most cooperatives, the government should support community led initiatives by providing services such as audit, training and financial resources which will sustain their operations.

Additionally, institutional and legal framework should provide for an official overseeing structure which could be decentralized as required and charged with the responsibility for the registration and approval of all cooperatives. Such an agency should also be responsible for maintaining a national data bank on cooperatives which outlines their membership, performance, challenges and impact on members including producers.

The private sector and non government organisations may be instrumental in assisting cooperatives to access better and lucrative markets. Many cooperatives are hampered by the lack of innovation and inability to get information on market demands and specifications. Many of them produce to market rather than producing for the market, meaning that they do not always consider what will sell well before deciding what to produce. NGOs and development partners can

help co-operatives by initiating linkages and partnerships with relevant organisations, for example with financial service providers.

5.1.1 Lessons learned from the Milk industry: Kinangop Dairy

Compared to the horticulture industry the milk industry in Kenya has more structure. Over the years milk has more or less eliminated the highly exploitative marketing brokers that still dominate the horticulture industry. In milk industry, general uniformity has prevailed over time. Access to coolers and the numerous private sector buyers at the farm gate has more or less helped determine and stabilise farm-gate prices. It is the accessibility by smallholder farmers to milk coolers that makes a major difference. Farmers can have more predictable prices with freedom to pay for the transport to the cooler or deliver by their own means.

As if to emulate the milk industry, the Government built coolers for small scale horticulture through HCDA. However these are few and they were provided and mis-located far away from the smallholder horticulture farmers. Apart from location the coolers came into use 10 years too late, long after they were designed and authorised by Government. By that time, smallholders had established business links with private buyers, to pick their produce by the day. Smallholders remained in business with no logistical or business connection with the coolers. In any case, all the coolers have a limited total tonnage capacity of about 800 tonnes of produce. They are hardly used by smallholder farmers and today, 80% of the space is today rented to largescale buyers like Suripe and Frigoken.farmers.

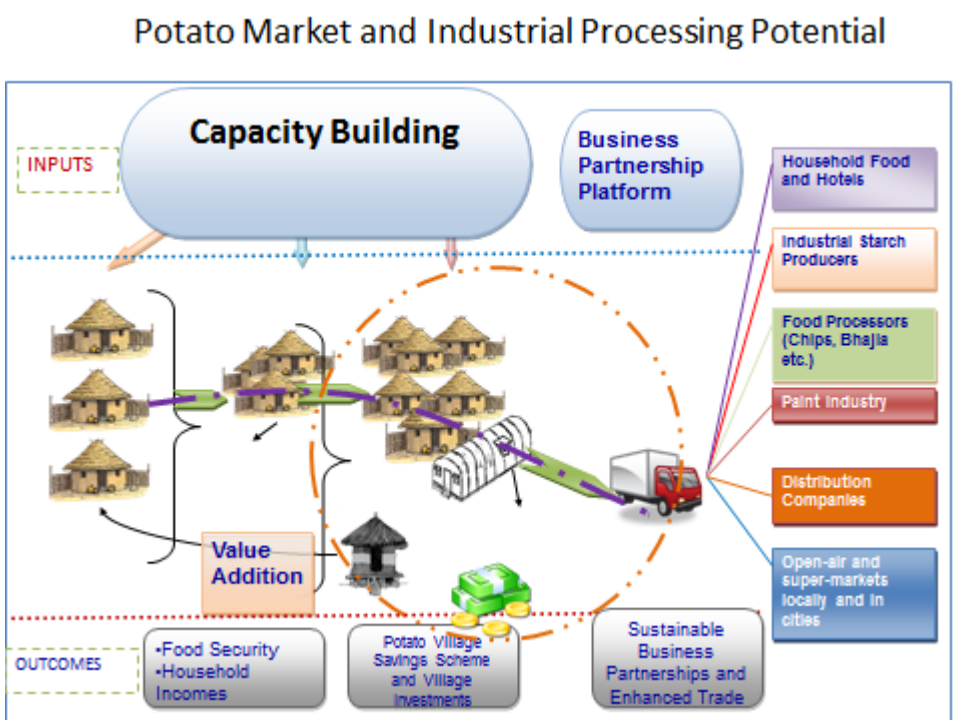
5.1.2 Lessons learned from Farm Concern International: The case of the potato value chain

Farm Concern International (FCI) is an NGO promoting Commercial Villages as the best means of grouping and winning markets for smallholder farmers. The chart below shows the ingredients of interventions to undertake in the form of an input and output analysis. These interventions are led by Capacity Building and a Business Partnership platform on the inputs side. On the output end of the commercialization process there are outcomes such as household income, savings scheme and sustained business partnerships.

Through Farm Concern International , farmers in Kieni Division of Nyeri County, were able to establish Commercial Villages Models (CVM) and welfare groups to support agricultural production and marketing activities. Through the CVMs farmers are able to connect with different players within the value chain and market. Farmers are able to receive training expose to new farming technologies including pre and post-harvest management techniques. Members are equipped with supply chain management innovations as well as being offered a platform for direct partnership with other smallholders.

Rather than FCI marketing the farmers produce, it links farmers directly to the markets' traders. Farmers then decide on the pricing of their produce depending on the market prices and knowledge impacted on them. This gives them independence to market their produce and eliminate brokers who would most likely exploit them.

According to a local FCI coordinator in Nyeri, the market development strategy directly links farmers to traders and thus eliminates the influence of middlemen in the value chain. Farmers now have a growing database of onion traders in Nairobi, Mombasa, Karatina and Kisumu, accessed easily from cell phones. Onion traders are also trained in cash flow management, business development plans, transportation, customer selection and formation of traders associations. "What we want is sustainability, which is only possible if all the components are working efficiently and making profits," the coordinator explained. Kieni has largely been considered developmental backwater. Lately, banking institutions had opened branches in the area because of improved production and hence demand for financial services.



Adapted from Farm Concern International (2012)

Figure 19: Commercial Village based potential exemplified for the case of the potato industry.

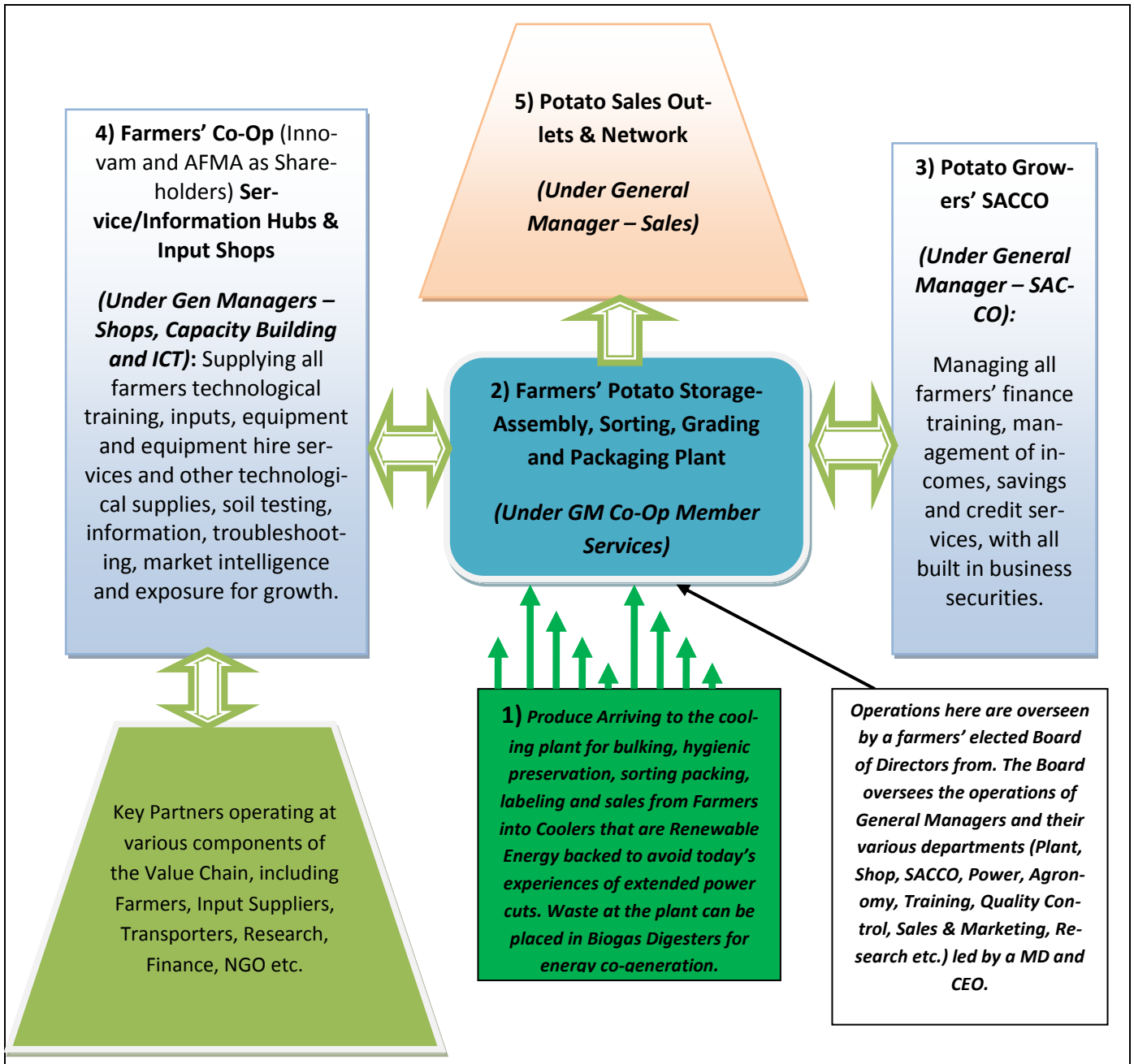
The Figure shows the ingredients of a farmer commercialization scheme, in this case exemplifying the potential of the potato industry. Clearly the potential available can only be fully exploited if farmers are part and parcel of the entire process to help convert agribusiness building inputs into outcomes.

Farm Concern International undertakes a capacity building process that has the following interventions which are required to build eventual sustenance:

- Leadership & governance training,
- Farm level governance and structuring,
- Technical services provision with due regards to farming, hauling, storage and other value-chain stages,
- Finding market while advancing business partnership and other trade skills,
- Killing the fear of technology, including applications of ever-advancing ICT
- With the right value-chain partners by way of organised farmers on one end and traders on the other, this process is bound to build a business partnership platform whose activities may comprise of but not be limited to:
- Farm level buyers forums.
- Industrial and market exposure visits.
- Village forums supported by farmer to farmer visits.

Conducted in a participatory manner, the outcomes of the agribusiness journeys that take place are bound to lead to deeply engraved psycho-social as well as the much needed business and livelihood transformations including:

- Assured food security.
- Improved household incomes.
- Village level potato savings scheme aiding other investments.
- Sustained business partnerships and enhanced win-win trade arrangements.



1. Any number of farmer groups (like in Commercial Villages), glued together by a
2. Potato storage grading & packaging sheds,
3. A business management, savings and credit services unit (SACCO/Bank),
4. The line of input supply shops located at information and business exchange hubs (training, information, troubleshooting, market intelligence etc.), and
5. Potato sales outlets conveniently located, growing into a national and regional network over time.

Figure 20: The Potato Hub, the ultimate Co-Operative Unit

5.1.3 The Market Cluster Approach by CASE

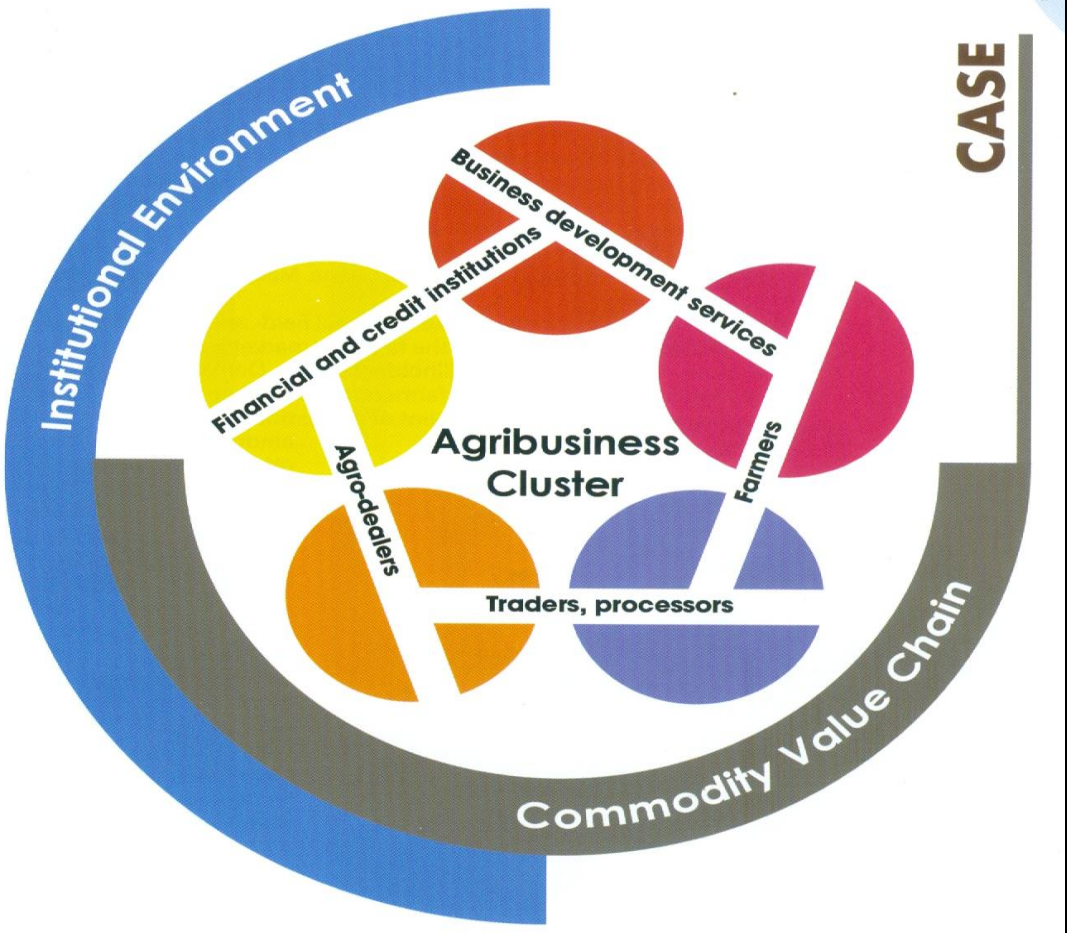
As further support to agricultural value chains the study team came across a supportive model that the International Fertilizer Development Centre has adopted. The so called **Competitive Agricultural Systems and Enterprises (CASE)** approach rhymed with the expressed need (also adopted by FCI) to set-up robust and business-driven and market-linked farmer supportive systems. The CASE approach like the Commercial Villages work under the core principles or components of capacity building namely:

1. Agribusiness cluster formation – to strengthen local capacity for innovation and entrepreneurship involving a diversified array of stakeholders.

2. Agricultural value chain development – to link farmers to others in the chain with emphasis on integration of all actors and their strengths towards an agribusiness cluster formation.

3. Enabling institutional environment – to build capacity of both public and private sector stakeholders to foster inclusive improvements in the institutional and agribusiness environment.

These three components are exemplified in the schematic given in Figure 21.



The IFDC Agribusiness Cluster approach exemplified. By bringing all key players in the Chain, be they farmers, traders, transporters, processors, financiers, researchers and regulators etc. credible market-pulled, win-win business arrangements result.

Source: IFDC: Competitive Agricultural Systems and Enterprises Booklet 2012

Figure 21: The Market Cluster Approach by CASE

IFDC reports that from her experience, establishing commodity-based value chains, not only empowers farmers to shift from subsistence farming to an entrepreneurial business, it gives them the tools they need to take ownership of the process and build sustainable markets. Market-oriented agriculture encourages farmers to invest in their fields in order to increase yields while decreasing production costs. The input value chain encompasses those involved in the steps leading up to the harvest. These might include agro-dealers, who sell farmers agro-inputs and provide information on their use, or producer organizations that help farmers learn more effective farming techniques. The output value chain encompasses all the steps that an agricultural product takes, from its point of origin to the consumer.

IFC further reports that CASE strengthens the capacity of smallholder farmers and small and medium enterprises (SMEs) to develop a competitive environment in order to produce a certain commodity/product for a targeted market and to overcome the risks and other barriers related to further market integration. This is buttressed with the business support services (BSSs), banks and/or micro-finance institutions (MFIs).

The individual and collective capacities of the participants in an agribusiness cluster are improved through collective learning and action. This improves participants' coordination at the grassroots level and ensures informed and sustained integration in targeted value chains and markets. This empowerment is another crucial element of CASE. Empowerment can include helping farmers learn more productive farming techniques and/or be more effective advocates for information and stronger agricultural laws, better services from public organizations, protection and improvement of their rights and transparency at all levels of policy-making (IFDC, 2012).

5.1.4 Conclusions: The Hub approach for long-term sustenance

From the above considered suggestions for supporting the high-value farming sector and during this study it has become clear that:

- To speak to and manage the trade that composes some 95% of the horticultural industry in Kenya, smallholders must be part and parcel.
- If smallholder farmers are to be helped, they need to see and feel ownership of processes as much as agribusiness interventions to be undertaken towards their livelihood advancement.
- If smallholders are to be supported into commercial farming, they need to belong to producer organizations in order to access finance and inputs, mechanization support, GAP and other certification, technical assistance etc.
- This scale and skill building process would be helped by ownership of a central trading and Agribusiness Hub approach, as described below.

6 Conclusions and further research needs

This Kenya horticulture industry study included crop enterprises that made it possible to capture and detail the logistical as well as agribusiness concerns of the local as well as international market scene. At the conclusion of this study we note that we have a Kenya horticulture industry that has the following characteristics and/or support structures:

6.1 Sector characteristics:

- Horticulture is of major importance, since it employs 6.5 m people and contributes 22% directly and 27% indirectly. The sector generates foreign exchange earning amounting to Kshs 91 billion, with daily exports of 1,200 MT produce. Additionally, the sector grows at 15 – 20 % annually.

- The 95 per cent produce sold within the country in a relatively complex amorphous but in its own way working agribusiness sector driven by all manner of brokers, be they farm-level produce finders and gatherers, transport seekers and operators, market 'managers' etc. It is these brokers who are likely to be the greatest beneficiaries, not the farmers. However, with increasing Kenyan prosperity, the national market is growing fast and an increased demand for high value products is generated.

- The 5% produce sold in the international market under strict Global GAP regulation. Rejects (for whatever reason) in this market are likely to find their way into the local market, if not disposed as cattle feed in zero-grazing units bordering the cities.

- A logistical, transport and agribusiness system and scenes where the smallholder farmer is prime. Indeed the smallholder feeds the majority of the local as well as the international market. Even established exporters need the easily manageable small plots of smallholders. They succeed if only they can manage to reach these farmers and organize them into groups for predictability and scale in their planting, harvesting and marketing schedules. On the other hand organised farmers have higher bargaining power against the brokers.

- With regard to marketing, the following types were observed:
  - The 'amorphous' local and national market where local traders buy from farmers and sell to various markets.
  - The medium scale farmer cum trader who buys from organized farmers in produce bulking groups and sells to local niche market in form of supermarkets of for local processing.
  - The medium scale farmer cum trader who buys from farmers for direct export to small importers in foreign locations.
  - The large scale farmer who has own farms and who may have ties with the smallholder farmer or approach them only in times of general shortage of supplies.

- In the horticultural sector post-harvest losses make up 30-40%, which is mainly due to bad roads and inadequate infrastructure for post-harvest handling of produce. This study could not quantify the losses, but rather relied on the statements of producers that range between 10 and 50%. Thus this issue definitely needs more research.

- Produce is marketed under logistical systems that grossly affect quality of produce reaching the market. There are hardly any refrigerated trucks in the entire industry, serving smallholders or even large independent hauliers. The way produce is parked in open and closed trucks leads to major damage of produce by the time it reaches the market. It is very clear that contaminated produce of low shelf-life is reaching the local market. Under current economic and business performance levels regulators need much policing if produce hauling trucks are going to stay specialised for this business alone. Many a trader will most likely haul farm chemicals back to the farm after dropping the produce load at the market.

- To improve product quality and agribusiness economics a lot of development attention is needed to be focused on what this report is calling the “First Mile”. It is in this mile where farm productivity, farmer organization, infrastructure and transport determine the efficiency of the entire chain, as much as the quality of produce reaching the market. There is no way the value-chain can increase operational and economic efficiency without fixing the happenings in this bottom section.

6.2 Needs and support structures

- HCDA is working hard to manage the export industry, hoping to reach smallholders and manage them through the structures set by the produce exporters. Unfortunately the majority of the smallholders are feeding the local market under unstructured, hence unaccountable operational and phyto-sanitary conditions.

- FPEAK, a private sector organization realizes the importance of implementing Global GAP regulations among smallholders, for the safety of their international markets. Fortunately FPEAK has realised the need to serve not only the smallholders attached to the export sector. They have developed the Practical Training Centre (PTC) where smallholders can receive training towards protecting the industry. FPEAK is well aware that the journey in managing traceability for the export market will remain easier than traceability for the local market. Only with traceability structures, which must be backed by numerous aspects of logistical etiquette (hard and soft) will the 95% market of produce begin to bear possibility of sanitation.

- FPEAK in partnership with HCDA and KARI have established the PTC outside Thika town, next to the KARI National Horticulture research unit. The elaborate PTC training centre has a fruit, flower and vegetable unit and an engineering (green housing, drip irrigation etc.) unit. HCDA cold rooms located in Nairobi, Limuru, Mwea, Nkubu, Machakos, Yatta, Sagana and Kibwezi have all been converted into mini-Practical Training Centres. FPEAK

has the advocacy and networking, regulatory and promotional service networks with key industrial players all over East Africa well grounded.

- FPEAK foresees a day when failed efforts of the past will see the light of day. This will take the form of cold houses or hubs that will form the farmers' markets, privately or City-Council run, one at each of the primary entry routes to each growing city, including Nairobi. Structured collection of produce, its sorting, grading and packing will help efforts at traceability. A pre-requisite for this however is farmer organization right from the farmer level. In this regard an entire chapter on farmer organization into groups and cooperatives is included in this report.

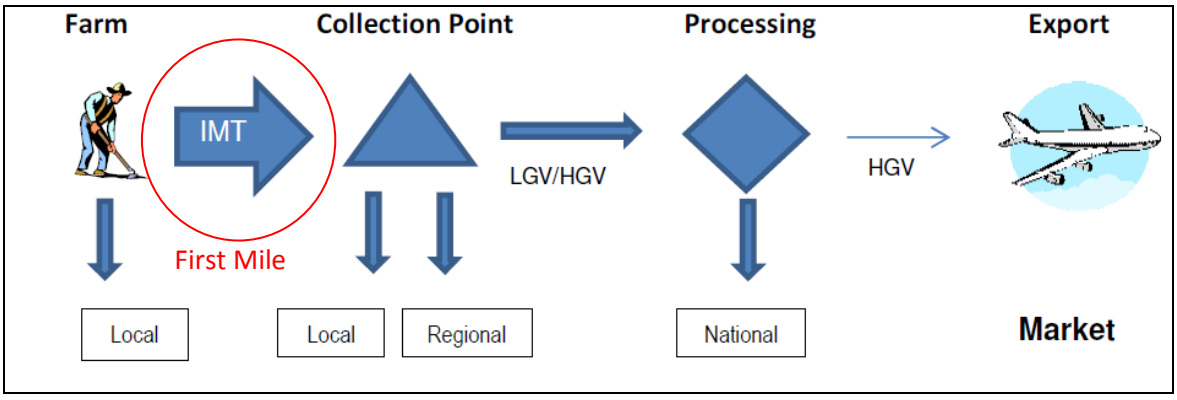
6.3 Most important findings from the study:

Logistic Chains researched

For this study seven Logistic Chains in Meru, Mwea, Mwala, Naivasha, Nyeri and Kinangop transporting French beans, bananas, onions and potatoes were researched. Products were produced on small, medium and large scale farms.

General outline of a Logistic Chain

The below figure show the main ingredients of a Logistic Chain, containing the production, collection point, processing units and the export market. The "First Mile" from the farm to the collection point has proven to be essential. The length of the researched chains ranged between 100 and 300 kms.



Essential facilities and components of Value Chains

	Local Market	National Market	International Market
Production	Production standards according to destination market. Grading leaves lowest quality to the local market highest to international markets.		
First Mile	Usually not cooled, accessibility during harvesting essential, high transport costs per tkm, road condition is essential for costs		
Remaining Logistic Chain	Local means, no cooling	Heat insulated trucks, air vent cooling or overnight transport	Refrigerated transport, pre-cooling
Grading facilities	Local Grading Sheds	Modern grading facilities usually next to cold storage facilities	
Storage	Charcoal Cooler, solar panel cooler	Refrigerated warehouse	
Packaging, Processing	None	Kenyan Standards	International standards including branding
Quality Standards	Kenyan Standard often circumvented	Kenyan Standards, often circumvented	International Standards,

The first mile

The average length of the first mile transport segment ranges between 1.5 to 13 km which makes up only 0.4% to 10.6% of the distance of the entire chain. However, the significance of the 1st mile becomes apparent when transport costs are assessed: the first mile can make up one fifth of the total transport costs of the chain and may even rise up to 37%.

Choice of the mode on the first mile

The choice of a more cost efficient transport mode on the first mile is important for overall costs. For example in Mwea (Kangai Tisa) the shift from porterage to oxcart can half overall transport costs; and in Meru the change from porterage to motorcycle can reduce overall costs by roughly one third.

Total transport costs

If transport to the national wholesale market at average prices is assumed, transport cost only amounts to between 3 and 5% of the total Value Added. Specific costs range between 16 and 72 Ksh/t-km. Highest specific costs are generated in Mwea for Kangai Tisa, where human porterage makes up 36% of total transport costs.

Impacts of bad roads on transport costs

Case examples from the fieldwork show that transport costs may increase considerably if roads are in a bad condition. During rains Mt Kenya Gardens has to use of a Pickup instead of a 8-ton truck for the First Mile which increase overall transport cost by 16% Cost. If the roads were in a good state and HGV could reach the fields in Nyeri directly, overall transport costs for potatoes could decrease by 59%.

Value addition for national markets

If transport to the national market at average prices is assumed, the revenues for the farmers amount to between 43% and 79% of wholesale price. Transport costs range between 3 and 5%. The remaining items contain the profit margin and the costs of the processing, packaging and grading. These vary between 5% and 16% of the wholesale price. Thus, for the national markets profit margins are rather low.

Value addition for international markets

The value addition rises considerably, if international markets are targeted. Profit margins may increase up to 79%. However, it has to be taken into account, that international markets only accept the highest quality. Even though profit margins seem to be low for the exporters, it is highly profitable to sell lower quality products to the national market instead of throwing it away.

Farmer Groups and Cooperatives

are an adequate measure to improve farming, transport volumes and critical mass of produce for dependable and consistent marketing. Commercial Villages and Agribusiness Clusters are some of the organised marketing models being tried under NGO and private sector initiatives. These make a great positive difference across the entire chain.

Vehicle hiring services

There are several sources of transport services for a typical farmer, depending on the volumes, location, nature of road surface, the weather, distances etc. HCDA once had trucks that groups of farmers could hire at a subsidised cost. This business soon collapsed due to unprofitability. Farmers who specialise or remain in groups are nevertheless likely to get reasonably priced transport services though commercial vehicle hiring services. They may even be organised enough to have their own truck, the cheapest option when volumes are definite and consistent. Single medium scale farmers with own trucks easily get a network of farmers to engage in their system, to generate the volumes needed for transport. Larger payloads are cheaper per tonne-km. smaller trucks may be the only option on rough roads in bad weather.

Gender Dimensions

From Farm to Market women have a primary role to play in horticultural value chains. An estimated 60 per cent of the fresh bean industry are women, working in commercial farms, processing, and logistics operations. Women are active at every point in the food chain and are often responsible for the household farming activities under which most of the green bean farms fall. At the pack houses, gender roles become distinct again with women dominating handling sorting, grading and quality control. Men will often do manually demanding tasks like land preparation, irrigation, spraying, loading and offloading trucks. This evidence is confirmed in the researched chains. SUNRIPE employs 500 people of which women are 80% and men are 20%. Women make over 60% of farmers in Farm Concern International (FCI). In Meru Greens women definitely have a dominion. Men appear to come in only when IMT, light and heavy goods vehicles, equipment operation need an operator. With Kangai a large percentage of workers are women.

Planning of new high Value Chains

Precondition are irrigation schemes that allow for the production of high value products. The form of marketing through private brokers (informal), large or medium exporter (contract farming) or cooperatives (self-organisation) is determining the market studies that have to be conducted. Private investments in grading sheds, local cooling facilities, warehouses, vehicle fleet, etc Logistic Chains are indispensable. The adequate road conditions have to be guaranteed. For location of facilities a mapping of the Logistic Chains using GIS is helpful, which determine the costs of an investment plan. Training of farmers is needed on production, Quality Standards, storage, transportation, etc. Additionally, the provision of inputs for farming has to be organised. It is important to emphasise that the private sector is not able to provide all these items. A public private partnership between public and private entities will foster the development of Value Chains. Additionally, the chains have to be integrated into regional and national planning procedures

A wider approach is needed

The conventional freight logistics planning would only analyse the costs of the motorised chain and try to improve its cost efficiency. From this study, it clear that a wider approach taking into

account the entire chain, would help improve the logistics efficiency by reducing the bottlenecks of the first mile transport. The first mile costs are mainly borne by the producers and they can erode the farmer's income significantly.

6.4 Future Research topics:

During this study a large number of unresolved questions appeared, that may be answered through university or consultant research.

- Kenya's agricultural sector is expanding rapidly. Therefore, market studies for new value chains that might be viable in the future are needed.
- Kenya's national markets for high value food items explode. Here as well market studies assessing the consumer preferences and demand are needed.
- Harvest losses and quality of produce landing at the market or factory, and how these can be minimised, across various crop enterprises, for the fresh produce or process markets.
- Many areas with bad or no road access are excluded from value chains. Large economic effects of providing access to these areas may be expected.
- There is much to learn about how improvements in the 1st Mile, be it by farmer organization, infrastructure (coolers and trucks, roads etc.), types of vehicles across (farming of) different enterprises etc. influence quality and price over the rest of the chain, upto market level.
- Study of value added at each operational component of the value chain and across enterprises and as specific logistics models and requirements are called for.
- Studies of impacts of agribusiness performance as infrastructural improvements are introduced to get the produce sooner, fresher, later or lighter (like by removing water under solar-driers), to the market.
- Comparison of different chains and savings made by economies of scale, introduction of mechanization, storage capacity etc. as they apply differently for smallholder and large-scale farmers.
- Comparison of different products and investments that leverage smallholder farmers' investments and propulsion to rural agro-industrial development and growth.
- Geo-spatial and logistical analysis towards identifying new workable and agribusiness efficient value chains with clear hubs and spokes.
- There is much to explore by way of GIS planning and ICT application in general as would aid but not be limited to the following research aspects:

- Mapping nationally and regionally by enterprise or by service the volumes of produce available from which section of the country, towards a national or enterprise mapping of availability of raw materials for market or industry in a given period of time.

- A trader or produce transporter can tell how much produce is available from dispersed smallholder farmers by sending a mobile telephone query that is tied to GIS maps in terms of geospatial location. This can save much unnecessary travel and transport costs, increasing the utilization efficiency of vehicle space.

- As Kenya grows into the formation of the East African Community, the Community will need to adopt public-private partnership approaches and explore extensive engagement with private sector and development partners in designing policy and programmes to support growth of regional value chains. There is much commonality between value-chains in the various countries. This study captures all the aspects and ingredients that would need to be researched as logistical and agribusiness commonalities and differences are defined, challenges addressed and harmonised across the region.

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8 Annexes

Annex 1: National Legislation:

Practice:
HCDA Code of practice, KS 1758, Kenya Gap, KFC Code of practice, FPEAK Code of practice

Legislation:
HCDA legal Order 2011, Agricultural Act; 318, Agricultural (Export) Act; 319, Plant protection Act; 324, Seed and plant varieties Act:326, Plant product control Act: 346

HCDA: horticulture legislation:
HCDA Legal Order, 2011 that surpasses L. N. 228/1995, 229/1995, 230/1995, 231/1995, 232/995

HCDA Clauses of industrial importance
Horticultural inspectors, 13
Horticultural research fund, 16
Horticultural Nursery and mother blocks, 17-25
Traceability, produce handling and KS 1758/2004, 27
Safe use of pesticides (MRL's), 28
Registration and certification of produce dealers, 29 to 31
Submission of returns by dealers, 34
Produce quality conformity, 32
Levies' imposition, 33
Penalties for offenses, 26, 32 and 35

International Standards:
ISO 65:1996, General requirements for bodies operating product certification systems,
ISO 17020;2005, General criteria for the operation of various types of bodies performing inspection
ISO 17025:2005, General requirements for accreditation bodies accrediting conformity assessment bodies
ISO 1901, Guide for quality and/or environmental management systems auditing
ISO 9001, Quality Management systems
ISO 22000, Guide for Food Safety requirements

Annex 2: HCDA Exporters Verification Checklist

HORTICULTURAL CROPS DEVELOPMENT AUTHORITY

EXPORTERS VERIFICATION CHECKLIST 2013

Company Name: _____ **Tel:** _____

E-mail: _____ **Date:** _____ **Physical location:** _____

	Requirement	P	V	E	N	Wts %	Award %	Compliance		Remarks
								Yes	No	
1	Certification to Kenya GAP/Global GAP					22%				
2	Traceability list of the company contracted farmers/schemes/ Marketing Agents (Suppliers)					17%				
3	A Spray Program.					13%				
4	Procurement of pesticides					13%				
5	Evidence of buying produce from farmers who have undergone annual training on GAP					9%				
6	Evidence of attendance of annual training on GAP by production staff and agents.					8%				
7	Copy of HCDA Export Certificate (validity)					7%				
8	Evidence of membership of FPEAK					6%				
9	Evidence of compliance to submission of quarterly returns (EQS) to be confirmed from HCDA records.					5%				
	Total Awarded %					100%				

Officer Confirming	Officer's Name	Organization	Sign
1.	_____	_____	Signature _____
2.	_____	_____	Signature _____
3.	_____	_____	Signature _____

Key- GAP
P- Pre audit report: 18%,
E- Expired Cert: 11%,
V- Valid Certificate: 22%,
N- None: 0%

Annex 3: Agribusiness and Horticulture Policy and Interventions

According to the Kenya National Agribusiness Strategy (GoK 2012a), the four drivers that make up the enabling environment for agribusiness to grow are:

1. An enabling and predictable policy and institutional framework,
2. Market-driven product development and value addition,
3. Competitive cost structures from production to markets,
4. Communication, knowledge and facilitation services.

According to this newly launched document, the Government's strategic priorities for Agribusiness in Kenya are to:

- Put markets at the centre of all production, processing, product development and packaging.
- Focus research development and innovation to better catalyse growth of a vibrant agribusiness sector.
- Promote smarter organisation of the actors in the sector to enable enterprises to benefit from economies of scale and improved productivity.
- Improve the range and effectiveness of financial and non-financial services.
- Attract investment by creating an enabling environment and putting performance above politics

The logistics and transport activities associated with these priorities include but are not limited to:

- Supporting farmers to develop organizations,
- Creating linkages of actors along the value chains,
- Improving range of, and accessibility of financial and non-financial agribusiness products,
- Improving market intelligence, information and communication agribusiness,
- Improving market infrastructure with involvement of the private sector e.g. shared management of the built-up markets,
- Exploring and expanding to new export markets,
- Promoting and encouraging value addition and
- Improving research in secondary and tertiary levels of agribusiness value chains.

Recently the Government has also launched the National Horticulture Policy (GOK 2012b). The objective of the policy is to The objective of the policy is to sustain the industry's growth and development to enable it to;

- contribute to food and nutrition security,

- provide raw materials for primary processing,
- compete favourably in the export market and
- earn more foreign exchange,
- generate increased incomes and employment for various players, and
- generally, contribute to the broader economic goals as envisaged in Vision 2030.

The document recognizes the challenges involved and sets policy for the following aspects:

- Production (land, planting material, inputs, crop management practices, urban and peri-urban horticulture, resource mapping and development of special economic zones and aesthetic horticulture)
- Support services (research and development, extension, information and communication services, financing and investment in the industry and insurance schemes).
- Marketing, value addition and trade (domestic, regional and international markets, food safety and quality standards, market information systems, value addition and traceability)
- Infrastructure (roads, electronic communication, energy, water and irrigation, sea ports, railway and air transport, market infrastructure and produce cold-chain facilities),
- Legal, regulatory and institutional framework,
- Environmental, social and economic sustainability, and
- General issues (gender, health, youth and integrity in the industry)

The Government interventions relevant to logistics and transport as spelt out in the Policy Document, include but are not limited to:

- The Government will continue to offer incentives to the private sector to enhance distribution of farm inputs.
- Facilitate the development of long-term plans and suitability maps/profiles for various eco-zones for horticulture investment.
- The Government will establish special horticultural economic zones and provide incentives for investment.
- The Government will undertake comprehensive resource mapping to delineate and exploit resources for horticultural development.
- The Government will establish special horticultural economic zones and provide incentives for investment.
- Local authorities will designate outlets and provide necessary infrastructure for aesthetic horticulture.
- The Government will design innovative ways to disseminate research findings to beneficiaries that will include establishing research databases, use of ICT and promoting technology adoption.
- The Government will encourage farmers, extension agents and suppliers to build quality into the products throughout the value chain.

- Institute innovative communication strategies for collecting and disseminating market information.
- In partnership with financial institutions, continue promoting the development of long-term appropriate financial products that are accessible and affordable.
- The Government will regularize operations of market agents.
- Contract farming and promoting formation of farmer organizations or groups will be encouraged to increase farmer bargaining power and benefits from economies of scale as well as cushioning them from price fluctuations.
- The Government will facilitate training in recommended best practices in pre- and post-harvest handling, packaging and transportation.
- The Government will improve wholesale and retail outlets for fresh produce.
- Involve private sector in provision of appropriate transport for fresh produce and installation.
- The Government will explore direct flights to non-traditional export destinations.
- The Government will collaborate with the private sector and development partners to develop an efficient market information system, and to build the necessary physical and human capacity to manage the system.
- Partnerships among key actors along the value chains will be enhanced to ensure effective traceability mechanisms are in place and operational.
- The Government will develop and maintain rural access roads and other roads leading to market outlets to all-weather status to facilitate timely delivery of produce to markets.
- The Government will promote community and private initiatives in the construction and maintenance of rural access roads.
- Levies charged on horticulture will be used to improve and maintain roads in the production areas.
- The Government will encourage development of more irrigation schemes and mapping out of alternative areas for future investments.
- The Government in partnership with the private sector will invest in more fresh produce handling facilities.
- The Government will continue with restructuring, commercializing and privatizing the Kenya Railways to improve efficiency and competitiveness of its operations.
- Efficiency in the provision of air transport services will be enhanced and efforts will be made to reduce the cost of jet fuel and handling costs.
- The Government will endeavour to increase cargo space and allow more airlines landing rights.
- The Government will undertake coordinated development of markets by relevant ministries, local authorities and stakeholders to ensure construction of appropriate fresh produce markets; and effective management by the private sector.
- The Government will encourage public–private partnership approach in development and management of markets.
- The Government will encourage development of designated wholesale and retail markets and fabricated hygienic kiosks for retailing fresh horticultural produce.

- Efforts will be put to ensure that cess collected from the markets is used for market development and maintenance.
- Stakeholders will be encouraged to build clearly designated markets for wholesale and retail.
- In addition to the existing markets, the Government will construct mega fresh produce markets in Nairobi, Mombasa, Nakuru, Eldoret, Kisumu and Meru with cooling and storage facilities.
- Stakeholders in the horticultural sub-sector will be encouraged to invest in cold chain facilities.
- Public–private partnerships will be encouraged to develop cold chain facilities.
- The Government will encourage use of low-cost technologies like charcoal coolers and wet walls.
- The Government will develop guidelines for promoting and managing collection centres.
- Establish the Horticulture Fund.
- Stakeholder organizations and institutions will be strengthened through enhanced linkages and partnerships among players along the value chain.
- The Government shall encourage and offer incentives for green and conservation farming.
- The Government will ensure produce is only taxed at the point of entry to local market or point of exit for export.
- The Government will enforce the appropriate laws and promote the mainstreaming of gender and marginalized persons in management of the horticulture industry in line with the constitution, Vision 2030 and the gender and development policy.

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