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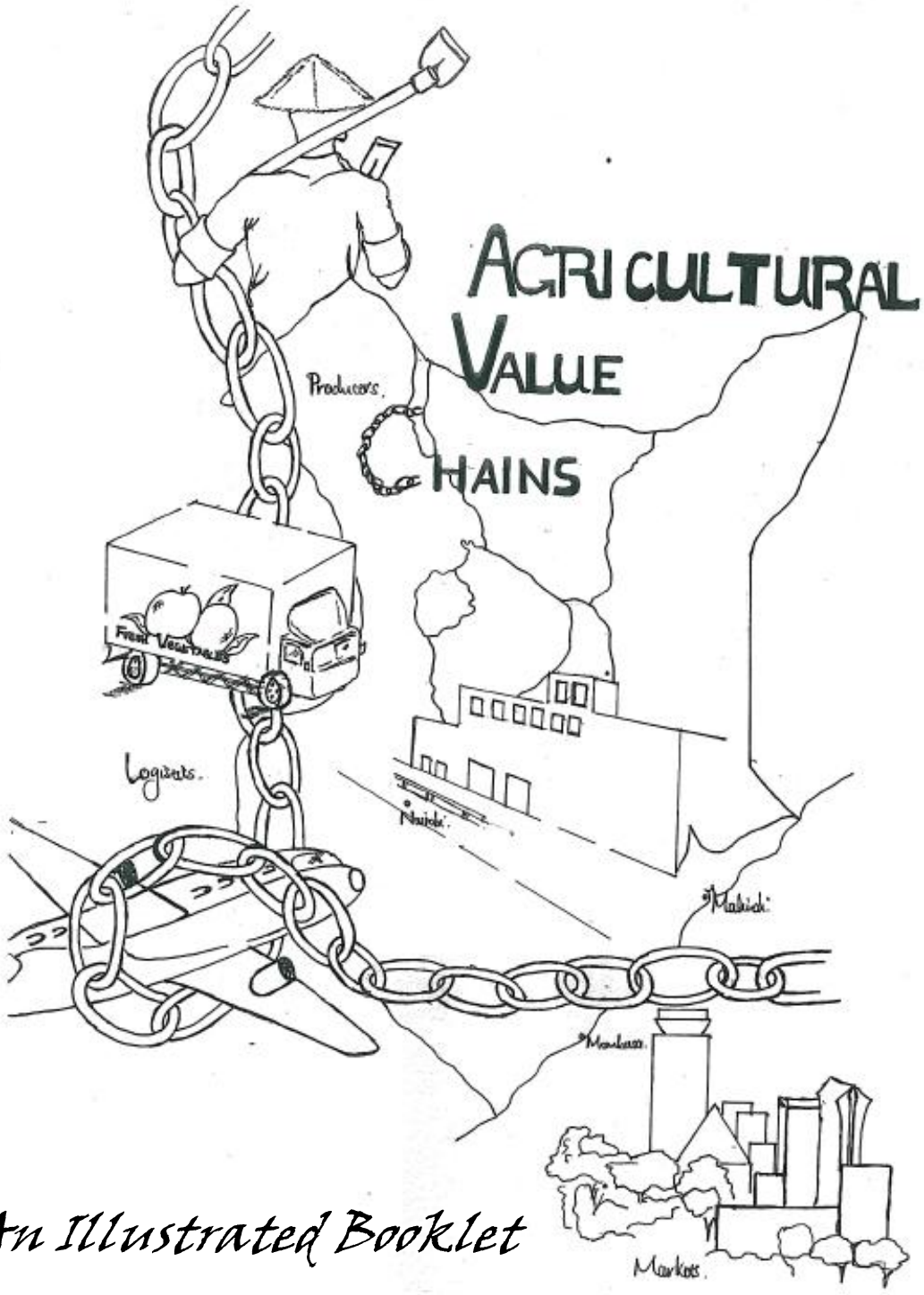

An Illustrated Booklet

May 2013

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Launched in June 2008 and managed by Crown Agents, the five year-long, UK government (DFID) funded project, supported research and knowledge sharing between participating countries to enhance the uptake of low cost, proven solutions for rural access that maximise the use of local resources.

The programme was active in Ethiopia, Kenya, Ghana, Malawi, Mozambique, Tanzania, Zambia, South Africa, Democratic Republic of Congo and South Sudan and was developing relationships with a number of other countries and regional organisations across Africa.

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This booklet was developed from research carried out to explore the role of rural transport services in supporting the production of high value agricultural goods. The information presented is expected to benefit actors in the agricultural value chain development whose goal is to improve the incomes and livelihoods of small holder farmers through increased marketing of high value products.

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We are thankful to the following establishments which opened their doors and their records for the Research Team to build practical information background to the principles and operational agribusiness concepts highlighted here-in: Sunripe Ltd, Meru Greens and Mt Kenya Gardens Ltd, Goshen Farm Ltd, Freshpak Ltd, Athi Farm Ltd, Farm Concern International (FCI), Operators of Wakulima, Kangemi, Githurai and Thika wholesale Vegetable Markets among others.

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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

RESEARCH SUMMARY

Purpose of research and booklet

The general purpose of this research was to develop a methodology of how rural transport services for high value agricultural goods can be planned and implemented with due concern for household livelihood systems. This project contributes to the overall goal of improving the incomes and livelihoods of small holder farmers through increased marketing of high value products.

This methodology includes a logistics approach that exploits among others, a multi-modal planning methodology, ICTs, and route schedule management that is synchronised to load thresholds at different times.

This booklet presents the main findings of the project in an easy-to-read manner. It is meant for researchers, policy makers and practitioners in the field of agricultural logistics, marketing of agricultural produce, planning and maintenance of rural infrastructures and financing of rural investments. It refers not only to planners in the public sector, but as well to private enterprises wishing to develop new logistic chains.

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

Figure 1 below shows 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.

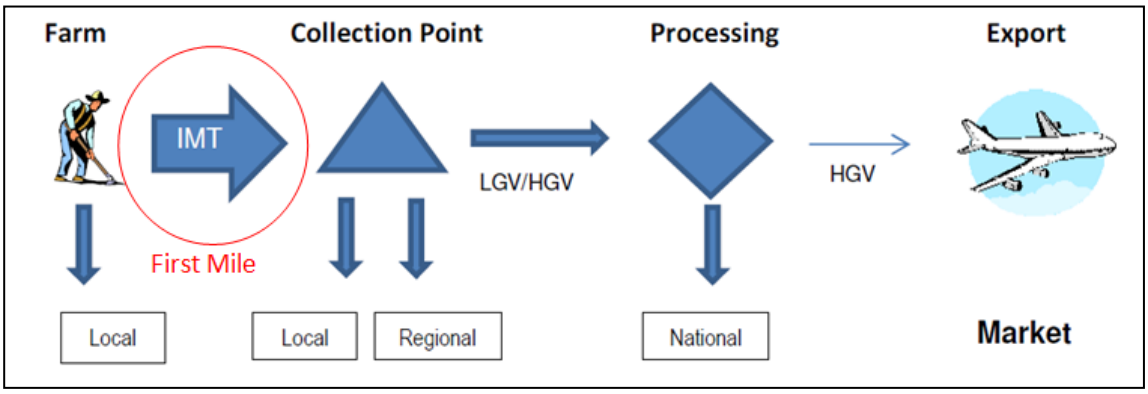


Figure 1 Main Components of a Logistic Chain

Table 1 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 conditions have strong impacts on transport costs		
Remaining Logistic Chain	Local means, no cooling	Heat insulated trucks, air vent cooling or over-night transport	Refrigerated transport, pre-cooling
Grading facilities	Local Grading Sheds	Modern grading facilities usually next to cold stor-age 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,

Essential facilities and components of Value Chains

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 mode on the first mile

The choice of an 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 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 farmers' earnings from agricultural produce amount between 43% and 79% of wholesale price[1]. 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

For unorganised famers, the formation of farmer groups or cooperatives entails a number of advantages that are generated through increased 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 may 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

[1] Since the project was only assessing the marketing side, agricultural production cost were not included.

cheapest option when volumes are definite and consistent. Single medium scale farmers with own trucks more 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 people involved in 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 comes from 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, and other equipment operation needs an operator. With Kangai a large percentage of workers are women.

Planning of new high Value Chains

A necessary precondition may be the establishment of irrigation schemes that allow for the production of high value products. The form of marketing through private brokers (informal), large or medium exporters (via contract farming) or cooperatives (self-organisation) will determine the market studies that have to be conducted. For private investments in grading sheds, local cooling facilities, warehouses, vehicle fleet, etc studies of 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 only analyses the costs of the motorised chain and tries 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.

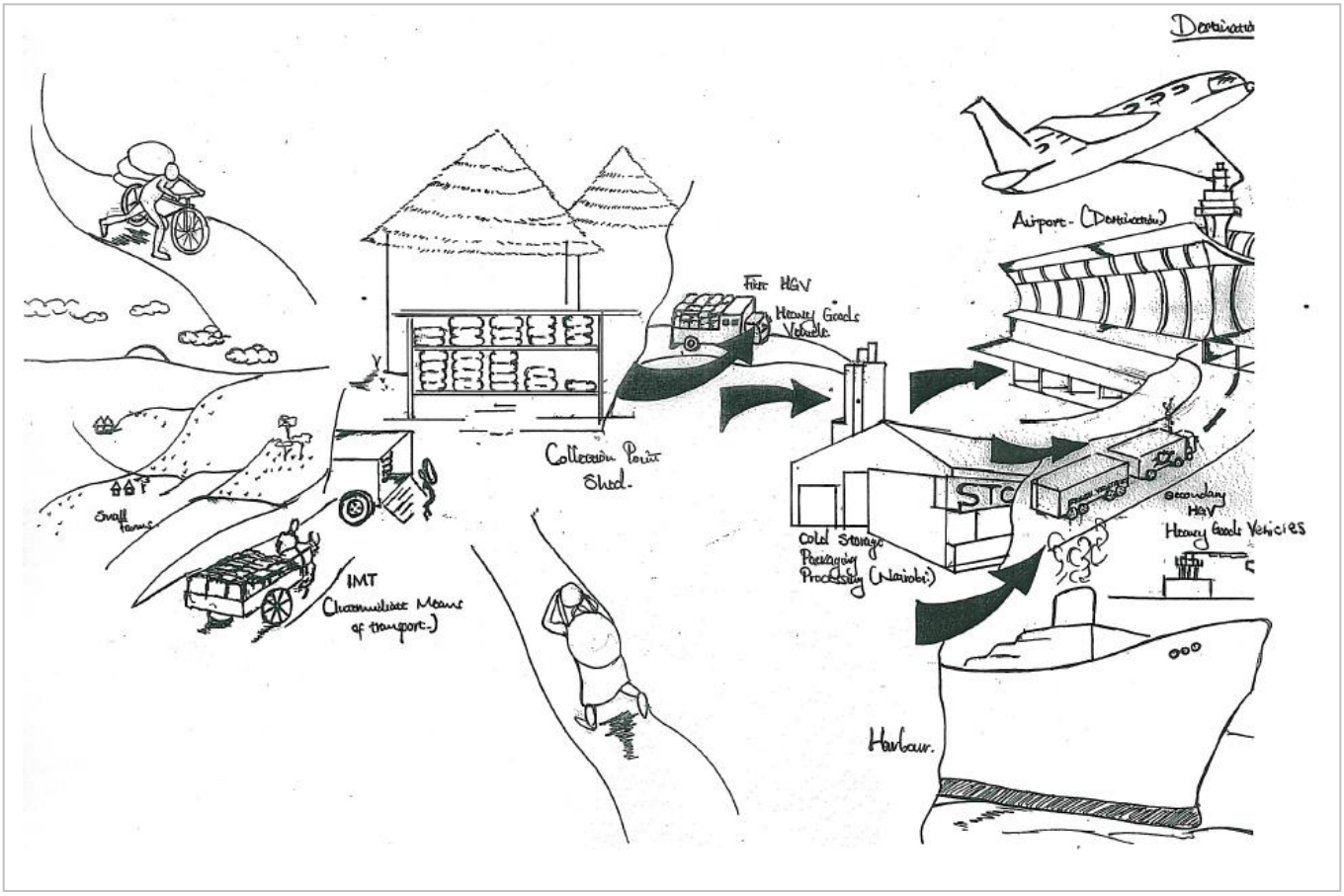


Figure 2 Typical Agricultural Value Chain and related Logistics

1 Introduction

In recent years a renewed focus on agriculture has been evident in Africa's development agenda. 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. Small holders 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, livestock rearing or fishing. A food-secure world requires that African farmers 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 losses, a good fraction of which can be associated to the poor transport infrastructure and generally poor logistical efficiency.

Today, the high value agricultural sector in East Africa 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 in horticulture where crops can be planted and sold within two to three months. Demand for good quality horticultural produce is increasing globally, but Africa's smallholder farming system is constrained by opaque trading and transport chains that run from farm level to regional, national and even international markets.

2 About the Book

This Booklet is based on a study looking at the organisation of logistical chain in the potatoes, onions, bananas and french beans sub-sectors. The study examined the organisation of the logistical operations, from the 1st mile (from farm to collection point) through the various intermediate logistical stages leading up to national and international markets. A common feature of the Kenyan logistics system is that it is not a distinct, specialised operation, but it is typically run together either as a part of a farming or trading enterprise.

The study focused on four typologies of the logistical and transport chains that are common in Kenya. These can be characteristised as follows:

1. The ‘fragmented’ local and national market chains where traders who are the key actors in the chain, buy from various farmers and sell to various markets. Usually there is no bond between the farmers, traders and the market as the system operates opportunistically.

2. The medium scale farmer cum trader who has his/her own farm but supplements by buying from contracted farmers in produce bulking groups and sells to a local niche market in the form of supermarkets or for local processing.

3. The medium scale farmer cum trader with his/her own farm who buys from farmers for direct export to small importers in foreign locations.

4. The large scale farmer who has his/her own farms and who may have ties with the smallholder farmer or approach them only in times of general shortage of supplies

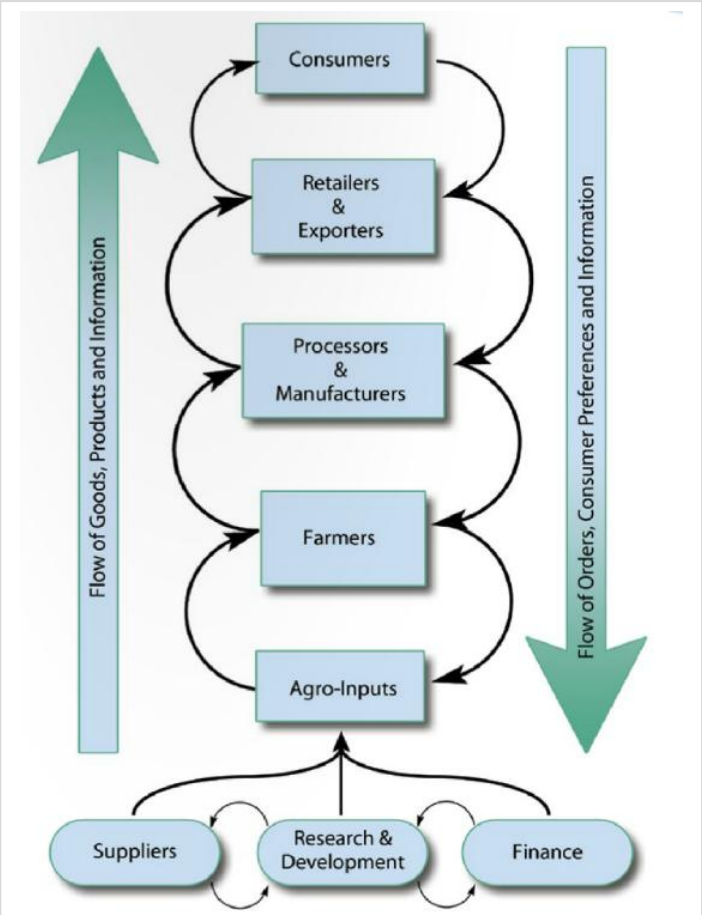
The Booklet attempts to present a Quick-Look Framework of the structure and operations of the Agri-business Value Chains, from a logistics perspective. The lessons are derived from our Kenyan case study, but the study team believes the frameworks included are typical of the operations as practiced in East Africa and other Sub-Saharan Africa countries.

The target audience for this Booklet includes but is not limited to value-chain planners, regulators and investors targeting the high-value agricultural sector and involving smallholder farmers. In a world of changing nutritional habits, rising world population and diminishing resources, the smallholder in tropical lands is in focus for today’s development interventions. The position remains that, to sustainably supply high quality fresh produce to the growing urban populations, the smallholder farmer must grow high value crops, with improved levels of land productivity and logistical efficiency.

3 What is an Agricultural Value Chain?

Transport and organised logistics chains are important components in the development of viable agribusiness for small holder farmers. 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 chain is depicted in Figure 3.

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.



Source: ACDI/VOCA World Report (2006)

Figure 3 Value Chain Marketing System

3.1 Value Chains for growing agribusiness

For a value chain that will grow agribusiness to emerge, producers, transporters, traders, wholesalers and exporters have to work together and meet a large number of requirements including but not limited to:

- 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. 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.

3.2 Key ingredients that determine chain efficiency

The main requirements of logistic chains are presented in **Error! Reference source not found.**. 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, national and international markets, all involve smallholder farmers. Collectively, smallholders produce much of the agricultural produce often within farms units that support multiple activities (livestock and crop production). Smallholders sell to brokers or are organized to sell in groups to organized medium and large-scale traders or industrialists.

Smallholder farmers typically grow under rain-fed conditions dominated by many production and transport handicaps, even where markets exist. The development of an internationally competitive agro-processing sector, backed by an efficient production and transport system, is constrained by a wide range of factors, including the small scale of operations, which limit the technology that can be used, along with poor access to raw materials, which can result in considerable low levels of capacity utilization.

The seasonality of raw material production affects agro-industrial productivity negatively. Seasonality translates in limited supplies in the markets which pushes the prices of commodities higher leading to inflationary trends. This problem could be alleviated by increased vertical integration, whereby local

processing would provide semi-processed products while final processors transform them further into finished products.

Table 2 Main requirements for logistic chains

	Local Market	National Market	International Market
Production	Production standards are according to agronomic and other information or technology and market support available.		
First Mile	Very occasionally will have an off-farm charcoal cooler, used only if transport does not show-up on the day of harvest. Accessibility during harvesting is essential. This section which can be as long as 20km in distance has highest transport costs per ton-km. Means of transport include humans and IMT and road condition greatly determines prevailing costs.		
Beyond the 1st Mile	Pick-up and larger trucks.	Lack of heat insulated trucks necessitates the adoption of practices such as overnight transport.	Large-scale marketers might own refrigerated trucks.
Grading facilities	Casual local sorting and grading.	Local casual sorting and grading at on-farm loading spot. Sheds are rare.	Sorting, grading and packaging facilities on-farm or nearest the airport.
Storage	Rarely necessary.	Charcoal coolers and refrigerated warehouses	
Packaging, Processing	Gunny bags, cartons, nets, wooden and plastic crates. Bulk packing cushioned with 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. Supermarkets receive mini-packs of single produce or ready-to-eat or cook mixes.	Packing by customer specification in branded pellets, bottles or cartons.
Quality Standards	No formal quality standards. Unpurchased produce likely to go to waste.	Kenyan-GAP[2] Standards, exist in books but are scantily enforced.	International Standards, Kenya-GAP under occasional sampling by KEPHIS.. Strict traceability regulation in place and applied.

Value chain performance is determined by agricultural land productivity (soil health) and the logistical performance and market stability. Land productivity is determined by availability of factors such as farm inputs, water, energy and access to good transport systems. Market stability is also important especially for small scale farmers. Unlike large-scale farmers, smallholders depend on rains. They plant and harvest at the same time and thus overload markets and bring the farm-gate price tumbling down

4 Case models

To be able to characterise the structure of value-chains, six logistic chains were studied. In order to understand the performance of the value chains, the typical profiles for the four commodities, french beans, banana, onion and potato, the value chain components are presented in the charts below:

[2] GAP = Good Agricultural Practice

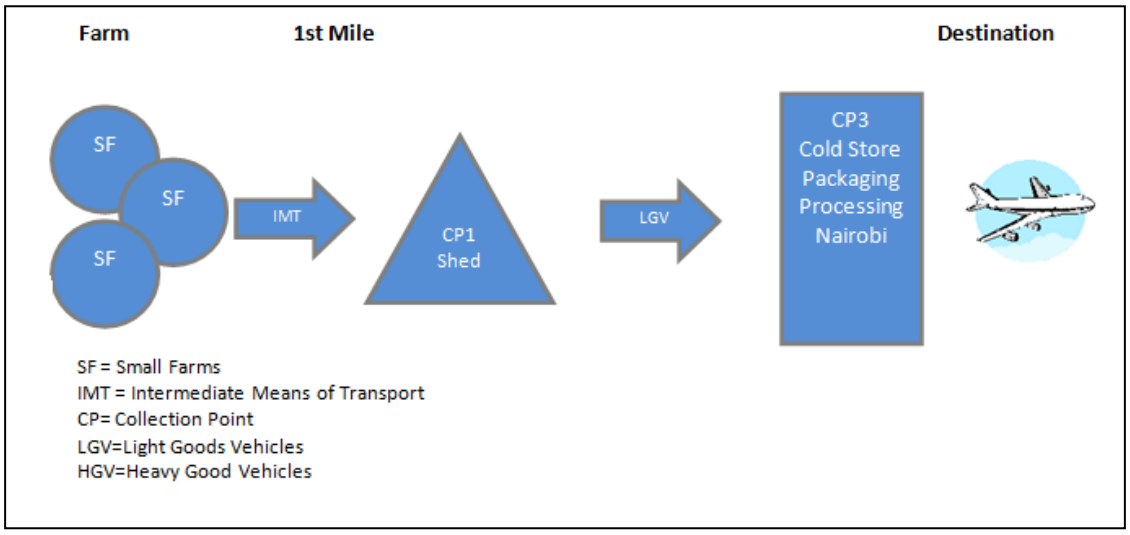


Figure 4 Three-stage transport chain for French Beans with Kangai Tisa in Embu County

This chain consists of small scale farmers (farm size 1-2 acres) in one zone supplying to an entrepreneur/company through contract arrangements. The small scale farmers transport the produce to designated collection points along a rural road. The collection points serve the purpose of load consolidation and 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.

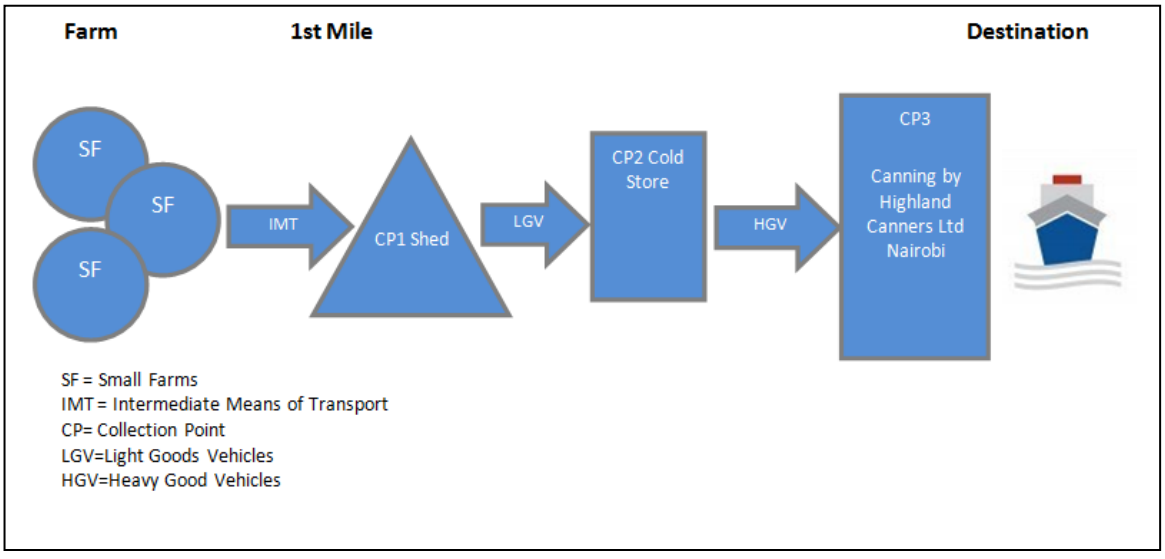


Figure 5 Four-stage transport chain for French Beans with Meru Greens

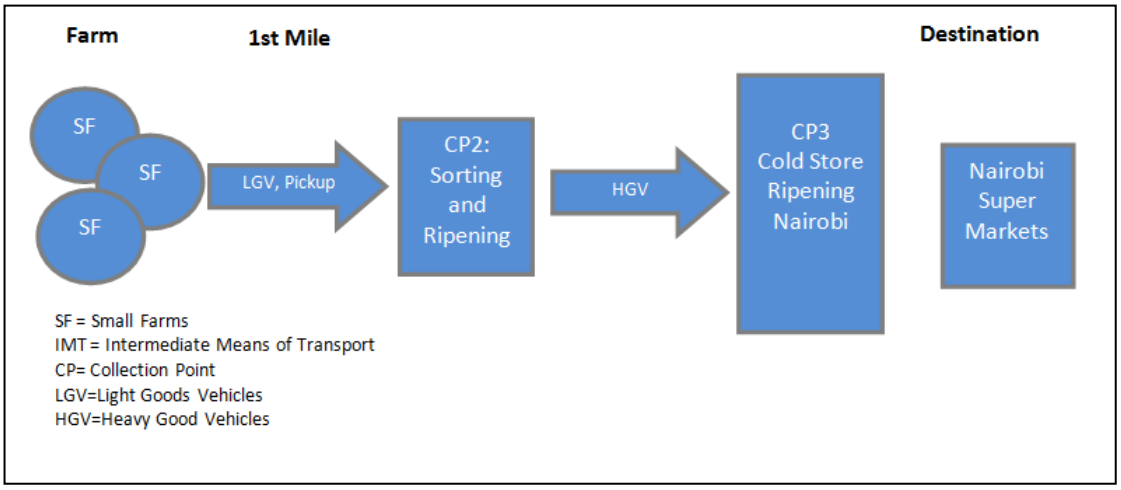


Figure 6 Three-stage transport chain for Bananas of Mt Kenya Gardens Ltd

The chain consists of smallholder farmers (1-3 acres). The company collects bananas directly from the farms using company's trucks. The bananas are taken to ripening depots located nearby or in Nairobi. The bananas are then supplied to a contracted supermarket chain's distributors. For an average farm-gate price of Kshs 19.00 per kg, the national markets price could ranges from Kshs 60-80 per kg.

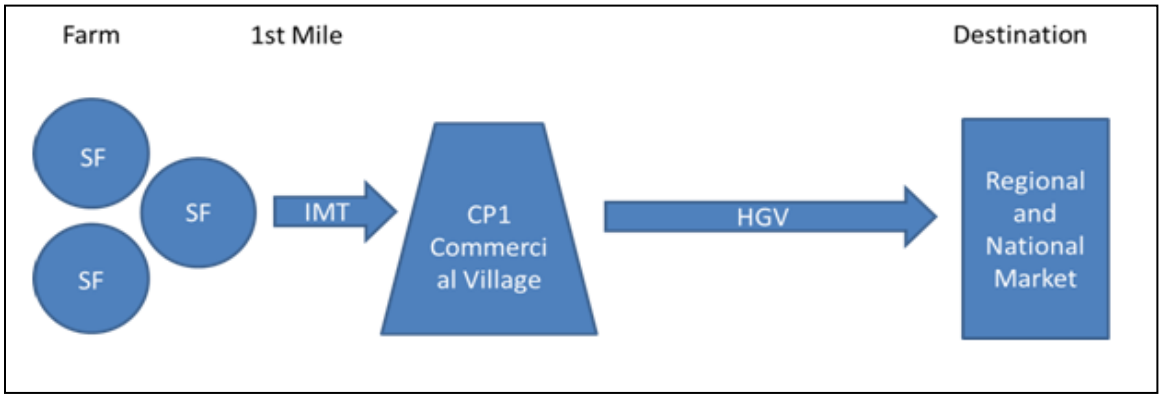


Figure 7 Two Stage Chain for Onions produced by a Commercial Village

This chain exemplifies the framework of Commercial Village Model promoted by Farm Concern International (FCI). The model organizes small scale farmers in a village into Commercial Producer Groups (CPGs) working together to achieve leverage and voice in the on-farm market place. The small holder farmers - with average of one acre - operate a coordinated production and marketing system that connects them to a range of traders from different markets who collect from designated points along a circuit and transport to

various regional and national markets. In addition, it allows farmers to gain in input prices by purchasing together in bulk. Typical farm-gate prices for onions average Kshs 30 per kg, while at the national level, the price ranges from Kshs 80-110 per kilogramme.

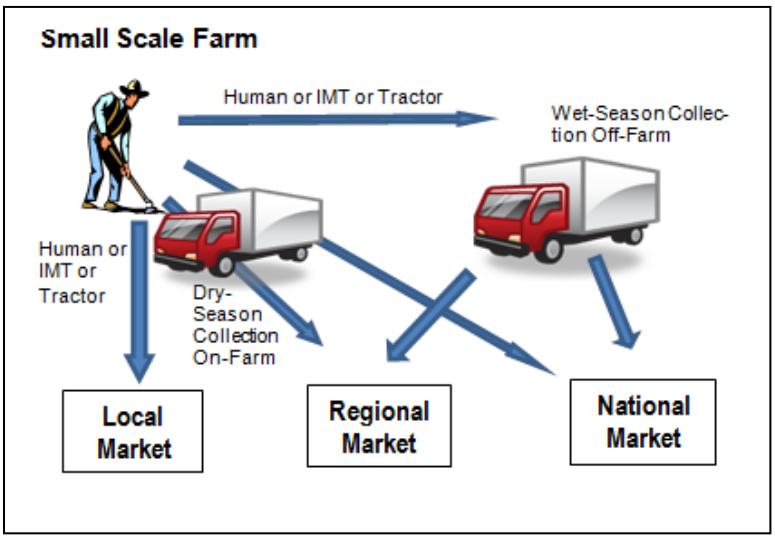


Figure 8 Mixed chain for uncoordinated broker-market for Potatoes

The established ***large scale exporter*** will typically have a centrally coordinated, capital intensive chain, consisting of own large scale farms, on-farm sorting yards, own transport (refrigerated or not) and a cooling plant near an airport. One such chain was SUNRIPE with a 500 acre farm in Naivasha region, growing for export. French beans made up approximately 20% of the total production in the farm.

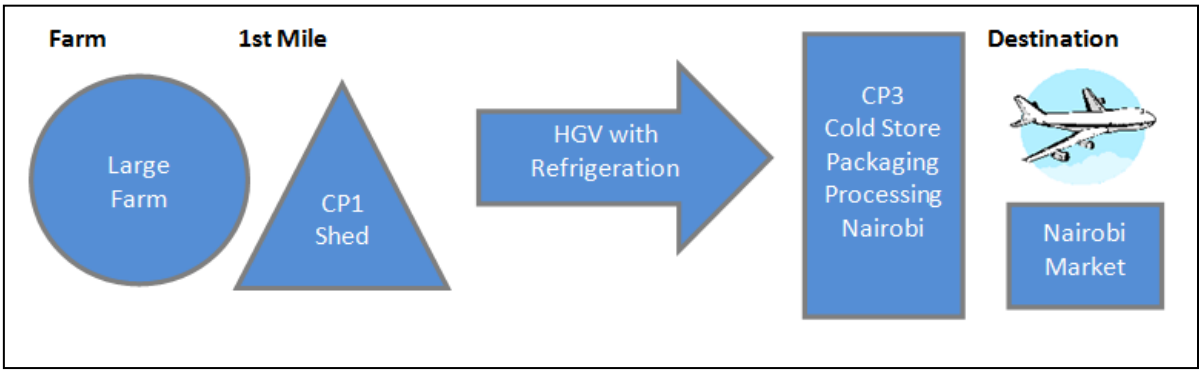


Figure 9 Large farm owned by SUNRIPE, refrigerated logistic chain for French Beans

5 Logistical and transport structure for small holder value chains

The typical rural logistics chain for high value crops can be segmented into 3 parts. The *first mile*, representing the distance from the farm to a designated collection point or a market hub, 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 transport segment* that operates after full consolidation of the produce and then onto the regional or national markets or airport termini for the international market.

5.1 The First Mile

Figure 10 below shows the main ingredients of a logistic chain for small holders, containing the production, collection point, processing units and the export market. For the chains studied, the entire length to the national market or final destination before export ranged from 100-300 Kilometres. The first mile from the farm to the primary collection point is essential for small holders in terms of costs, distances and preservation of value. The length of the researched chains ranged between 100 and 300 kms.

Figure 10 The typical chain highlighting the First Mile

The average length of the first mile transport segment ranges between 1.5 to 13 km. This consists of only 0.4% to 10.6% of the distance of the entire chain. However, the significance of the first 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 transport mode on the first mile is important in determining total transport cost in a value chains. In one of the case studies (Kangai Tisa) human porterage made 36% of total transport costs. The shift from porterage to ox-cart may lead to a reduction in overall transport costs. Depending on location topography and other factors, change from porterage to motorcycle can reduce overall costs to roughly one third.

In the first mile donkey or ox-carts are mainly used for larger loads or bulky products, such as onions and potatoes. For these type of loads donkey carts and especially ox-carts are much cheaper than motorcycles. Pickups and tractors, where they are affordable, may be cheapest means of transport for the first mile. However they need to be fully occupied and running full most of the year.

Typically, conventional freight logistics planning will tend to analyse the costs of the motorised chain and try to improve its cost efficiency, leaving out the all-important fist mile. 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.

5.2 The Second and Thirds Transport Segments

Depending on how one may choose to view the chain, large-scale farms may not have a first mile. On farm assembly of produce is mechanised, with a central on farm collection point. A second transport segment may consist of cooling, processing and packaging facilities before delivery to final destination. The third segment is the long trip from far or near-farm to the urban hub or near-airport packaging or processing destination.

The second and third segment experience increasing economies of scale as payload are consolidated into higher volume vehicles with a resultant decrease in unit transport costs. A fully loaded 8-ton High Goods Vehicle (HGV) will have unit costs that are roughly half the transport cost of a one tonne pick-up. The third segment is often characterised by good quality inter-urban or national trunk roads, a factor that significantly reduces transport costs.

5.3 Models of Group Organisation for Small Holders

The challenges of achieving economic volumes, consistent quality and leverage in the market have lead to emergence of a variety of organisational models for farmers. These include Commercial Villages and Agribusiness Clusters models being tried under NGO and private sector initiatives. This study did not undertake any assessment of these models, but on the face of it, and with the right governance structures, they could be part of a process of incubating and developing small holders capabilities to participate in the market.

5.4 Gender Dimensions:

From farm to market, women are playing a key role in the functioning of horticultural value chains. Women form the majority of workers within agricultural production systems. There is no discrimination in wage between women and men who work on the farms. Women are preferred in harvesting, grading and processing stages, with an argument that they have more patience which is important for quality. Men are typically involved in manual asks like land preparation, irrigation, spraying, loading and offloading trucks.

6 Contextualizing agricultural value chain planning and information requirements

6.1 Spatial local, regional and national dimensions

Spatial dimensions (local, regional and national)

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. 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.

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. 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.

6.2 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. The significant role of ICTs in supporting agricultural value chains is elaborated in section 6.5.

- **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. Successful value chains depend on the ability of all chain actors to communicate, coordinate and collaborate.

- **Institutions and policies:** 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 sustained value chain development.

- **Investments in core infrastructure and services:** Value chain development needs to be supported by backbone infrastructure located in strategic places. Infrastructure means good quality and accessible sheds at first mile collection points, clean surfaces for produce grading and cooling as well as quality sanitary and waste disposal facilities, followed by quality rural and other roads connecting the first mile circuits are important. These investments are best done through public/private partnerships.

A general framework for assessing value chain feasibility is proposed as follows:

Table 3 framework for assessing value chain feasibility

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

6.3 Regional planning framework for agricultural value chains

Regional planning for value chains focuses on having an integrated oversight of all 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 involved. For example, there are parts of any 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. Unless local enterprises are able to meet market (national and international) requirements, they will remain closed to them. Information structure and flow is critical at every stage of the business practice.

Improved 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. Improvement in infrastructure, research and technology are needed, to help increase producer returns and income by lowering production and transaction costs. Hubs and spokes models help understand the value chains. The nodes and networks providing the linkages can be seen as hubs and spokes (see

).

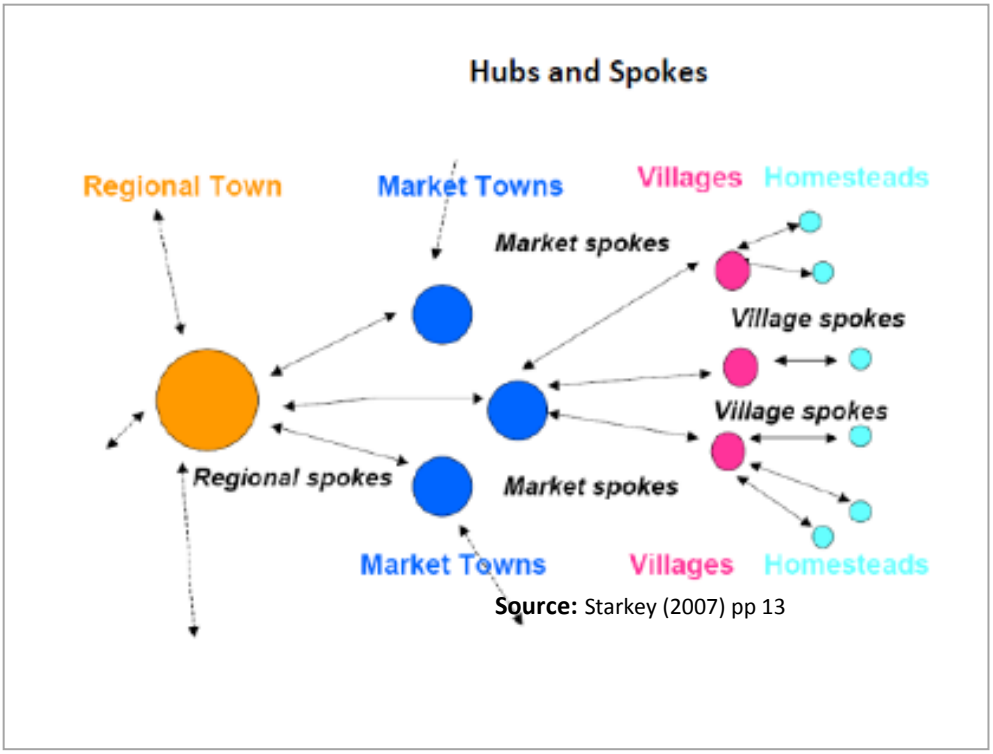


Figure 11 Hubs and spokes

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.

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 **Error! Reference source not found.**).

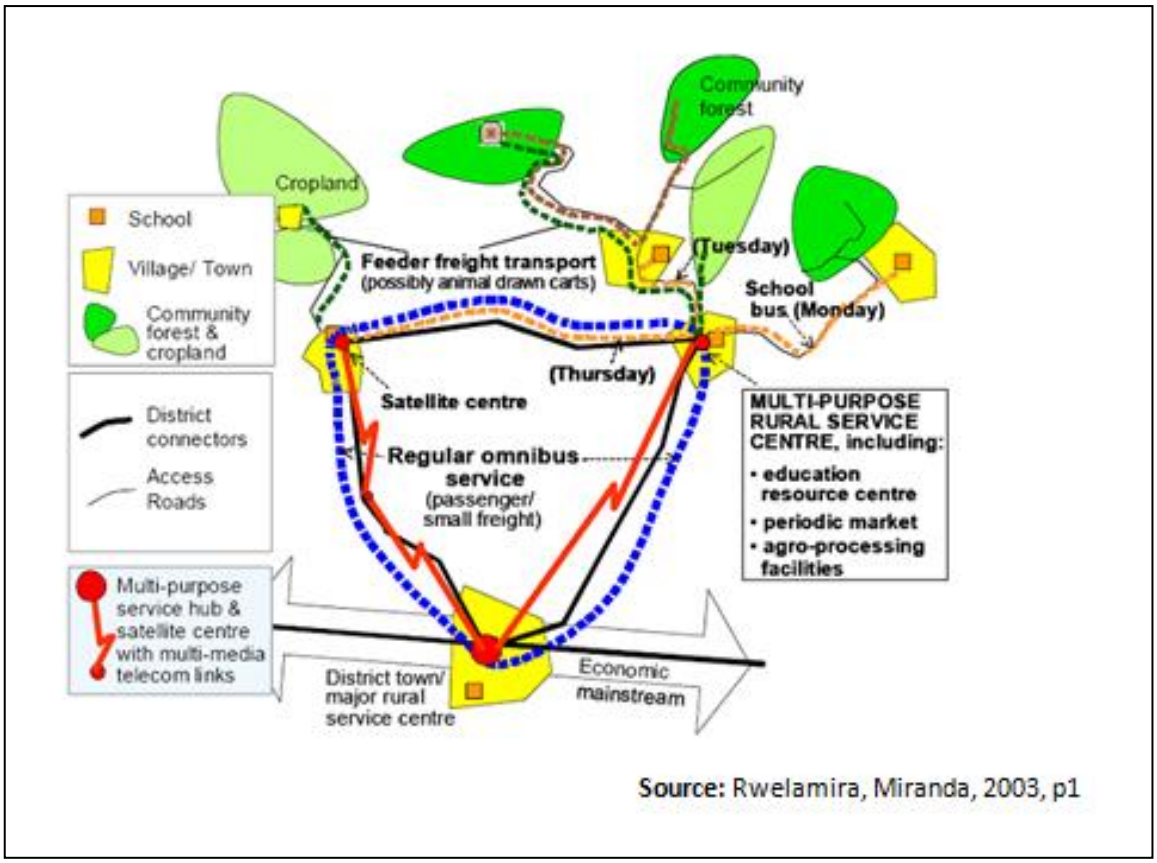


Figure 12 Central Locations in the Master Plan of South Africa

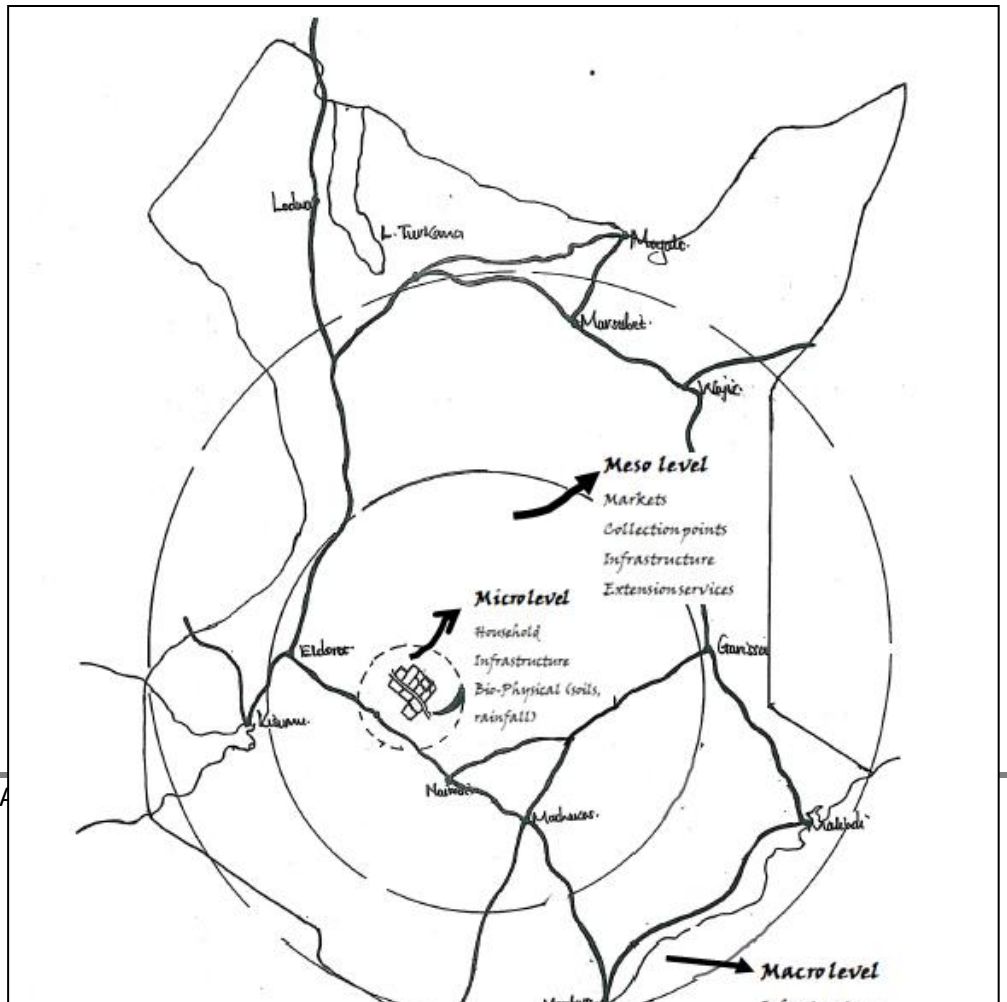
6.4 Information requirements and the role of GIS in planning of Logistic Chains

Why do we need GIS and Mapping Tools in Agricultural Value Chains?

GIS and mapping tools are useful within agricultural value chains especially where spatial / location 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.

Other useful uses include; 1) 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 (2) the optimal location of collection and distribution points for produce and inputs (3) The optimisation of transport costs by optimal location of facilities (sheds, storage, cool-houses, hubs, etc)



6.5 ICT tools and Information flow between various sectors / components of an AVC

Table 4 GIS tools and Spatial Information Development for Agricultural Value Chains

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 (Rain-	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

	fall)	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.

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.

In Figure 14, a conceptual model of an agricultural produce value chain showing the broad horizontal and vertical linkages is presented. Additionally, the roles of each actor have been outlined.

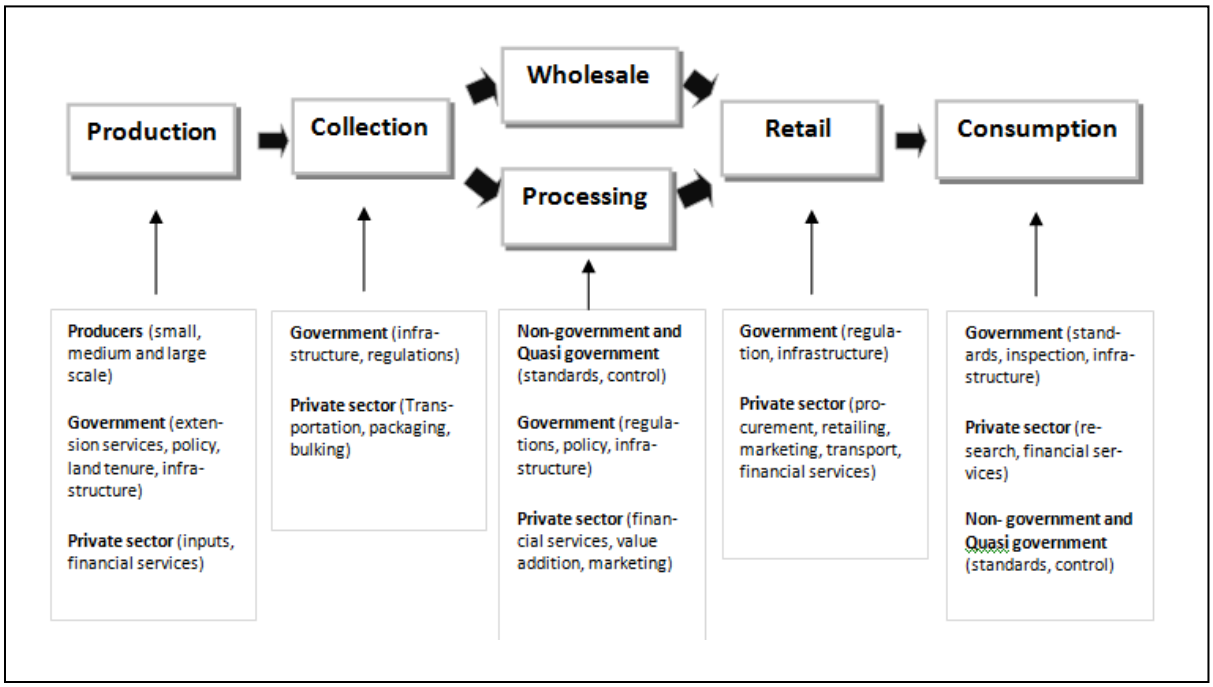


Figure 14 Value chain components and players

6.6 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 agricultural commodity exchange platforms such as the Esoko3. 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 have the potential to attract the young generation to the agricultural sector where they are able to provide services and engage in business ventures. In Meru for example, small scale French bean farmers located more than 0.5km from the collection centre used mobile phones to contact motorcycle operators who provide transport services. Motorcycles are owned or operated mainly by the youth in rural areas.

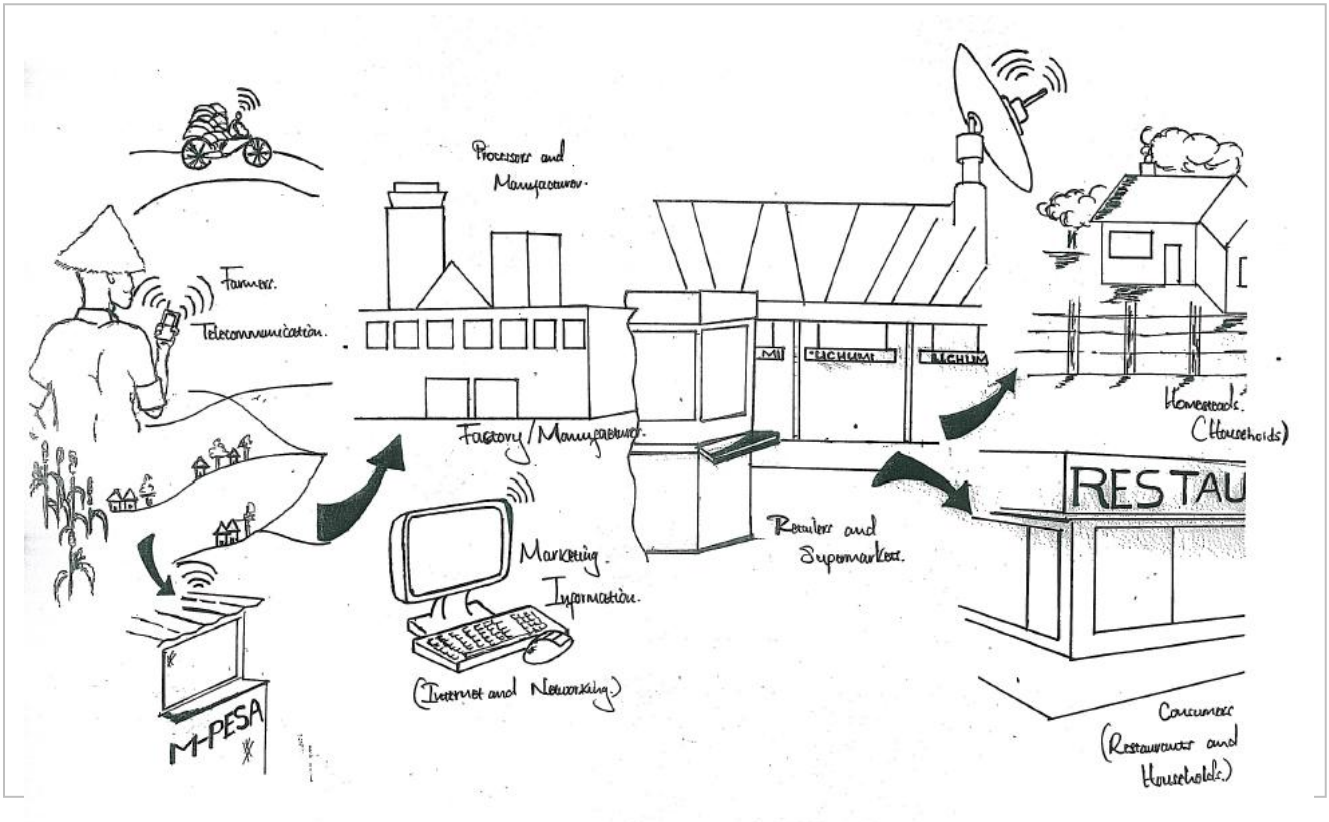


Figure 15 ICTs in Agricultural Value Chains

[3] *E-soko is active in 15 countries through different partnership agreements; both public sector agricultural projects and E-soko country franchises). E-soko 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 tr
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 transportatio
vices. Farmers are able to pool their produce and utilise space available in the carts thereby cut on costs. The ox cart owners are
coordinate transport services by alerting farmers on pick-up times.

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

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.
tionally, the middlemen are able to use mobile cash payment methods to pay for produce collected from farms.

Source: Field wo

7 Organizational, Institutional and Policy Support

One of the major issues highlighted in this booklet is the need for improved infrastructure to reduce transportation costs and perishability that makes the sector uncompetitive. Developing and improving regional value chains for agricultural commodities will require the building of public-private partnerships to create an environment that is conducive to the profitability of the enterprises. 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.

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.

7.1 Support of the high value farming sector

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 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

7.2 Policy Support

Key policy agribusiness attributes and actions for success must target the following mandatory advances in the interest of the high value agricultural sector:

- Clear Government strategies that target the much needed agricultural production potential;
- Improving the quality of raw materials through innovative and better 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 its agencies, such as for Kenya, the Kenya Private Sector Alliance (KEPSA).
- 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, national standards bodies 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 key issues to be addressed are poor infrastructure to reduce transportation costs and perishability, as such losses make the sector grossly uncompetitive. Developing and improving regional value chains for agricultural commodities will 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.

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8 Future research on logistics and transport studies to support AVCs

There is potential to enhance the knowledge base in this area of work through further research. Potential aspects for further research include but are not limited to;

- Market studies for new value chains that might be viable in the future taking into account a rapidly expanding African agricultural sector,
- Market studies assessing consumer preferences and demand,
- Harvest losses and quality of produce landing at the market or factory, and how these can be minimised, across various crop enterprises, including the quantification of economic losses attributed to poor road access,

- Exploring 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 across the entire chain,

- The impact 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 are needed.

- Comparison across chains on the introduction and impact 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 are urgent.

- Geo-spatial and logistical analysis towards identifying new workable and agribusiness efficient value chains with clear hubs and spokes,

As Africa grows into the formation of the Regional Economic Communities (like East African Community for Kenya), the RECs 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 Booklet study highlights key aspects and features 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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