

From Farm To Market



Agriculture Value Chains



A Picture Story



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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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May the adage that "A PICTURE SPEAKS 1000 WORDS" come true for all those that interact with the material and learnings presented in this exciting and ground-breaking booklet.

If only produce could narrate the story of where it has come from to reach its market destination...



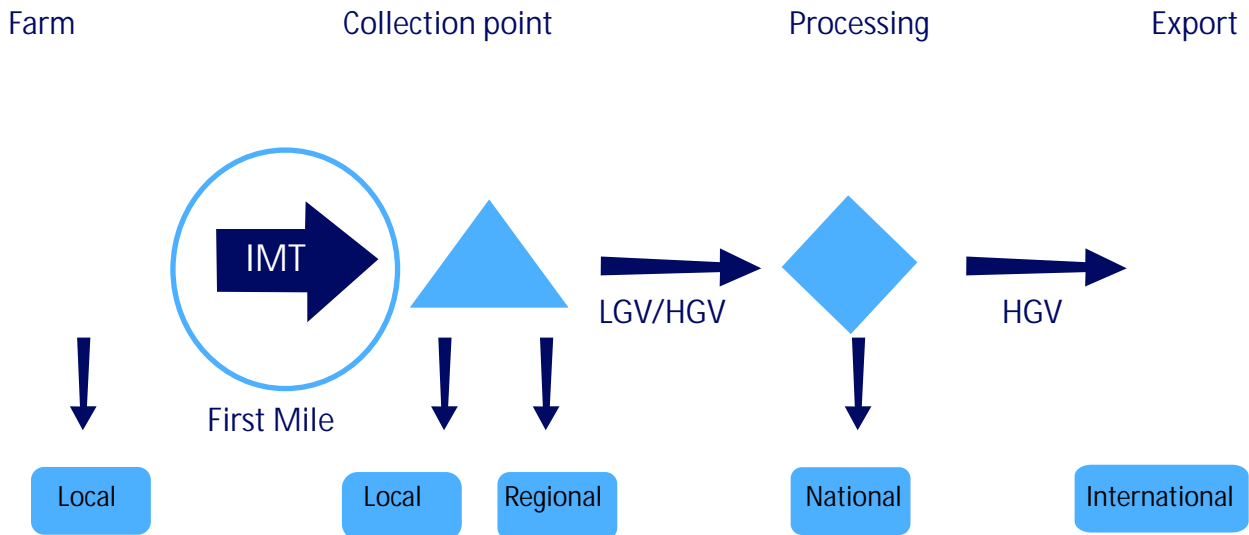
Four horticultural value chains were studied in this project. They typify the various categories of agribusiness players in the chain and include the following:

1. The local national market trader targeting produce from smallholder farmers mostly in amorphous individual or group farming entities, purchasing directly or through a range of farm-level brokers. This trader sells the produce at congested urban and peri-urban formal or informal markets, normally through market-end brokers.
2. The local national market trader producing from individually owned farms and buying from contracted or non-contracted out-growers and selling to local supermarkets or local processing factories. Such traders have their own or hired transport fleet serving the market directly or through medium scale cold rooms for short term storage. The particular companies studied had ventured into post-harvest value-addition in form of banana ripening plant. The factories studied were serving local or international markets.
3. Upcoming exporters targeting international markets but not immune to the attractions of a less organized and controlled local market. The upcoming exporters studied had their own or hired transport delivering to rented Horticultural Crops Development Authority (HCDA) cold-rooms and pack houses.
4. Established exporters producing from their own large-scale farms as well as out-growers, feeding climate-controlled produce assembly pack houses served by own or hired elaborate fleet of vehicles. In recent years and with increased urbanization, these companies have been attracted to the growing local market, led by a middle class that is sensitive to quality, sanitised and healthy nutritional supplies.

This is the “one thousand word” story of the journey of horticultural produce, *From Farm to Market*.

Overview

General layout of logistic chains: From Farm to Local, Regional, National or International Market



Key:

IMT = Intermediate Means of Transport

LGV = Low Capacity Goods Vehicle

HGV = High Capacity Goods Vehicle

Local = Local Market

Regional = Regional Market

National = National Market

Production Process



Production Process



The ability of farmers to access clean quality seed determines their success or failure as farmers. For instance, the importance of researching the performance of various seed potatoes cannot be taken for granted. Potato farmers have to use farms that have no signs of Bacteria Wilt

(sudden withering of the crop as it nears maturity), Late Blight and others like the cutworm on the picture



Clean Seed from the Netherlands and Local Seed from the farmers' farms: Both seeds are ready for planting. When seed has already tillered, farmers should remove the tillers under clean and sanitised conditions. If seed is planted with the tillers, only those tillers will develop. Removing the tillers allows the potato to grow similar and more tillers as the dormancy period comes to an end. ▶



◀ Onion seedlings

Production Process

Women: The Drivers of the Production Process in the horticultural sector



▲
Seedling preparation

Weeding



◀ *French bean harvesting*

Production Challenges

Majority small-scale farmers report that they are faced with a myriad of challenges that breed agribusiness frustration. They report three core problems:

- Lack of Market access
- Lack of capital and labour
- Impassable roads, especially in the rainy season

A system is typical of majority of small-scale holders in high potential areas of Africa. Rainfall is plentiful but the flat terrain and waterlogs cause transport challenges.

At the same time, farmers can only farm during rains where lack of dams (that would hold the rain water) and boreholes do not allow all year production. Accessing labour, especially for female farmers is difficult. Able-bodied men also prefer less tasking jobs like operating a shop in the local urban area. Farm mechanization is scanty consisting of only a tractor with a plough. All other farm operations including ridging, weeding, harvesting, post-harvest and livestock feeding operations are manually performed.



Production Challenges

This area of Nyeri West has sections of slopes over 60 degrees, all under production, and without much concern for establishing terraces or changing hoe-based farming methods. Losses of rich volcanic soils can reach 40 tonnes per hectare per year. Much training in establishment of terraces is needed by these communities.



The country is losing tonnes of healthy top soil to erosion due to the way farms are managed. Each rain season takes the country closer to desert situations.

Production Challenges

Poor roads are the greatest hindrance to rural agribusiness advancement. As much as communities have to be active members of the transport sector, their capacity to repair tricky spots of the rural road is limited as demonstrated below. Continuous grading by local government of highly erodible soils soon forms a gorge on the hill, rather than a road. Cheaper methods of developing all weather roads affordably are available in countries like Malaysia and South Africa.



Production Challenges

Access to seed is a major determinant of the yields and business performance of the rest of the value chain. Different crops experience different kinds of challenges

Examples of Popular crops:

Potato:

Importance of access to quality seed is especially notable with potato. It is estimated that today the country can only supply about 6% of the clean seed needed in the country. Potato seed is accessed from KARI Tigoni, ADC farms and from specialised farmers like Kisima Farm in Meru. Typically, farmers pick the remains of current crop yields for use as seed for the following season. This practice facilitates transmission of diseases from the current crop to the next.



French Beans:

French Beans are grown mostly for the export market. Most exporters and their agents contract farmers to grow the crop. Typically the exporter supplies to the contracted farmer all the inputs, including the seed of the variety sought by the importer. Export market faces stiff regulations that farmers, handlers and exporters must adhere to. These are called Global Good Agricultural Practices (GAP). The most stringent rule is the Maximum Residue Level (MRL) of chemicals allowed on the crop at the time of harvest. Smallholder farmers are increasingly

getting left out of the French Bean market, because for them it is an uphill task to achieve the acceptable MRLs. medium

Production Challenges

Examples of Popular crops:

The banana:

As a fruit, the banana is one of the most widely consumed fruits of modern day Kenya. The banana has many established varieties considering its long history as a Kenyan food. Some bananas are good for cooking while others are good for eating. The banana grows in the low to midlands in terms of altitude. It thrives in well drained soils contrary to the common belief that they do well in swampy areas. Once established on soils free of nematodes and other soil pest, the banana is an easy crop to cultivate if good agronomic practices like manuring, pruning and irrigation are well practiced.



The onion:

The Onion is a bulb and does very well in the midlands where climate is cooler. It does reasonably well across the agro-ecological zones. Among the counties studied, the onion is grown widely in Nyeri and parts of Meru/Isiolo, Kirinyaga and Nyandarua. Onion is scarce in Kenya between the months of June to December.



During this period, much of it is sought from Northern Tanzania. Traders indicated that onion from Tanzania is well cured while still in the farm and has a superior shelf life compared to the variety grown in Kenya. Market incentives encourage farmers to adopt certified seed, use of fertilizers (both organic and inorganic), even where these inputs are relatively expensive. Onion is favoured for its storability, hence the long marketing period. The timing of its planting and harvesting is important to ensure that that harvesting is done when it is dry. Good production practices require effective farmer training.

Water Harvesting & Use



Technology Integration:
Small and large scale producers integrate technology to support their production. Large scale operations are capital intensive and have put in place automated irrigation systems not comparable or accessible to the labour intensive processes employed by the small scale producer.

Hand / Hose pipe irrigation is more efficient than sprinkler. It is however labour intensive and needs to be done under farmer supervision for efficiency. Flood irrigation can make the soil surface crust, preventing water to infiltrate the soil after a while.



Water Harvesting & Use

Solar water pumping is gaining prominence where farmers can organise themselves, to finance and manage efficiently. Farmers receiving 4 cubic metres per hour may spend Ksh 0 (zero) per month compared to their Mains (KPL) power that may cost them Ksh 50,000 per month. The farmers using solar energy can operate a hybrid system where they use KPL power on days of poor solar insolation. They can also use solar power where they must pump water at night. With large storage capacity, solar power can be used more efficiently. Water pumped during the day can be used at night. Drip irrigation systems are highly recommended for solar pumped systems



Buuri Farmers tap spring water from the Eastern Slopes of Mt Kenya. They have established highly sophisticated water distribution systems where certain members get water on alternate days. The water is subject to clogging by debris and numerous pipe busts and leakage repairs are needed each day. The water is only adequate to sustain farming of small plots (1/8 acre) of vegetables. Pipe quality and plumbing efficiency greatly compromise the dependability of the service. Extended long dry seasons often result in conflicts.

Access to Markets :

The First Mile, Second and Third segments



Access to Markets :

The First Mile, Second and Third segments



First Mile Logistics: Small Scale Farms Value Chain Model Meru Greens, Katheri Area French Beans Contract Farmers

Farmers located within a radius of 0.5 km from the collection and processing centres used human labour and or farm hands to deliver their produce. Farmers were able to save on transport and production costs. Other modes of transport used by farmers within the 0.5 km radius include wheelbarrows, bicycles and motor cycles. For distances more than 0.5 km farmers used donkeys and motorcycles to transport produce to the collection and processing shed. The availability / reliability of motorcycles depended on season and road condition. Transport charges by motorcycle depend on distance and load.

Access to Markets :

The First Mile, Second and Third segments



The Motorcycle has revolutionized rural transport services. As transformative as the mobile phone, farmers now wonder how they managed without the convenience that it affords them in the transportation of people, farm produce and even livestock. It is not unusual to see a truck owner hire many motorcycles to bring out a full load of produce from difficult terrain or during bad weather. Motorcycles need only a portion of the road and can choose the dry sections during the wet seasons. The truck or pickup may not manage, no matter the driving skill.



Access to Markets :

The First Mile, Second and Third segments



Farmers use human labour or various Intermediate Means of Transport (IMTs) including wheel barrows, donkey backs or carts, bicycles and motorcycles, depending on the distances and terrain between the farm and the road. Today, motorcycles have become common and the most preferred means of transport from the farm to the main access roads.



" Before motorcycles, we used our backs. We still do, as back-loading is the only means usable on impassable access roads and on steep slopes where all other means can't access." *Wanjiru Mwangi, farmer, Nyeri*

Access to Markets :

The First Mile, Second and Third segments

There is a national dilemma whether to sell produce by the measure of a kilo or by the bag. Bag size is not a standard measure as it is determined by the sight of the individual.

In some areas like Narok and Bomet, the bag extension shown on this page remains the standard measure despite nationally recognized bylaws. What informs the preference of the bag as a measure, as opposed to the kilo? The logic is that the truck owner, tier, loader, the town council (market entry fee), potato peeler, and everyone else all charge for services by "the bag". It is cheaper to charge and pay for services by "the bag". In time the bag has assumed the natural measure of transaction and has now become culturally accepted. Farmers run the risk of losing out in the national potato market if they insist on using the kilo as a measure (which would earn them more) as the competition in the market uses the extended bag as the standard measure.



Storage



There is demand for cool and sanitized produce that reaches the pack houses in the city. However farmers do not always have the resources for decent sheds where produce from farm can be gathered and sorted. It is at farm level where most challenges lie. Yet this is the section of the chain that determines the quality levels manageable and profitability of the rest of the chain.



The Markets

A Producer's Dilemma: The Market Power Brokers Transporting 5 tonnes of potatoes from Kinangop to Nairobi fetches a profit of only KShs. 8,000, making the enterprise unprofitable. The conspiracy of Market Brokers makes farmers and truck owners like David Kungu avoid the Nairobi fresh produce market for more remote markets like Thika and Kitui. David explains, " In Marigiti, the brokers are in charge and control the market operations. Once our Lorries arrive, they immediately take charge. They pay the city council levies and taxes and sell our potatoes or cabbage. Since most traders arrive in the wee hours of the morning at 3 am, the brokers count the number of lorries that arrive in the market. If there are many lorries in a particular day, they will strategize how to buy the produce slowly in order to create an artificial oversupply. That lowers the market prices. We lose." David sums it up as the height of exploitation by market brokers.



“...the net profit from the truck load can be only Kshs 8,000”.



Processing and Packaging

While international destination horticultural produce value chains (such as French Beans) are well structured and secured in terms of regulations and even food safety, the local market that handles and absorbs 95% of the national horticultural produce needs attention and assistance. Assistance needed is multifaceted and multi-sectoral.

Sorting Produce for the Export Market ▶



◀ Packaged produce ready for the Export Market

Services to the Value Chain

As urbanization and food insecurity increases, urbanites as much as rural dwellers will need more food. This presents great opportunity for growth of Agribusiness for those ready to invest in the vibrant but needy-of-structure, horticultural market.

Systems that are more dependable, supportive infrastructure, and accessible farmers' markets, are urgently needed. Both county and national Governments can assist farmers in this regard.

Rural agro-industry can absorb the off-farm labour, creating employment for the youth as Nairobi and other traditional cities gain the much needed decongestion, resulting from the devolved governance system.

This study made some new discoveries on the operations of the agricultural value chains in some counties of the country. The findings are relevant to most agricultural production zones in the country. Equally, the recommendations emanating from the study will be relevant to most agricultural counties.

"These days it is women sleeping on the side of the bed nearer the door. This is because our men come home drunk, are first in bed and last out of it. We are the bread winners, the early risers, the security and everything".



Farmer Organisation

Farmer Organization:

Farmer organization is paramount. Several models have been tried, recording great success for smallholders. Farmer Field Schools, Community Parliaments, Commercial Villages, Value chain Business Clusters etc.) Despite the negativity of the past attached to cooperative societies, the most successful form of smallholder farmer organization is some form of group learning, consolidation and marketing.



Farmer Commercial Villages supported by Farm Concern International (FCI)

“Since we got organized and trained by FCI as a Commercial Village, our harvesting season in May-July can now witness over 200 trucks coming to our village, to buy the onions and other produce. Previously, we were lucky to find 20. This prevents post-harvest losses and frees farmers to prepare land to cultivate other legume crops. Before, we sold onions to brokers who exploited us or took produce on credit and defaulted. Most brokers would come to the farms and take produce on credit, with the promise that they will pay after they sell. Most of them paid in bits and eventually defaulted. Some did not pay, claiming that the produce went bad. Indeed some of these brokers were our sons and village mates. Since the training, they now find it more lucrative to farm, letting outsiders do the brokering.”

Mr. Karanja - Farmer, Kinangop



Farmer Organisation



Farmers need agribusiness structure in order to have a voice and respectable space at the market place: Farm Concern International organises farmers into Commercial Villages. This organisation helps farmers be trained to improve yields and to market as a group. At meetings, farmers of both genders, young and old need to be supported to express fears as much as aspirations. Congruence of minds beats all resources that may be availed to up-and-coming farmers

The Typical Horticulture farm labour providing family: "We farm maize and beans but we are experts at weeding, harvesting and packing horticultural produce for transport. We cannot farm horticulture crops ourselves since we need capital and connection to the market, which is not easy to come by".



Rukaria Agro-Processors (RAP Farmers Self Help group): Women farmers in African communities show appreciation and praise their development through song and dance.

Policy Framework

Policy framework:

Policy and regulatory environment enables more and quality produce to reach the market from a win-win agribusiness grounding that puts money in the pockets of all concerned.



Farmer Support Programmes

Improved yields

Improved crop yields are possible through climate-smart agriculture, improved agronomic practices, irrigation and access to mechanization. Horticultural crops are the new “modern crops” and need much more skill than is provided by the current national government extension service.

The more sophisticated crops require more farming knowledge with respect to inputs (seed, fertilizers, sprays, irrigation, machinery) Accessing these inputs and services is an uphill task for the smallholder farmer. The value chains are not clearly defined and the markets are informal and complex, managed by exploitative and opportunistic brokers.



Appropriate Interventions



Infrastructure, improved roads will save up to 50% of the food cost at the market place.



▲
KENDAT: get picture of motorcycle carrying produce on a tarmac road
First mile attention to planning. It is at this section that 30% of the transport cost is expended

Water Harvesting & Use



Irrigation water tanks like the one shown here are now available in the country. Holding 345m³ of water, from a raised location, It can serve a community of 500 smallholder farmers farming half an acre each with gravity driven water.

◀ Using drip irrigation enhances the efficient use of the scarce commodity. Such water harvesting and irrigation systems, however are not available at the community level. Such systems can mitigate prohibitive expenses of pumping water from boreholes using mains electricity. Drip Irrigation checks inefficient water use common in flooding and sprinkler irrigation systems.



Drip irrigation systems are cost saving and efficient on labour and water. They however are capital intensive and need installation skill by experts. The system here shows why the capital expense is considered high given the detail buried ▶



Mechanized Operations

Improved crop yields are possible through mechanisation.



Some parts of the world including Asian countries and West African countries seem to have a wide range of hand tools, specialised for activities like weeding, and hard-soil breaking.

In Kenya it can be argued that 90% of farmers have nothing else but the hoe and panga (machete).



A locally designed hoe with wide teeth suitable for Kinangop potato farm conditions.

Mechanized Operations

There are various technologies available in the country that smallholder farmers are not aware of. For example, it is possible to plant and harvest your potatoes with a 2-Wheel Tractor. It is possible to transplant *sukumawiki* (kale) with a tractor drawn equipment. ▶



Production through reduced tillage or soil manipulation using specialised equipment. *Sukumawiki*, spinach etc. transplanter



Mechanized Operations



Agricultural Mechanization enables farmers to work fewer hours and harvest more. Agricultural Mechanization is and will be the answer to integrating the "digital generation".



Mechanized Operations



Training rural operator-hirers and repairers is a prerequisite for proper use of machinery. This is one of KENDAT's contribution to rural and agribusiness development.



Hubs & Storage

Attention to cold chains, from charcoal coolers at farm level to refrigerated trucks to cold rooms for market storage (all to add shelf life and reduce wastage of produce).



▲
Outside

Locally designed and built potato storage structure, courtesy of Kisima Farm in Meru. Most potato growing areas have chilly nights. By letting into the store the cold night air and closing it in at day-break, a well-insulated (straw inside moulter) wall will keep the potato cool enough for the better part of the day. Potato storage is one of the most highly needed technologies in Kenya. Selling one's harvest a month or two after mass-harvest season may see a farmer triple or quadruple her income.

►
Inside



Hubs & Storage



Market hubs: County and National Government market-pull hubs that build structure hence ready produce assembly and marketing points organized from a cold-chain and logistical marketing perspective

Grading, weighing and packing of sweet bananas in Meru Greens central collection point



Value Addition

Value addition need not be expensive.

Solar Drier: It is increasingly viable to use solar technology for fruit and vegetable drying. There is a great opportunity for cottage industry development for women and youth in this area. Dried fruit and vegetables are easily carried to the market, with greatly reduced weight and greatly increased shelf life. ▶



◀ A bicycle-powered tuber slicing unit: As transport and the motorcycle gain prominence at the rural logistics market place, their operational power is increasing possibilities in the rural areas. Using motorcycle engines to run maize shelling machines is a common practice in Kenya today.

Value Addition



Dried pineapple, mango and apple. This is what comes out of the solar drier tunnel which has a small fan on one end driven by the solar panel. Tastes as good as fresh!!

Other Technological Innovations

New, innovative agricultural practices using modern technologies are introduced into the agricultural sector continuously making production more efficient. Clean, quality seed is available for smallscale farmers. Seed potato sorting and grading at Kisima Farm Meru. Kisima is one of the largest private seed producing companies in Kenya. ▶



◀ Hydroponic production of clean potato seed: For more about this approach, contact Kisima farm in Meru who have perfected this technology.

Other Technological Innovations



Test-Tube Banana Production:

Tissue Culture Banana is a scientifically proven and perfected technology and means of availing clean seed to farmers. Popularly called TC Banana, Tissue Culture is not a process of producing Genetically Modified (GMO) Banana. From the test-tube, mini-plants are transferred to crates and provided with nutrition until they are larger plants. At the farm these are removed from the crate and hardened for about a month and a half, after which they are ready for transplanting in well manured and protected holes.



Recent advances in banana farming using Tissue Culture (TC) technology has boosted production of bananas. TC is not a genetic modification but a technology that helps provide clean seed that is not contaminated from previous crops and soils. Banana farming in several parts of the world has advanced to drying for its powder and even wine production. The banana is popular for its high energy and mineral content.



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