

## **Pilot to improve linkage of domestic tomato supply chains to local high segment markets.**

### Goal of pilot

The pilot aims to link smallholder tomato farmers in both Kenya and Tanzania to local high segment markets as supermarkets, hotels, restaurants and hospitals.

### Objective

1. To analyse requirements, demand and institutional setting of the high segment market;
2. To organise tomato farmer groups who have the ambition and potential to meet the requirements of the high segment market;
3. To support farmer groups producing the required tomatoes for the high market segment;
4. To provide high quality tomatoes to consumers.

### Outputs

1. An overview of the size, requirements, institutional setting and current supply issues of tomatoes to the Uchumi market in Nairobi and of the hotels and restaurants in Arusha (finalised in 2007);
2. Farmer groups identified around Arusha and Nairobi who may participate in activities enabling them to deliver their produce to the high market segment (finalised in 2007).
3. An overview of the current production yields and related management techniques including post harvest and trading aspects of the identified farmer groups (in Kenya finalised in 2007 and in Tanzania fieldwork finalised in 2007, analysis in January 2008).
4. Confrontation of output 1 with output 3 and subsequent identification of bottle-necks as a basis for development of an appropriate training (to be finalised early 2008).
5. Farmers training and action research focussed on identified bottle-necks (2008).

### **A. High segment market**

To get an overview of the high segment market (their tomato demand, quality requirements) and to know the current situation and challenges the following activities have been performed:

1. A limited literature review in Kenya by Mr A. Nabiswa, horticulture consultant, titled 'High segment market for tomato in Nairobi' (Report in Annex 1)
2. In Nairobi, an Uchumi supermarket has been interviewed by Mr A. Nabiswa
3. In Arusha 13 hotels, 10 restaurants, 10 tour operators and 6 supermarkets have been interviewed by Multiflower (results presented below).

Results of these activities are summarised below.

### **B. Farmers Situation**

For each pilot a number of interested farmers will participate. To have a first idea of chain bottlenecks from farmers' view, basic production and trade information has been gathered.

1. In Tanzania farmer groups have been identified by linking to on-going activities with existing farmer groups with whom the Arusha District office of Agriculture and Livestock (DALO) already has relationships.
2. In Kenya farmers have been contacted through the KHDP (Kenya Horticultural Development Program) of USAID who already have relationships with these farmers.
3. Current production management techniques including post harvest and trading aspects have been gathered by interviewing 12 farmers in Tebere in Central Kenya by Mr A. Nabiswa (Report in Annex 2).
4. Current production management techniques including post harvest and trading aspects have been gathered by interviewing 47 farmers around Arusha by DALO and TAHA.

Results of the interviews with the farmers in Kenya are shown below and more details can be found in Mr Nabiswas report "Tomato production, distribution and marketing in Kenya, a baseline survey of Kirinyaga District" in Annex 2. Results of the interviews of the Tanzanian farmers have been analysed and are shown below.

## **A. High segment market**

### **Kenya**

Kenya has a thriving horticulture sector annually producing over 1 million tons of vegetables on an estimated 100,000 ha, with 90% being consumed domestically and 10% exported. Most production is carried out by small scale farmers, with approximately 0.5 -2.5 ha of land each. The main vegetable crops grown in Kenya for domestic market include kale, tomato, cabbage, African leafy vegetables and onion while French beans and peas are grown for export. The vegetable industry provides employment to many people who are engaged in production, processing, and marketing. Tomato is one of the major vegetable crops.

#### Development of the tomato market

Tomato (and other vegetables) demand increased in the last few years. From 2001 to 2005 there has been a tomato production increase of 100%. The increase in volume is slightly attributed to the expanded area from 16 thousand ha in 2001 to 23 thousand ha in 2004. In 2005 despite reduction in area, production volume increased to 519 thousand tons due to favourable weather and improved production technologies. A number of factors that underlie this impressive growth have been discussed in various forums and they include but are not limited to:

- (1) the expanding domestic market due to urbanization
- (2) the relatively high value products per unit of land and affordable labor inputs which leads to increased income for smallholder farmers
- (3) the quick maturing period when compared to most staple and cash crops which leads to quick return on investment
- (4) market liberalization.

#### Sources of tomato

Tomatoes are produced in many different areas in Kenya, mainly covering medium to high potential areas. Nyanza province produces 43% of total production, followed by Rift Valley with 26% and Central comes third with 11%. These three provinces account for about 70% of total national tomato production in 2006.

In Kenya, tomato production is carried out mostly by small scale farmers and some large scale farmers. It is grown under rain fed and irrigated conditions. The most common varieties grown include Cal J, Riogrande, Onyx, Money maker, Fortune, Kentom, Neema 1400, Neema 1200(resistant to nematodes), Caltana, Manset, Zawadi F1 hybrid and Rotade. Other new varieties continue to be introduced for farmers to grow.

Alboran variety is grown under green house and has a higher yield of good quality. Growing tomato in a greenhouse can enhance quality in such a way that it suits the demands in the high segment market, stated by Uchumi supermarket as well. Usually the tomatoes are not affected by heavy rainfall that damages the developing fruits.

#### Size of and major players in the high segment market

The high segment market has seen a rapid growth during the last decade. It has risen from a tiny niche five years ago to a fifth of food retail, spreading well beyond the richer consumers to derive more than a third of their sales and half of their customers from middle to low income consumers. Nairobi's population of almost three million (2007) growing at a rate of 6.9% leads other urban areas in terms of high segment market growth. The main driver for the growth of the high segment market is urbanization and relative increase of incomes in the population.

Supermarkets are the fastest growing category in Kenya serving high and middle-income consumers. The supermarkets growth in Nairobi and other cities in Kenya now account for 20% of urban-food retail supply (Neven and Reardon, 2004). The supermarkets have evolved from just selling processed food to be the leading fresh vegetable stores in the high segment market. There are about 209 supermarkets and 16 hypermarkets in Kenya. The past decade has seen the supermarket food sector grow well above 20% share of the US\$1.9 billion urban food market in Kenya. The rest of the urban food market, in 2003, was composed of smaller self-service shops (chain convenience stores and mini-supermarkets, both of which are non-traditional

retailers having emerged recently) represent another 17% of the market, while the remaining 63% of sales comes from traditional retailers (Neven and Reardon, 2004). Sales of the sector are growing at 18% a year. Two leading vegetable sellers (Uchumi and Nakumatt supermarket chains) dominate the market share with 70% divided equally between them. While Uchumi targets consumers from all socio-economic groups, Nakumatt's consumer focus has been mostly on the high-income segment (50% of their customers fall in this category).

#### Procurement system of the high segment market

Procurement systems has began to be modernized in supermarket chains in Kenya by centralizing procurement into distribution centers (away from spot market), by selecting sets of preferred farmers / suppliers and specialized franchise dedicated to sourcing from those farmers and instituting basic quality standards. In 1997, when supermarkets first started selling vegetables in a significant way, they procured from whatever source was available, hence sourcing only 30% direct, and the rest from traditional brokers. Over the past few years, the chains have begun shifting toward sourcing directly from farmers i.e. 60 % farmers and 40% brokers. Supermarket procurement officers are of the opinion that direct sourcing allows them to inspect the farm to judge potential reliability in volumes and quality by noting farm size, presence of irrigation, and the water source. This allows them furthermore to cut out intermediaries' margins, and have more control of supply through direct communication. The new procurement systems put more demands on the farmer than the traditional system – a spot market, fragmented, few if any standards, operating through many small brokers.

Uchumi supermarket was incorporated in 1975 and currently has one distribution centre and 10 operational branches in Nairobi. The supermarket procures tomatoes from traders/ brokers and farmers alike. Unlike Uchumi which procures directly from traders and farmers, Nakumatt and Tuskys supermarket procures largely through a department/franchise known as Fresh n Juice. Hotels, restaurants and up-market groceries source from brokers who buy from spot market. Uchumi presents orders to suppliers mainly by telephone communication, while Nakumatt through Fresh n Juice has agreements with suppliers. Other high segment markets competing for urban vegetable consumers include Tuskys and Ukwala supermarkets, up-market groceries, hotels and restaurants commanding about 30% of vegetable market share.

Uchumi supermarket alone has a yearly turnover of 425 thousand tons of tomatoes. This is only 1% of the total amount of tomatoes produced in Kenya. The supermarket procures from farmers (60%) and brokers (40%). Most of farmer / suppliers have big land ranging from 5 to 40 acres all under tomato or intercropped with other crops. They also source from small scale farmers who collect more supplies from fellow small scale farmers to meet the supply order.

#### Prices in the high segment market

Supermarkets pay the highest wholesale prices for high quality tomato at Kshs 40 per kg (about 40% higher than traditional retailers), but other benefits of selling to supermarkets are even more important to farmers than the higher price. The supermarket price tends to be stable across the year and does not fluctuate irregularly. Generally, average prices for tomato have been relatively stable (at Wakulima wholesale market in Nairobi) with no significant changes over the past four years. Comparison of traditional wholesale monthly prices for tomato across a four year period indicate that price peaks occur especially from November to March, but are difficult to use as an indicator of optimum planting times.

#### Requirements in the high segment market

The tomato high segment market requirements in Kenya consist of quality, quantity and timely supply. There are several quality requirements in the high segment market which closely reflect the consumer preferences. High Segment Market (HSM) requires superior standards for tomatoes. They have to appeal in their taste and appearance based on perceived quality preferences. Consumers like tomatoes that are clean and fresh with soft texture but firm and free

from visible damages by pests and diseases. The tomato must have long shelf life after ripening. Most of the varieties that meet the above requirements include Riogrande, Onyx and Alboran.

Consistence in quantity supplied to HSM is a critical issue the suppliers are supposed to meet. Whereas hotels and restaurants demand small units of tomato, the supermarket requires large volumes per supplier. Uchumi and Nakumatt supermarkets command 70 % of all traded volume in the high segment market equally divided between them. This roughly translates in to about 425 thousand tons per year and 35 thousand tons per month for each of the supermarkets. It is from this background that small scale farmers have to form tomato producer organization to be able to penetrate these markets.

The HSM demand consistence in delivery per supplier, usually once per week. The supplier is supposed to deliver the tomato using their own transport which is factored into their selling price. Supermarkets may give one month credit or less depending on the agreed arrangements. The HSM set prices which put into consideration the suppliers' cost of tomato, transport, labor and taxes. This price is usually higher than in other market segments.

#### Trends in the high segment market

In Kenya, the high segment market is not only dynamic in growth but also in procurement and quality of the tomatoes supplied. Locally, initiatives have been developed to organize farmers into groups so as to meet quantity demanded and shared investments in quality, grades, standards and consistence in supply of tomatoes. Neven and Reardon (2004) show that the supermarket share for the vegetables is growing at an annual rate of 18% and has a 20% share of the urban food market overall with 7% of fresh fruit and vegetable market in Nairobi while in other towns this is lower at 4%. The segment is likely to grow due to urbanization, per capita income and growth rate. Furthermore, the changing lifestyle in the urban set -up has led to the proliferation of large chain supermarkets stocking most of the fresh and processed food which attracts both the middle and upper class citizens. The congestion, untidy conditions and poor management of retail and wholesale markets for fresh produce in Nairobi has seen most people heading for the supermarkets for their vegetable purchase.

Consumers and key sub-sector regulators have become increasingly aware of quality and standards like MRL's and hygiene. As a result the National Codex Committee was established whose main purpose includes the development of a comprehensive code of practice (COP) for horticultural industry. Consequently key stakeholders comprising KEPHIS, USAID-KHDP and Uchumi Supermarket have an ongoing MRL's testing program including tomato.

#### Challenges in high segment market

The major challenges in the high segment market are varied because some have their origin in the production side at farm level and others further in the value chain. Nevertheless, the following challenges face the high segment market in the tomato business:

- 1) Quality
  - Poor quality tomato due to poor varieties that have short shelf life.
  - Pest and diseases, poor handling and rain damage that lead to physical losses and quality deterioration.
  - Variability in terms of sizes, colour and level of maturity.
- 2) Inconsistent supply
  - Fluctuation in supply between dry and rainy seasons also result in price fluctuation.
  - Inconsistent supply of required volume due to different supply sources, pest and diseases and varying quality.
- 3) Standards and hygiene.
  - Use of wooden packaging that bruises tomato instead of the polystyrene boxes.
  - Untidy tomato fruits due to chemical spray or mud.
- 4) Selection by consumers
  - Consumers have a tendency turning around tomatoes while selecting what they want.

### Recommendations based on the above described tomato chain analysis

- 1) Quality  
As identified above, quality issues have origin in variety, harvesting techniques, production techniques, grading and handling. Farmers should be trained on these specific issues.
- 2) Consistent supply
  - a. Farmers in Kirinyaga can be encouraged to increase production especially during dry season because they have enough water for irrigation. By doing so it will cushion quantity and price fluctuation.
  - b. Organise farmers to be partners of Uchumi.
- 3) Standards and hygiene.
  - a. Training farmers on pesticide use and timing to achieve Minimum Risk Levels (MRL). This can further be reinforced by supporting KEPHIS to carry out sample testing.
  - b. Farmers can adopt plastic packaging material weighing less instead of the wooden boxes that is prone to damage tomatoes during handling and transportation.

### **Tanzania**

In Tanzania the study has been limited to Arusha in which the major players in the high segment market are hotels and lodges, tour operators, supermarkets and restaurants. Each year tomato production increases as the market expands with the increase in hotels, lodges and other outlets.

Production is expected to continually increase. Exporting is also a possibility. Already supplies from northern Tanzania are sent to Dar es Salaam and Zanzibar and farmers from Ngarananyuke are currently exporting Onyx variety tomatoes to Mombasa.

Farmers do apply pesticides. However, it's likely they don't have adequate knowledge about the correct way of chemical handling and safety. The product is not washed in the field at harvest or in the market. It's left up to the customer to do so. The product usually comes to the customer in wooden crates, without added packaging to protect the product.

### Tomato demand

In General:

1. Major Hotels– there are about 5 major hotels in and around Arusha and several smaller ones. A 86 room hotel like Arusha Hotel in town centre buys around 200 kg tomatoes per week.
2. Local lodges buy on average about 10-50 kg tomatoes per week.
3. Tour Operators – large operators such as Sopa or Serena buy about 250-300 kg tomatoes per week to supply their lodges outside of Arusha (the number mentioned in the table below is for inside Arusha). Supplies are sent out by truck. However, these lodges also buy in from local markets when supply is good.
4. Supermarkets – Shoprite is the largest and main supermarket outlet in Arusha. Shoprite buys tomatoes from the local market about 200 kg per week. Some other supermarkets like Sakina on the road to Nairobi buy a lot more. The smaller supermarkets buy up to 50 kg a week from the central market.
5. Restaurants source 30-150 kg tomatoes per week.

A detailed overview of the tomato demand per market player can be found in the overview below including the size of the market player and the requested quality standard.

<b>1 SUPERMARKETS IN ARUSHA</b>					
NAME	LOCATION	SURFACE AREA	AVERAGE NUMBER CUSTOMERS / DAY	Tomato	
				Sales per week in kg	Quality Standards
Shoprite Supermarket	Esoo Road	8000 m <sup>2</sup>	2000	200 kg	high
Kijenge supermarket	Kijenge	2000 m <sup>2</sup>	200	300 kg	average
Sakina Supermarket	Sakina (Nairobi road)	3000 m <sup>2</sup>	500	700 kg	average
Rushda supermarket	City centre	2000 m <sup>2</sup>	750	50 kg	none
Mr Price Supermarket	Njiro road	1800 m <sup>2</sup>	250 +	na	na
Pick n Pay	Njiro road	1800 m <sup>2</sup>	250 +	na	na

<b>2 RESTAURANTS IN ARUSHA</b>					
No. COVERS					
Arusha Hotel	250 +			200 kg	high
Coffee Lodge	200			150 kg	high
Flame Tree	75				
Impala Hotel	500+			500 kg	high
Friedkin	50			10 kg	unaware
Stiggy's	75			40 kg	high
Dragon Pearl Chinese	120			200 kg	taste must be good
Everest Chinese	100			50 kg	high
Vama Indian	75			30 kg	very sensitive
Pepe's Italian & Indian	100				

<b>3 TOUR OPERATORS - ARUSHA BASED</b>					
No. VEHICLES					
Leopard Tours	100 +			40 kg	all are not much interested in
Ranger Safaris	100 +			no data available	quality
A & K	100+			250 kg	
Sunny Safaris	32			no data available	
Thompson Safaris	50+			no data available	
Roy Safaris	30+			no data available	
Bushbuck Safaris	50+			100 kg	
Warner Safaris	10+			no data available	
Kudu Safaris	50+			20 kg	
Simba Safaris	40+			20 kg	

<b>4 HOTELS AND LODGES - ARUSHA AREA</b>					
No ROOMS		Ownership			
Arusha Hotel	86 rooms	foreign	200 kg	high	
Impala Hotel	160 rooms	local	500 kg	high	
Safari Hotel	46 rooms	local	20 kg	average	
Kibo Palace Hotel	63 rooms	local	30 kg	average	
City Link Hotel / Lodge	53 rooms	local	10 kg	average	
Jacaranda Hotel	23 rooms	foreign	15 kg	high	
Ilboru Lodge	20 rooms	foreign	10 kg	little awareness	
Karama Lodge	10 rooms	foreign	5 - 15 kg	little awareness	
Kigongoni Lodge	18 rooms	foreign	20 kg	high	
Moivaro Lodge	80 rooms	foreign	100 kg	high	
Coffee Lodge	20 rooms	foreign	10 kg	low	
Arumeru Lodge	20 rooms	foreign	20 kg	high	
Rivertrees	12 rooms	foreign	5 kg	high	
Game Sanctuary Lodge	17 rooms	foreign	4 - 10 kg	high	
Serena - Tengeru	42 rooms	foreign	50 kg	high	

Prices in the high segment market:

Market purchase price of tomatoes from the farms ranges from Tsh 125 per kg to Tsh 500. Variation in price is due to seasonal difference. April to August is a wet cold season in which there are far less tomatoes available (produced). During May, June and July it is difficult to get

good quality tomatoes for a reasonable price. Lower prices are found at Tengeru market 10 km outside of Arusha than at the Arusha central market. Prices differ at the different markets. The further you move into town, the more expensive the tomatoes become.

#### Procurement system in the high segment market

Most of the larger players, like Shoprite, Kijenge supermarkets and a few hotels and restaurants, buy tomatoes through a supplier who buys from the market. They rely on the supplier for quality and best price. The main markets are the Arusha central market, Arusha Kilombero market and the Tengeru market. Lodges outside of town will also use their local markets in the high season when supply is good or buy direct from local farms where there is one. Smaller players will buy direct from the market, from the Shoprite wholesale section, or from family or from workers' families. Some hotels and lodges also buy directly at their gate.

Frequency of tomato sourcing is every day, or every other day, at least 2 to 3 times per week. Some buyers provide their suppliers with a monthly or weekly forecast of demand. With the exception of Shoprite, the market players don't have purchasing criteria. Tomatoes are bought by smelling, feeling and squeezing or cutting the tomatoes. Actual tasting does not occur.

If a buyer is purchasing directly from the supplier they will have their particular business relationship. If a middleman is involved, the relationship will be between buyer-middleman and supplier-middleman – no relationship in this case between buyer and supplier. When a player gives a contract to a supplier, the agreed quantity, quality, variety, price and delivery times must be respected. In June, July and August supermarkets can not make fixed price agreements due to low tomato supply.

#### Requirements

The preference is for Marglobe variety in almost every case but Roma tomatoes are also preferred by some restaurants. Buyers' purchase is 80% or more of Marglobe. Some players also buy Cal-J in smaller quantities or cherry tomatoes for salads. Marglobe has a more round shape compared to Cal J. Cal J has a longer shelf life.

The quality criteria required in the high segment market are:

- a medium size tomato
- semi ripe in the hot season and ripe in the cold season
- free from any damage caused by insects, picking, packaging etc.
- the product should be firm and compact inside
- the product should be fresh but still have a good shelf life (4 – 5 days)
- a sweet taste is preferred
- the skin appearance should be smooth and unblemished, with a polished look
- no smell of chemicals or traces of chemicals
- not too juicy

#### Trends

In general the data show various trends but cannot be considered as being reliable as different answers have been collected during a second and even third interview, interviewing the same purchasing officers.

Remarkable is the difference between foreign and local owned hotels and restaurants in which the locally owned entities showed much less concern about pricing and quality than foreign owned. Also names of varieties were better known by purchase officers working for local firms.

At present the middleman dominates the market place and dictates volumes and prices. Volumes and prices are difficult to predict and depend mainly on season and rainfall. The price for the farmers is therefore unpredictable and even the higher segment hotels will still go for good prices rather than high quality and consistency

The high segment market in Arusha with demand of high quality tomatoes is interested in a long term reliable supply of tomatoes. A reliable source is stressed much more than the quality of the tomatoes, see summary below of the high segment market players with high quality tomato demand.

<b>SUPERMARKETS</b>	<b>Interested in</b>	<b>Currently sourcing from</b>
Shoprite Supermarket	Long term flexible contracts with package deals	Direct 2 suppliers and agent at market
Kijenge supermarket	Good relation with fixed number of suppliers	Direct through middle man
Sakina Supermarket	Reliable supply and willing to stick to one supplier	Direct from farmers
<b>RESTAURANTS</b>		
Coffee Lodge	Organic grown vegetables	Own production and buying at market
Stiggy's	Reliable supply and willing to stick to one supplier	Fixed supplier
Dragon Pearl Chinese	Reliable supply and willing to stick to one supplier	Fixed supplier
Everest Chinese	Being selfsupportive	10 % own production and from market
<b>HOTELS &amp; LODGES</b>		
Arusha Hotel	Reliable yearround supply	Various changing agents
Jacaranda Hotel	Reliable supply	Buying just outside the gate
Kigongoni Lodge	Reliable supply	Purchasing at market
Moivaro Lodge	Transparant pricing	1 agent in town for all supplies
Arumeru Lodge	Quality varieties	Own gardens and supply
Rivertrees	No chemical spraying	Buying at the gate
Game Sanctuary Lodge	Use of Chemicals	Supplier in town
Serena - Tengeru	Reliable supply, prompt deliveries	Various suppliers

### Recommendation

Most supermarkets, restaurants and hotels are sourcing from the market or from whoever dropping buy without any arrangements. As most high segment market players are particularly interested in a reliable supply of tomatoes it is recommended to focus on this issue and to research together with the market players and the farmers possibilities to organise a reliable supply of tomatoes for the high segment market in Arusha.

## **B. Farmers Situation**

### **Kenya**

#### Basic data

Twelve tomato farmers were interviewed; 3 women and 9 man. Most of those interviewed were household heads while few were related (son or daughter) to the household. Majority of the tomato growers were within early to middle age group (20-45 years). Over 90% of the respondents had seven or more years of education.

#### Land and soil type details

Most of the interviewed farmers owned land while the rest rented land. Total land area owned varied from ½ acre to 30 acres. There was a slight decrease in the mean tomato production area in the past 4 years from 1.6 to about 1.1 acres per farmer respectively. The most common type of soil for tomato production is black cotton (80%) while the rest is loam or clay loam soil.

#### Labour use in tomato production

The labour used in tomato production was grouped into own, hired and family. Specific activities include nursery preparation, land preparation, preparation of ridges/holes, spraying, watering, staking/tying and harvesting. Farmers with small units of land of about ½ acres rely on family labour. Larger farmers make more use of hired labour. The labour cost in tomato production is estimated at KShs 9,000 (USD 140.6) per acre per season.

#### Farming System

Practically all farmers practice mixed farming. Domestic animal species include cattle and goats. The farmers also produce a number of crops next to tomatoes as French beans, pepper, green



grams and maize. Maize and tomato are commonly intercropped. Tomato land size is on average 2 acres.

#### Tomato production inputs, varieties and irrigation practices

Fertilisers and manure are used by all farmers. Fertilisers range from DAP, NPK and CAN. An application was timed according to periods of nutrient uptake by the tomato. Split dressing was practiced for precision and maximizing of nutrient uptake. Other inputs commonly used include stakes and ties for staking.

#### Important pests and diseases of tomato as listed by the farmers

The most important tomato diseases as perceived by farmers were fungal blights (95%), powdery mildew (30%), bacterial wilt (86%), nematodes (20%) and (15%) recordings for Leaf rolls, tomato spotted wilt virus and blossom end rot. According to most farmers (90%) spider mite, *Tetranychus spp* was the most important pest of tomato followed by African bollworm, *Helicoverpa armigera* (75%), thrips (60%), whitefly (55%), cutworm (45%), aphid (29%), cricket (15%) and leaf miner (10%).

#### Pesticide use

All the tomato farmers interviewed used pesticides for their tomato production. The pesticide use was for the control of fungal blights caused by *Phytophthora infestans* and early blight *Alternaria solani*. Other pesticides formulated singly or in mixture, were being used to control various pests including spider mite, whitefly, thrips, leaf miner, bollworm and cutworm. Majority (80%) of the farmers usually applied pesticides on regular intervals. Another 66% applied pesticides after they had noticed the pest on the crop. The frequency of pesticide application varied from one to 40 times per season, depending on the active ingredient and targeted pest. The most commonly used pesticides applications involved Propineb, Mancozeb and Dimethoate. The first two pesticides target blight, while Dimethoate was used as a broad-spectrum insecticide. On average, the highest mean number of pesticide applications was 16 times per season. Farmers would apply pesticides either at certain specific crop stages or seasons or throughout.

#### Tomato variety

The most common tomato varieties mentioned by farmers in Kirinyaga District were Riogrande (95%), Onyx (80%), and Cal J. The variety Riogrande was the most preferred: high yield, long shelf life, drought and disease resistant. Tomato production in Kirinyaga District can be undertaken at all times during the year. However, most farmers grew their tomatoes either during the dry season or short rainy season. Tomato was irrigated during the dry season using furrow irrigation method (100%). Water was obtained from artificial canals and pumped to the fields if the canals were far.

#### Output from tomato production

Tomato produce was usually sold in boxes of 60kg each. The average cost per 60kg box was KShs 800 during high season and Kshs 2000 during low season. The average amount of tomato harvested by each farmer was 100 boxes per acre amounting to KShs 80,000.

All farmers sold their produce at farm-gate while one sold tomatoes outside the division (Nairobi). The buyers at the farm-gate were mainly the middlemen/brokers. The respondents cover an average distance of 5km to the local market and 175 km to the markets outside the district. The main modes of transport to the markets outside the district were pick-ups (100%). Tomato, supplied to a supermarket, has an average gross margin of 29.000 Ksh per acre.

Not all tomato is marketed. About 40% of the respondents reported rejection of their produce by buyers. The reason for rejection was mainly due to glut leading to poor market prices (22%), pests and diseases (19%), unmarketable small sizes of fruits (12%) and others are non-preferred variety and blossom end rot. Most of the farmers (77%) did not keep any record of their production; spraying or sales of tomato while about (23%) did so.

#### Tomato production constraints

The major tomato production constraints reported in Kirinyaga include diseases, nematodes, blossom end-rot and poor crop management especially lack of crop rotation practice. Other constraints include price fluctuation, unmarketable small size, lack of market, non-preferences of fruit size or variety and inadequate production techniques.

Price fluctuation due to market glut is a persistent constraint to tomato farmers in Kirinyaga. The production cycle is such that all the farmers grow tomato during the same season and time so that the produce matures at the same time. These farmers mainly depend on a few suppliers who supply supermarket while just a small fraction is able to directly market their tomato to Nairobi 175 Km away. Sometimes prices are too low leading to economic losses. It is impossible for the farmer to plan because the price is not stable for local and wholesale market in Nairobi.

The buyers, especially those that supply supermarkets, have specific quality requirements including fruit size and varieties. Buyers supplying supermarkets come with demands that meet this high end market specification. The supermarkets require long shelf life, uniform ripening, medium size, taste and texture that appeal to customers.

#### Tomato marketing channels

The tomato produce like other local market vegetables is channeled from the farm-gate to different markets either directly or through middlemen/brokers. Some produce is channeled directly to the wholesale market while others to retail markets. The retailers include groceries, supermarkets especially in the urban areas and open-air markets in both urban and rural areas. One of the major supplier of Uchumi supermarket buys tomatoes from these farmers.

#### Discussion

Tomato production is a major farming business in Kirinyaga district. The percent area on tomato with regard to the total cultivated area shows that tomato production is one of the most important crops in this region. Out of the average 5 acres of land, tomato occupies more than a third of the cultivated area. It also employs a large number of people during the various stages of development especially during harvesting. The crop consumes high number of inputs including stakes, fertilizers and pesticides.

Staking and tying is done by all tomato growers while none practiced mulching. The study showed that all the farmers practice furrow irrigation probably due to the short distances of their water source and also because they would not require expensive equipment such as sprinklers. However, furrow irrigation has been known to favour insect and other arthropod pests besides mechanical transmission of soil-borne diseases such as the prevalent bacterial wilt. The climatic conditions of this area like other tropical regions are favorable for pest and diseases. A wide range of pests thrive well in this area due to continuous availability of crops supported by the availability of irrigation water.

The knowledge of insect pests, diseases and weeds was good because they are able to identify and name them. However, knowledge of their management strategies was scarce and was fully dependent upon pesticides for pest control. Furthermore, most of the pesticides used were synthetic broad spectrum thus exacerbating the pest problem due to extermination of natural enemies. In some cases the use of pesticides is extremely high.

It was also evident that middlemen / brokers play an important role in tomato marketing. The middlemen buy from the farmers at farm gate price and then sell to high end or wholesale markets in Nairobi at twice the price. The tomato farmers face marketing challenges especially unstable prices that range from Kshs 800 per 60 kg box during high season to Kshs 2000 for the same during low season. Producing high quality tomatoes is a challenge as demonstrated by the constraints highlighted above.

#### Recommendations

The following recommendation are based on the above described observation and analysis:

- (1) Training farmers in tomato production techniques which includes:
  - Variety selection

- Pests and disease scouting
  - Pesticides applications
  - Intercropping and crop rotation
  - Irrigation techniques
- (2) Post-harvest handling:
- Maturity indices
  - Harvesting techniques
  - Grading
  - Packaging
- (3) Business skills:
- Production planning
  - Record keeping
  - Business negotiation skills
  - Marketing in terms of quality requirements, market segmentation, prices etc

For the high segment market quality, consistency, year-round supply and volume of tomatoes are important. Protected cultivation by growing tomatoes in a nethouse or plastic house could address these issues. Protected cultivation is minimally influenced by weather changes which results in a more constant quality and less use of pesticides. It is recommended to evaluate the costs and benefits of such a system in the selected research area and market segment.

## **Tanzania**

The database of the 46 farmers covers general information and more detailed information about the farm, (tomato) cultivation, use of fertilisers and pesticides. A short summary is shown below with exception of the use of fertilisers and pesticides for which the dataset can be referred.

### General information

46 Farmers in Tanzania have been asked about farming. They live in the region Arusha. The youngest farmer is 24 years old and the oldest farmer is 56 years old. The mean of the age is almost 42 years (standard deviation is 9,0). 30% Of interviewed farmers are between 44 and 48 years old. The farmer with the longest period of farmer started in 1966 and the farmer with the shortest period of farming started in 2006. The mean year of starting farmer is medio 1986. Most farmers are fulltime farmers. The most common education level is standard 7 (33 farmers). Some other farmers have reached standard 4 and few farmers didn't reach standard 1 level.

### Farm information

The mean total acreage is 4.9 acres (0.41 ha). The mean rented acreage is 0.52 and the mean owned acreage is 4.36. The mean acreage of tomato is 1.5 acre, ranging from very small to 14 acres. 95% Of farmers have less than 3 acres of tomato and 80% less than 2 acres. Most farmers grow, next to tomato, maize and beans and some other vegetables like eggplant, onion and cucumber. Intercropping of tomato is not common. Only 4 farmers have intercropping pattern of tomato, with banana or cabbage.

All farms are mixed farms. This means that besides crop production the farmer also have animals. The animals are cows, poultries, goats, sheeps, donkeys and dogs.

The terrain in the farmers area is rather flat, 82% of total acreage. The soil types are quite diverse among the farmers. Most farmers have clay loamy or sandy clay fields.

Practically all farmers use irrigation. Most farmers use furrow irrigation and only a few use water pumps. The ox-plough is available to most households while only a few have access to knapsack sprayers.

Most farmers use local varieties, some farmers use hybrids. None of the farmers use open pollinated varieties. Of the farmers using local varieties, the beneficial characteristics mentioned are high yielding, large fruits and preference by the consumers. Farmers using hybrids are favouring these because of the high productivity (mentioned by almost all farmers) and because of the market demand.

All farmers use their own and/or family labour, next to hired labour. Only a few don't hire labour. 65% Of all households hire labour for more than 50% of the total labour required.

The mean yield of tomato is 26 ton per hectare. The mean output price of tomato is almost 976 T shilling, but with enormous differences showed by the standard deviation of 2064 T. shilling. Most farmers sell to the local market is (33), some to the regional (13) and only a few to the national market (9).

#### Recommendation

It is remarkable that all farmers except one are using irrigation. Secondly most farmers are not using hybrid but local varieties. The prices are fluctuating strongly which might go hand in hand with the unreliable supply about which the market players are complaining. It is recommended to discuss with the farmers and market representatives (buyers) how to reach more steady prices.

**Activities 2008**

1. Identify institutes to participate in the pilot;
2. Establish linkages between the farmer groups and identified institutions that define the type of arrangements based on their willingness to supply (farmers) and buy (traders) tomatoes. Aspects for training focus would be on, quality, standards & hygiene and consistent supply;
3. Develop training materials and start action research.
4. Running training program on required issues as GAP, post harvest handling and transportation
  - a. Use of demonstration plot
  - b. Study tour to the end market (institutions) and to another farmer group/farmers;
5. Monitoring and evaluation of the pilot two times a year;
6. Draft plan for scaling up, including reporting.

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Annex 1: Baseline survey of Kiringyaga District

**TOMATO PRODUCTION, DISTRIBUTION AND MARKETING IN  
KENYA, A BASELINE SURVEY OF KIRINYAGA DISTRICT  
REPORT.**



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Cover picture by Alex Nabiswa: **Tomatoes in Uchumi Supermarket from Kirinyaga farmers**

## **ACRONYMS AND ABBREVIATIONS**

MOA      Ministry of Agriculture  
DAO      Divisional Agricultural Officer  
KARI      Kenya Agricultural Research Institute  
Ai      Active ingredients  
MRLS      Maximum Residue Levels  
Ha      Hectares  
Kg      Kilograms  
L      Litres  
TSWV      Tomato Spotted Wilting Virus



# **TOMATO PRODUCTION, DISTRIBUTION AND MARKETING IN KENYA, A BASELINE SURVEY OF KIRINYAGA DISTRICT.**

## **1.0. Introduction**

The tomato belongs to the family Solanaceae. It is one of the most important local market vegetables in Kenya. Small-scale farmers in most arable areas in Kenya grow this crop. The main production areas in Central Province are Kirinyaga, Nyeri, Kiambu and Maragwa. In 2006, an estimated 35,881 metric tons of tomato valued at over KShs 661,130,000 million was produced in Central province, a reduction of 33.3% from the previous year (MOA 2005/2006). However, nationally tomato production is increasing. Its fruits are used fresh in salads or cooked as a vegetable, in processed form as tomato paste (puree), tomato sauce, ketchup, juice and can also be dried. Tomato is rich in vitamins A and C and is gaining importance because it contains lycopene a food component known to reduce the incidence of prostate cancer, heart and age related diseases. The major varieties grown in Kenya are Cal J, Rio Grande, Rodade, Nema 1200, Nema 1400, Onyx VF2 and Monyala F1 (KARI, 2005).

Tomatoes are fairly adaptable, but grow well in warm conditions with optimum temperatures of 15°C -25 °C. High humidity and temperatures reduce fruit set and yields. Very low temperatures delay colour formation and ripening and temperatures above 30°C inhibit fruit set, lycopene development and flavour. Tomatoes thrive best in low-medium rainfall with supplementary irrigation during the off-season. Wet conditions increase disease attacks and affect fruit ripening. Tomatoes grow well in a wide range of soil types, which are high in organic matter, well-drained and a pH range of 5 - 7.5.

## **1.1 Study objectives**

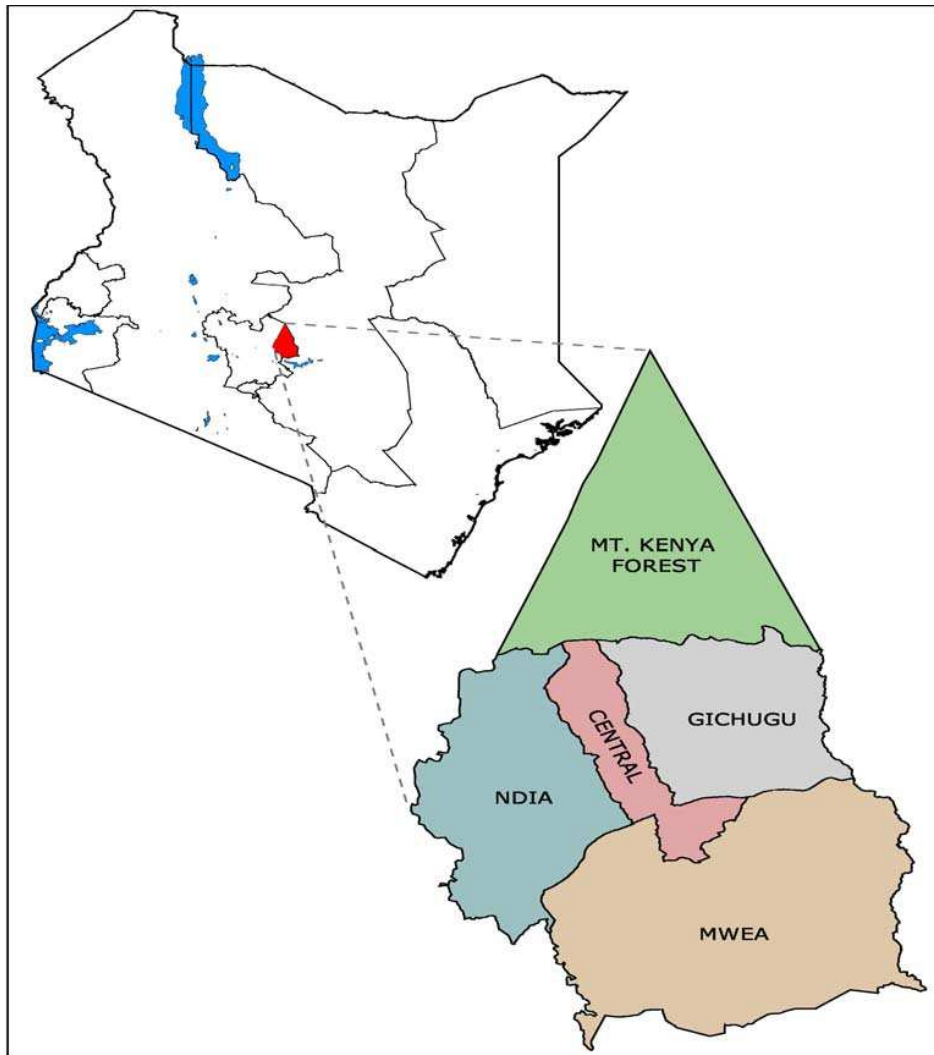
The objectives of the present study were to collect information on the current production yields and related management techniques including post harvest and trading aspects. The outputs of this research will complement development partners' strategies whose objective is to support small-scale farmers.

## **2.0 Materials and methods**

The tomato production baseline survey was conducted in December 2007 in the major tomato growing area of Tebere location in Kirinyaga District.

### **2.1 The study area**

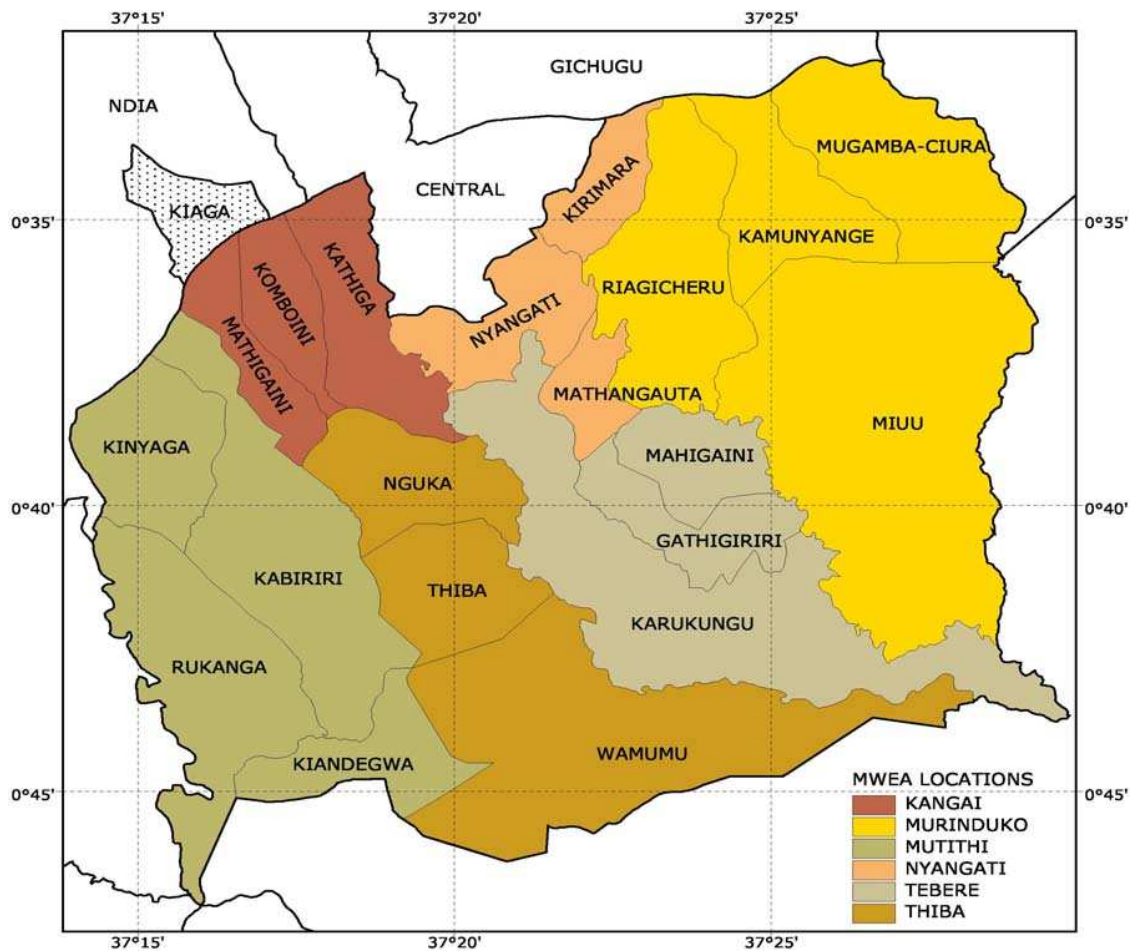
Kirinyaga District is one of the seven districts in Central Province of Kenya. It is a high potential area with annual average rainfall ranging from 800-2200mm. In most of the areas, the soils are deep and moderately to highly fertile. The average annual temperature range is 9.7-21.6°C. The district covers an area of about 1437 sq. Km. It has a total area of about 112,700 hectares with 95,500 ha. (85%) under agriculture (Provincial Reports, MOA 2002). There are two permanent rivers, namely Thiba and Nyamindi, which facilitate the growing of rice and horticultural crops in the lower parts of the district. Among the most important horticultural crops are tomato, French bean, onions, banana, mango, pawpaw and avocado (DAO, MOA 2007). The district has five divisions including Mwea, Ndia, Kirinyaga Central, Gichugu and Mt. Kenya Forest. This study was narrowed down to Tebere location of Mwea division. This area has a long rain season and short rain season, but with irrigation tomato production is possible throughout the year.



**Fig. 1. Kirinyaga District, Kenya and its Administrative Divisions**  
**SOURCE: KARI, 2000**

### **2.3 Data collection**

The survey was conducted using a structured questionnaire. It was administered to each respondent through farm visit using the most appropriate language or an interpreter where necessary. In addition, field observations were carried out to verify information provided where the tomato crop was available. The survey targeted households growing tomato in Kiamanyeki and Ndindiruku villages in Tebere.



**Fig. 2: Tomato production baseline survey areas of Mwea Division, Kirinyaga District, Kenya.**

**SOURCE:** KARI,2000

The households were selected based on trading aspect to whom they sold their produce to (supplying currently or in the past directly or indirectly to Uchumi) but interviews were purposively conducted only where individuals were actively producing tomato. This criterion was used in an effort to obtain valid and reliable data on tomato production in the area.

The questionnaire constituted the following sections

1. Basic data on respondents and the survey area
2. Land size and soil type
3. Labour

4. System of farming
5. Cultivated crops
6. Inputs used in tomato production
7. Yield per season
8. Marketing
9. Production constraints

### **3.0 RESULTS**

#### **3.1 Basic data**

Twelve (12) tomato farmers were interviewed including 3 females and 9 males. Nine of the farmers interviewed were household heads while the rest were related (son and daughter) to the household. Ninety five percent (95 %) of the tomato growers were within early to middle age group (20-45 years). Ten of the respondents had seven or more years of education

#### **3.2 Land and soil type details**

Among the twelve farmers interviewed eleven (11) owned land, five (5) supplemented by renting while one (1) dependent on rented land. Average total land area owned by each farmer is 6.5 acres. Land under tomato production was on average 2 acres per farmers while other crops took a share of 2.8 acres and the rest was used as homestead and grazing field. There was a slight decrease in the mean tomato production area in the past 4 years to present season from 1.6 to about 1.1 acres/farmer respectively (DAO, MOA 2007). This is attributed to lack of market because most farmers were growing less demanded tomatoes.

The most common type of soil for tomato production is black cotton (83.3 %) while the rest is loam or clay loam soil. Black cotton is identified as vertisols. It is a soil in which there is a high content of expansive clay known as montmorillonite that forms deep cracks in drier seasons or years. Alternate shrinking and swelling causes soil material to consistently mix, causing vertisols to have an extremely deep A horizon and no B horizon.

Vertisols typically form from highly basic rocks such as basalt in climates that are seasonally humid or subject to erratic droughts and floods. Depending on the parent material and the climate, they can range from grey to the more familiar deep black

When irrigation is available, crops such as cotton, rice and tomatoes can be grown. Vertisols are especially suitable for rice because they are almost impermeable when saturated. Rainfed farming is very difficult because vertisols can be worked only under a very narrow range of moisture conditions: they are very hard when dry and very sticky when wet

### 3.3 Labour used on tomato production

Tomato production in Kirinyaga District was undertaken at all times during the year. However, most farmers grew their tomatoes either during the dry season or short rains season. Tomato was irrigated during the dry season using furrow irrigation method (100 %). Water was obtained from artificial canals and pumped to the fields where the canals were far.

The labour used on tomato production was grouped into owned, hired and family. Specific activities included nursery preparation, land preparation, preparation of ridges/holes, spraying, watering, staking/tying and harvesting. Otherwise, farmers with small units of land about ½ acres rely on family labour. The estimated labour cost in tomato production is KShs 9,000 (USD 140.6) per acre per season as shown in the table below.

**Table 1: Estimated number of man-day and cost of labour**

<b>ACTIVITIES</b>	<b>NUMBER OF MANDAYS</b>	<b>COST PER MANDAY</b>	<b>COST PER ACRE KShs</b>
Nursery bed preparation and seeding	1	160	160
Land preparation	1	160	160
Preparation of holes	1	160	160
Manuring	2	120	240
Transplanting	1	120	120
Top dressing	3	120	360
Weeding	12	80	960
Staking	4	150	600
Spraying	24	80	1840
Watering	32	80	2560
Harvesting	24	80	1840
<b>TOTAL</b>			<b>9000</b>

### 3.4. Farming System

Ninety one percent (91%) of farmers interviewed practiced mixed farming. Animal species kept include cattle and goats. They also cultivate a number of crops including tomatoes, French beans, pepper, green grams and maize. All farmers intercrop maize and tomato. Tomato production per unit of land is on average 2 acres.

### 3.5 Tomato production inputs, varieties and irrigation practices

The inputs used by the farmers in tomato production are shown in Table 1 below. They include fertilizers (92 %) and manure (83%). From Table 2 below, the fertilizer were used either as a solid product or mixed blends applied to provide nitrogen and phosphorus nutrients. An application was timed according to periods of nutrient uptake by the tomato. Split dressing was practiced for precision and maximizing of nutrient uptake. Other inputs used include seeds, stakes and ties for staking.

**Table 2. Inputs used on the farm**

<b>Types of farm inputs used for tomato production</b>	<b>Quantity (Kg)</b>	<b>Unit cost</b>	<b>Estimated cost per acre (Kshs)</b>
Seeds (kg)	0.1	700	70
DAP (Kg)	50	33	1650
20:20:20	50	27	675
CAN	50	27	1350
17:17:17	50	27	675
Manure (carts)	5	1425	4750
Stakes	10000	1.00	10,000
Ties	20	20	400
Others (transport, pesticide etc)			10,000
<b>Total</b>			<b>32,570</b>



**Table 3: Fertilizer used by farmers per planting season**

Fertilizer brand name	Percentage of			Frequency of
	N	P	K	
Di-ammonium Phosphate (DAP)	18	20	-	1 (Planting )
Calcium ammonium nitrate (CAN)	21 – 27	-	-	1 (1stTop dressing )
Compound NPK 23-23- 0	23	23	0	1 (Planting )
Compound NPK 17-17-17	17	17	17	1 (flowering stage)
Compound NPK 20-10-10	20	10	10	1 (flowering stage)

### **3.6.0 Important pests and diseases of tomato as listed by the farmers**

The most important tomato diseases as perceived by farmers were fungal blights ( 95 %), powdery mildew (30 %), bacterial wilt ( 86 %), nematodes (20%) and (15%) recorded for Leaf rolls, tomato spotted wilt virus and blossom end rot. Ninety (90%) of farmers recorded spider mite, *Tetranychus spp* as the most important pest of tomato followed by African bollworm, *Helicoverpa armigera*(75%), thrips (60%), whitefly(55%), cutworm(45%), aphid (29), cricket (15%) and leaf miner (10%).

#### **3.6.1 Pesticide use**

All the tomato farmers interviewed used pesticides for their tomato production. The pesticide use was for the control of fungal blights caused by *Phytophthora infestans* and early blight *Alternaria solani* . Other pesticides containing active ingredients (a.i's) formulated singly or in mixture, were being used to control various pests in tomato including spider mite, whitefly, thrips, leaf miner, bollworm and cutworm. The dilution ratio of pesticide to water was 10ml: 15 litres. The average pesticide per hectare was 0.6 Kilograms per application. Eighty (80%) of the farmers interviewed applied pesticides on regular intervals. Another 66% applied pesticides after they had noticed the pest on the crop.

The frequency of pesticide application varied from one to 40 times per season, depending on the a.i and target pest. The highest frequency of application recorded involved Propineb, Mancozeb and Dimethoate. The first two pesticides targeted blight, while Dimethoate was used as a broad-spectrum insecticide. On average, the highest mean number of pesticide applications was 16 times per season. The minimum, maximum and average number of pesticide (a.i) application is shown in Table 4. Farmers would apply an a.i either at certain specific crop stages or seasons or throughout.

**Table 4: Pesticide used and application**

<b>Active ingredient</b>	<b>Min. Number of application</b>	<b>Max. No of application</b>	<b>Mean. No of times of applications</b>
Bitertanol	0	16	16
Copper oxychloride	16	32	14.1
Triadimefon	12	16	14
Copper hydroxide	0	13	13
Bifenthrin	0	12	12
Cyproconazole	0	12	12
Cypermethrin + Chlorpyrifos	12	12	112
Propineb	3	40	11.1
Mancozeb	1	40	10.3
Cuprous oxide	4	16	10.1
Propineb + Cymoxanil	2	24	9.8
Alphacypermethrin	2	24	8.9
Malathion		9	8.5
Sulphur	3	16	8.2
Azadirachtin		8	8.4
Metalaxyl + Mancozeb	1	12	7.4
Profenofos + Lambdacyhalothrin	3	14	7.4
Deltamethrin	1	8	7
Propargite + Tetradifon	1	12	7
Methomyl	3	12	6.9
Dimethoate	2	40	6.8
Propargite	2	12	6.0
Abamectin	2	9	5.7
Dicofol + Tetradifon	1	12	5.5
Ethoprophos	1	12	3.0
Glyphosate	1	1	2.8
Chlorpyrifos	1	3	2.0
Fenitrothion	0	5	2.0
Carbofuran	0	1	1.0
Diazinon	0	10	1.0
Imidacloprid	0	12	1.0

*Mean No. of times of applications is the mean number of times reportedly applied by all farmers who used the a.i.*

### **3.7 Tomato variety**

The most common tomato varieties mentioned by farmers in Kirinyaga District were Riogrande (95%), Onyx (80%), and Cal J. The variety Riogrande was the most preferred: high yield, long shelf life, drought and disease resistant.

#### 4.0 Tomato output and marketing channels

Tomato produce was usually sold in boxes of 60kg each. The average cost per 60kg box at farm-gate was KShs 800 during high season and Kshs 2000 during low season at farm gate. Farm gate price for tomatoes going to Uchumi supermarket or to wholesale market is similar. The average amount of tomato harvested per hectare was 5000 kg amounting to KShs 65,000. In total the interviewed group marketed 117 tons to different outlets.

Eleven of the twelve farmers interviewed sold their produce to brokers at the farm while one sold outside their division (Nairobi) because he had transport and orders to supply supermarket and other market outlets. To meet their supply order these farmers also doubles as brokers to buy from their fellow farmers. About 32 tons per harvest season (gathered from the 12 farmers) goes to Uchumi supermarket through one of the farmer/ broker while another farmer sells his 59 tons produce directly to Nairobi wholesale market / groceries and the rest (26tons) ends up with brokers who sell at different outlets. Farm gate price per kilogram of tomato is KShs 13 while wholesale price is Kshs 33 , retail price is Kshs 40 and consumer price in the high end market is KShs 59. On average the farmers interviewed have practiced tomato farming for more than 7 years.

The respondents cover an average distance of 5km to the local market and 175km to the markets outside the district. The main modes of transport to the markets outside the district were pick-ups (100 %) operated by brokers.

**Table 5. Gross Margin of tomato produced in Tebere, Mwea.**

<b>Items</b>	<b>Estimated amount per acre ( KShs)</b>
Total output	80,000
Total marketed tomato (90%)	72,000
Total labour cost	9,000
Total input cost	32,000
Total marketing cost	2,000
<b>Gross margin</b>	<b>29,000</b>

**NB: Farmers interviewed work with a supermarket supplier who buys at farm-gate. Thus the marketing cost is low**

Not all tomato is marketed. About 40% of the respondents reported rejection of their produce by buyers. The reason for rejection was mainly due to glut leading to poor market prices (22%), pests and diseases (19%), unmarketable small sizes of fruits (12%) and others are non-preferred variety and blossom end rot. Most of the farmers (76.7%) did not keep any record of their production; spraying or sales of tomato while about (23.3%) did so.

## **5.0 Tomato production constraints**

The major tomato production constraints reported in Kirinyaga include diseases (bacterial wilt, early and late blight, leaf curl, tomato spotted wilt virus, leaf spot and powdery mildew, insect pests and other arthropods (spider mites, thrips, white flies, African bollworm), nematodes, blossom end-rot and poor crop management especially lack of crop rotation practice.

Other constraints include price fluctuation, unmarketable small size, lack of market, blossom-end rot, non-preferences of fruit size or variety and inadequate production techniques.

### **5.1.0. Diseases attacking tomato in Kirinyaga.**

The major fungal diseases include late blight caused by *Phytophthora infestans* which attacks all above ground parts of tomato. It is one of the most destructive diseases of tomato in region. Leaf lesions begin as water-soaked spots, which rapidly enlarge to brown lesions engulfing the entire, leaf which subsequently dries up. Infected leaves shrivel, die and dry up. Infected areas on stems appear brown to black and entire vines may be killed in a short time when moist weather persists. Decaying stems emit a distinct foul rotting odour. Early blight caused by *Alternaria solani* occurs during the hot weather. It occurs on all above ground parts and is destructive at all stages of the crop development. Early blight begins as small brownish/black lesions on leaves. The surrounding tissue becomes yellow, covering the entire leaf, which results in partial defoliation.

Septoria leaf spot caused by *Septoria lycopersici* mainly infects the foliage of the tomato plant and it is a common disease. The fungus rests in plant debris, on seed, or on weeds such as nightshade. Spores of these fungi may be splashed or blown to tomato leaves. Disease development is favored by relatively warm temperatures, abundant rainfall and high relative humidity.

The most important bacterial disease of tomato is bacterial wilt caused by *Pseudomonas solanacearum*. This disease causes wilt of tomatoes as well as potatoes. It is mainly seed borne in tomatoes. Other bacterial diseases of economic importance include bacterial canker caused by *Clavibacter michiganensis subsp. Michiganensis* (CMM). The disease is usually introduced into fields on contaminated seed or on infected transplants, bacterial spot caused by *Xanthomonas campestris* pv. *Vesicatoria* is able to survive on tomato volunteers and diseased plant debris. Seed may also serve as a medium for the survival and dissemination of the bacterium. Disease development is favored by temperatures of 24-30 degrees centigrade and by high precipitation. The bacterium is disseminated within fields by wind driven rain droplets, the clipping of transplants, and aerosols.

Viruses such as the tomato spotted wilt virus cause other economically important diseases (TSWV) ('Kijeshi') and the potato leaf roll. The TSWV disease is transmitted by thrips, *Frankinella occidentalis* and *Thrips tabaci* while the potato leaf roll virus is transmitted by whiteflies.

Root knot in tomato is caused by nematodes particularly *Meloidogyne incognita*, *M. javanica* and *M. hapla* which are the most widely distributed nematode pests of tomato. *Meloidogyne spp.* have a wide host range among cultivated crops especially during the off- season. If environmental conditions are favorable, the nematode survives in weeds particularly the broad leaf species.

### **5.1.2 Insect pests and other arthropods in tomato**

The major soil pests attacking tomato seedlings are cut worms, *Agrotis spp* and chafer grubs, *Melolontha spp.* Aphids, *Aphis gossypii* and thrips, *Thrips*

*tabaci* Lindeman and *Frankliniella occidentalis* (Pergade) and whiteflies, *Bemisia tabaci* suck plant sap and cause leaf distortion and plant stunting. More importantly, thrips have been reported to transmit the tomato spotted wilt virus (TSWV) disease, while the whiteflies are known vectors of potato leaf roll virus which also infects tomato.

The African bollworm, *Helicoverpa armigera* Hub. caterpillars bore into the fruit and feed on the inner part of the fruit, releasing plenty of excreta (frass) which is noticeable on damaged fruits. Feeding by *H. armigera* causes tomato fruit rot as a result of secondary infection by bacterial and fungal pathogens which penetrate the fruit through the feeding holes. The red spider mites, *Tetranychus* sp. infest tomato leaves and suck the sap thus interfering with nutrient transportation and may be serious pests in hot weather and during drought (Knapp, 1999). Other minor pest include, leaf hoppers (*Empoasca* spp), which are small (2.5mm) green to yellowish green wedge shaped insects that jump off from foliage when disturbed.

Severe infestation by these arthropod pests usually causes significant yield loss and may result in total crop loss.

### **5.2.0 Plant nutritional disorders**

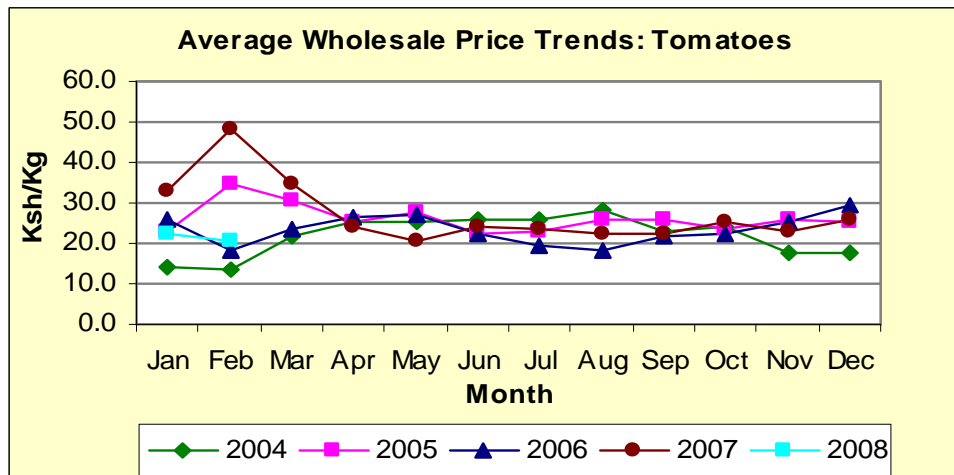
Symptoms of nutritional disorder in tomatoes as reported by farmers occur on leaves, stems, or fruit. They result from inadequate or excessive nutrient supply, characteristics of the soil and climate or from faulty fertilizer application. Several nutritional disorders caused by micronutrient have been reported (KARI, 2005). Among the farmers interviewed 33.3% recorded puffy fruits indicating excess use of Nitrogen (N); 50% recorded Phosphorous (P) deficiency ; 16.6% Potassium (K) deficiency while magnesium (Mg) and iron (Fe) deficiency recorded 16.6% and calcium which manifests itself as blossom- end rot of the tomato fruit was 83.3%.

### **5.3.0 Price fluctuations**

Price fluctuation due to market glut is a persistence constraint to tomato farmers in Kirinyaga. The production cycle is such that all the farmers grow tomato during the same season and time so that the produce matures at the same time. While farmers

in Kirinyaga grapple with price instability, average tomato wholesale price nationally has been relatively stable with no significant changes in average price between successive years as shown in the graph below.

**Graph 1: Average Wholesale Price Trends of Tomatoes**



#### 5.4.0 Non-preferences of fruit size or varieties

Farmers in Kirinyaga produce different varieties of tomatoes which are not demanded. One of the reasons given is because farmers are not organized into commercial groups with specific market need. They depend on brokers / middlemen supplying different outlets who have different specification of tomatoes demanded. The second reason is different seed/ input suppliers tend to promote their variety as the best and farmers are easily convinced to grow.

The buyers especially those that supply supermarkets have specific quality requirements including fruit size and varieties. Farmers have experience of one time having produced a variety that was bigger and was rejected by buyers. Buyers supplying supermarkets come with demands that meet this high end market specification. The supermarkets require long shelf life, uniform ripening, medium size, taste and texture that appeal to customers. With so many varieties promoted and unreliability of the market, farmers end up producing what is not highly demanded.

### **5.5.0 Blossom-end rot**

Farmers in Kirinyaga are constrained with blossom end rot disease which occurs at any stage of development of the fruit, but, most commonly is first seen when the fruit is one-third to one-half full size. Symptoms appear only at the blossom end of the fruit. Initially a small, water-soaked spot appears which enlarges and darkens rapidly as the fruits develop. The spot may enlarge until it covers as much as one-third to one-half of the entire fruit surface, or the spot may remain small and superficial. Large lesions soon dry out and become flattened, black, and leathery in appearance and texture.

This disease does not spread from plant to plant in the field, or from fruit to fruit in transit. Since it is of a physiological nature, fungicides and insecticides are useless as control measures. The occurrence of the disease is dependent upon a number of environmental conditions, especially those that affect the supply of water and calcium in the developing fruits. Factors that influence the uptake of water and calcium by the plant have an effect on the incidence and severity of blossom end rot. The disease is especially prevalent when rapidly growing, succulent plants are exposed suddenly to a period of drought. When the roots fail to obtain sufficient water and calcium to be transported up to the rapidly developing fruits, the latter become rotted on their basal ends. Another common predisposing factor is cultivation too close to the plant; this practice destroys valuable roots, which take up water and minerals. Tomatoes planted in cold, heavy soils often have poorly developed root systems. Since they are unable to supply adequate amounts of water and nutrients to plants during times of stress, blossom end rot may result. Soils that contain excessive amounts of soluble salts may predispose tomatoes to the disease, for the availability of calcium to the plants decreases rapidly as total salts in the soil increase. The soil type in Kirinyaga on which most of the farmers interviewed carry out their tomato production is black cotton (80%) while the rest is clay loam. When this is coupled with poor irrigation and fertilizer application techniques blossom end rot becomes a persistent problem.

### **5.6.0 Inadequate production techniques**

Nine of the twelve farmers interviewed reported that their main sources of farming information were fellow farmers ,eight seed and agrochemicals stockist and three agricultural extension officers (20%) and agro-chemical companies (5%). The other



less important sources of information included own experience from farming ,seminars, media, parents , schools and farmer training colleges (FTC). Eight farmers had not participated in demonstrations on how to grow and manage tomatoes while the rest did have.

## **6. DISCUSSION**

The present study established that tomato production is a major farming business in Kirinyaga district. The percent area on tomato with regard to the total cultivated area (2acres) shows that tomato production is one of the most important crops in this region. Out of the average 5 acres of land, tomato was shown to occupy more than a third of the cultivated area. It also employs a large number of people during the various stages of development especially crop harvesting. Because of its profitability, tomato production has been male dominated. The present study has also shown that a large number of tomato growers are in their early and middle age group 25-45 years of age. Efforts are therefore required to make the business viable to sustain this important population in Tebere location and other urban and peri-urban areas where the produce is marketed in Kenya. The crop consumes high number of inputs including fertilizers, pesticides and provides business to the transport industry

The climatic conditions of this area like other tropical regions are favorable for arthropod and disease pests. A wide range of pests thrive well in this area due to continuous availability of crops supported by the availability of irrigation water.

The study showed that all the farmers practice furrow irrigation probably due to the short distances of their water source and also because they would not require expensive equipment such as sprinklers. However, furrow irrigation has been known to favour insect and other arthropod pests besides mechanical transmission of soil-borne diseases such as the prevalent bacterial wilt. Staking and tying is by all tomato growers while none practiced mulching.

The study has also shown that the knowledge of insect pests, diseases and weeds was good because they are able to identify and name. However, knowledge of their management strategies just like in the whole production chain was scarce and was fully dependent upon pesticides for pest control. Furthermore,

most of the pesticides used were synthetic broad spectrum thus exacerbating the pest problem due to extermination of natural enemies.

It was also evident that middlemen / brokers play an important role in tomato marketing. The middlemen buy from the farmers at farm gate price and then sell twice to high end or wholesale markets in Nairobi. The tomato farmers face marketing challenges especially unstable prices that range from Kshs 800 per 60 kg box during high season to Kshs 2000 for the same during low season. Producing high quality tomatoes is a challenge as demonstrated by the constraints highlighted above. Their production per unit of land is well below other countries.

## **7. Recommendations**

The following recommendation based on my observation and analysis can be made:


- **Training farmers in tomato production techniques which includes;**

- (3) Variety selection
- (4) Soil sampling and analysis for available nutrients
- (5) Fertilizer and manure application techniques
- (6) Nursery seed bed and field preparation
- (7) Planting and Transplanting
- (8) Pests and disease scouting
- (9) Pesticides applications
- (10) Phytosanitary requirements
- (11) weed control
- (12) Intercropping and crop rotation
- (13) Irrigation techniques


- **Postharvest handling**


- Maturity indices
- Harvesting techniques
- Grading
- Packaging

### **(3) Business skills**

-  Production planning

 Record keeping

 Business negotiation skills

 Marketing in terms of quality requirements, market segmentation, prices etc.

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**Annex 2: Report on tomato high segment market in Nairobi**

**Draft Report on;  
HIGH SEGMENT MARKET FOR TOMATO IN NAIROBI.**

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## **ACRONYMS AND ABBREVIATIONS**

<b>GoK</b>	<b>Government of Kenya</b>
Ha	Hectares
HSM	High Segment Market
KEPHIS	Kenya Plant Health Inspectorate Service
Kg	Kilograms
KHDP	Kenya Horticultural Development Program
MOA	Ministry of Agriculture
MRLS	Maximum Residue Levels
USAID	United States Agency for International Development
Ton	Tonnage

## **Units and Measures**

Hectare (ha) 1 ha = 10,000 m<sup>2</sup>

Acre 1 acre = 0.405 ha

Metric Ton (Mt) 1 Mt = 1,000 kg

## **1.0 Introduction**

Kenya has a thriving horticulture sector annually producing over 1million tons of vegetables on an estimated 100,000 ha, with 90 % being consumed domestically and 10% exported. Most production is carried out by small scale farmers, with approximately 0.5 - 2.5 ha of land each. The main vegetable crops grown in Kenya for domestic market include kale, tomato, cabbage, African leafy vegetables and onion while French beans and peas are grown for export. The vegetable industry provides employment to many people who are engaged in production, processing, and marketing.

### **1.1 Basic description of the high segment market**

The high segment market has seen a rapid growth during the last decade. It has risen from a tiny niche a half a decade ago to a fifth of food retail, spreading well beyond the richer consumers to derive more than a third of their sales and half of their customers from middle to low income consumers. This market boasts of supermarkets, Up-market groceries, Hotels and restaurants. Nairobi's population of 2,940,911 (2007) growing at a rate of 6.9% leads other urban areas in terms of high segment market growth. The main driver for the growth of the high segment market is urbanization and relative increase of incomes in the population.

This paper will focus mostly on supermarket as the fastest growing category in Kenya serving high and middle-income consumers. The supermarkets growth in Nairobi and other cities in Kenya now account for 20% of urban-food retail supply (Neven and Reardon, 2004). We use the definition of ACNielsen/Kenya for supermarkets - "self-service stores handling predominantly food and drug fast-moving consumer goods (FMCG) with at least 150m<sup>2</sup> (1,625 sq. ft) of floor space." A "hypermarket" is roughly 15 times the size of a supermarket (i.e., 2,250m<sup>2</sup> or 24,460 sq.ft). Using these definitions, there are about 209 supermarkets and 16 hypermarkets in Kenya. The supermarkets and

hypermarkets with large parking areas are strategically situated along the main entry/exit roads in Nairobi and the city centre near busy areas.

The past decade has seen the supermarket food sector grow well above 20% share of the US \$ 1.9 billion urban food market in Kenya. The rest of the urban food market, in 2003, was composed of smaller self-service shops (chain convenience stores and mini-supermarkets, both of which are non-traditional retailers having emerged recently) represent another 17% of the market, while the remaining 63% of sales comes from traditional retailers (Neven and Reardon, 2004). Sales of the sector are growing at 18% a year (much faster than overall income growth, which means supermarkets are taking retail share from other retailers such as kiosks, greengrocers, retail markets and street hawkers.

The supermarkets have evolved from just selling processed food to be the leading fresh vegetable stores in the high segment market. Two leading vegetable sellers (Uchumi and Nakumatt supermarket chains) dominate the market share with 70 % divided equally between them. While Uchumi targets consumers from all socio-economic groups, Nakumatt's consumer focus has been mostly on the high-income segment (50% of their customers fall in this category). Other high segment markets competing for urban vegetable consumers include Tuskys and Ukwala supermarkets, up-market groceries, hotels and restaurants commanding about 30% of vegetable market share.

Procurement systems has began to be modernized in supermarket chains in Kenya by centralizing procurement into distribution centers (away from spot market ), by selecting sets of preferred farmers / suppliers and specialized franchise dedicated to sourcing from those farmers and instituting basic quality standards. In 1997, when supermarkets first started selling vegetables in a significant way, they procured from whatever source was available, hence sourcing only 30% direct, and the rest from traditional brokers. Over the past few years, the chains have begun shifting toward sourcing directly from farmers i.e. 60 % farmers and 40 % brokers. In interviews with supermarket procurement officers, they said that sourcing direct allows them to inspect the farm to judge potential reliability in volumes and quality by noting farm size, presence of irrigation, and the water source,

allows them to cut out intermediaries' margins, and have more control of supply through direct communication. The new procurement systems put more demands on the farmer than the traditional system – a spot market, fragmented, few if any standards, operating through many small brokers. Thus farmers have to evolve with supermarkets so as keep abreast with new quality standards demanded by consumers.

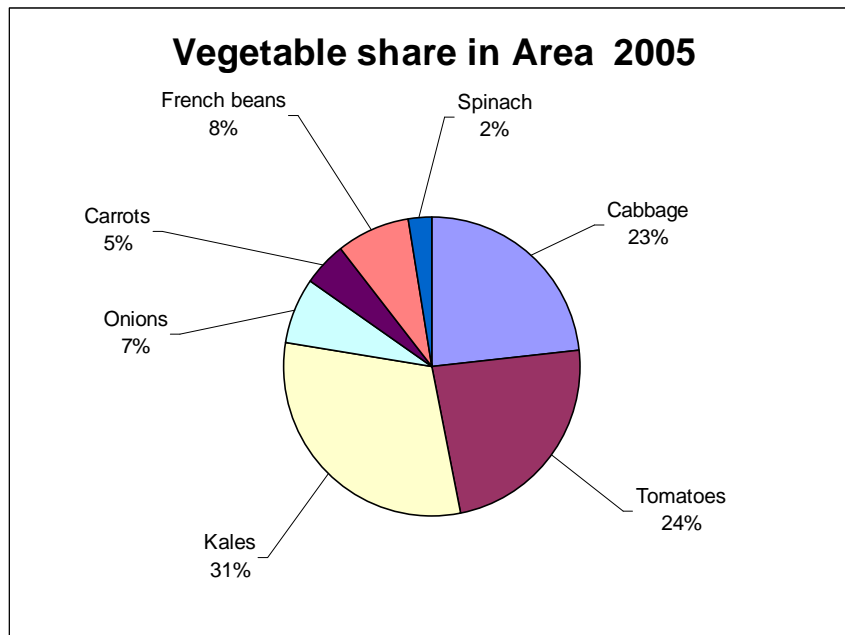
## **2 Development of the Vegetable high segment market**

Vegetable production in Kenya increased from 1.13 million tons in 2001 to 1.39 million tons in 2005. Major vegetables include tomatoes, cabbages, kales, spinach; French beans, carrots and onions. Other vegetables such as cucumbers, lettuce, turnips, broccoli, cauliflower are also grown but on a limited scale targeting the hotel and hospitality industry.

A number of factors that underlie this impressive growth have been discussed in various forums and they include but not limited to: (1) the expanding domestic market due to urbanization (2) the relatively high value products per unit of land and affordable labor inputs which leads to increased income for farmers from small farm size (3) the quick maturing period when compared to most staple and cash crops which leads to quick return on investment (4) market liberalization.

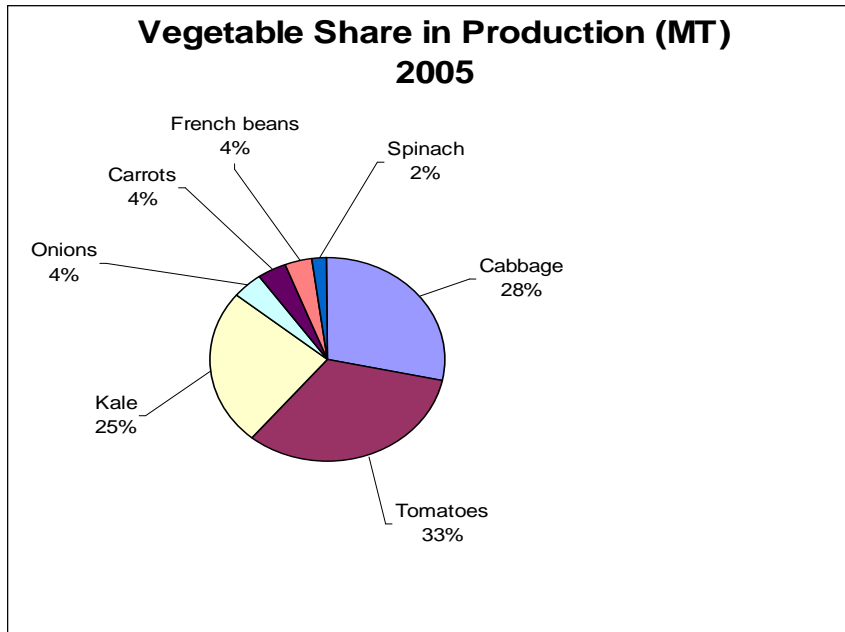


**Fig 1: Relative Vegetable share in Area (Ha) 2005**



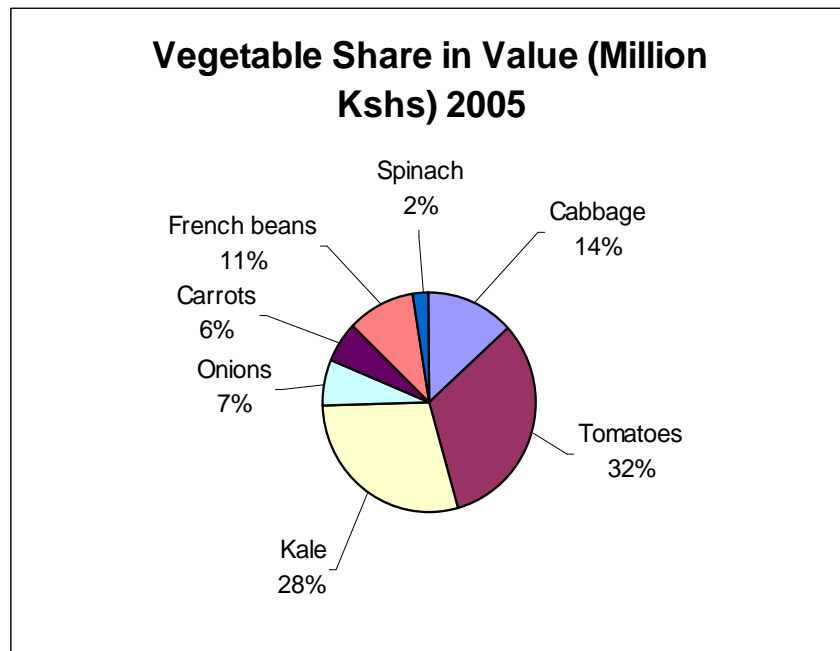
Source of data: MoA, Annual Report.

**Fig 2: Vegetable share in production (tons) 2005**



Source of data: Ministry of Agriculture , Annual Report

**Fig 3: Vegetable share in local value ( Million Kshs) 2005**



Source of data: MoA , Annual Report

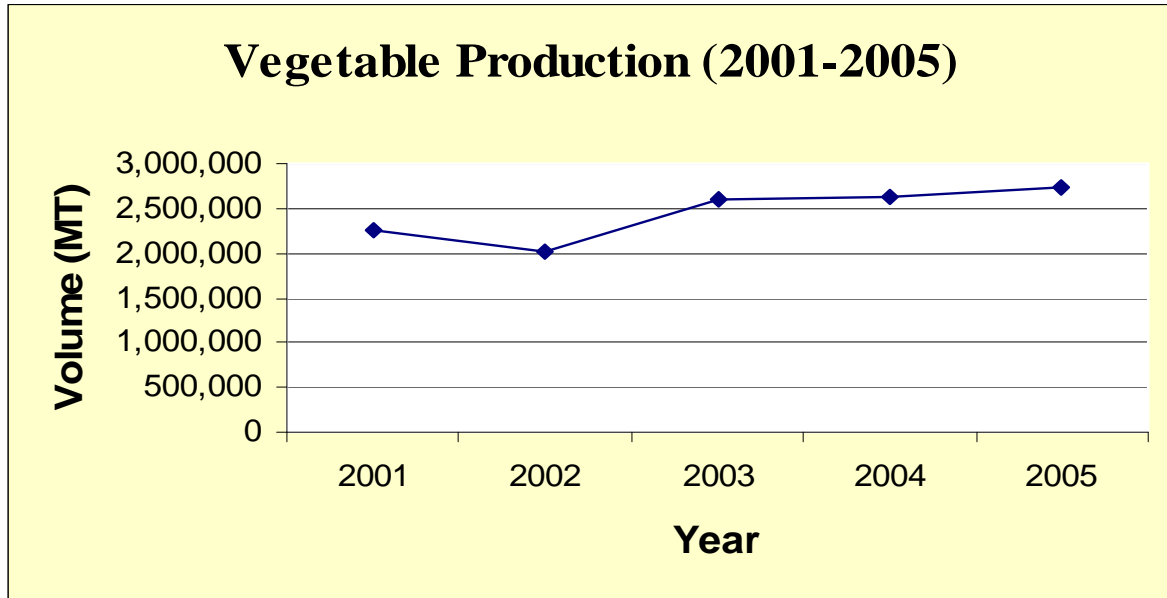
The table below shows vegetable volumes produced for the both domestic and export market from 2001 to 2005. As noted earlier, the export market consists of 10 % while domestic market is about 90%. The high end market takes in less than 10% while the rest goes into low end market across the country.

**Table 1. Vegetable Production Volume**

	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>
Area (HA)	213,343.0	211,963.0	230,925.0	230,187.0	233,658.0
Production Volume (MT)	2,253,307	2,014,152.0	2,593,175	2,627,163.0	2,725,469.0
Yield (Tones /HA)	4,762.0	4,621.50	5,223.3	6,392.2	6,615.1
Total Value (Million Kshs)	16,291.5	16,392.70	56,469.0	24,712.0	28,376.2
Exports Volume(MT)	34,383.5	38,141.5	47,128.7	59,627.1	68,723.8
Value (Million Kshs)	6,393.0	6,008.1	5,848.5	8,708.8	11,195.1

Source of data: Economic Review Of Agriculture 2007

**Fig 4: A graph showing vegetable production trends**



Source of data: Economic Review Of Agriculture 2007

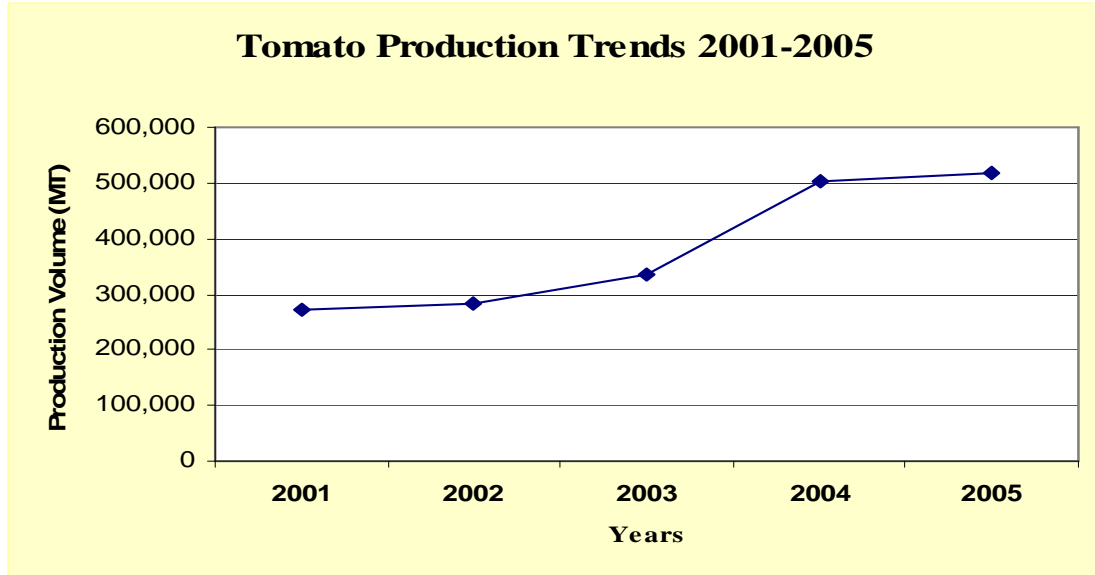
On average, cabbages dominate production having increased from 248,523 tons in 2001 to 529,003 tons in 2005 (Horticulture Annual Report 2006). Similar trends were observed for tomatoes (Table 2) and the rest of the vegetables. Otherwise, there was a general increase in vegetable production for the period of 5 years

**Table 2. Tomato production volumes**

	2001	2002	2003	2004	2005
Area(ha)	16,246	17,430	18,163	22,784	20,743
Production volume(mt)	271,151	284,859	337,076	501,248	518,575
Total Value(Million Kshs)	4,645	4,513	5,103	6,265	6,483
Yield ( Tones/ Ha	17	16	19	22	25
Exports volume (MT)	13.5	33.0	6.1	7.2	4.2
Value of Export( Million Kshs)	1.33	2.04	0.52	0.7	0.34

Source of data: Horticulture Annual Report 2006

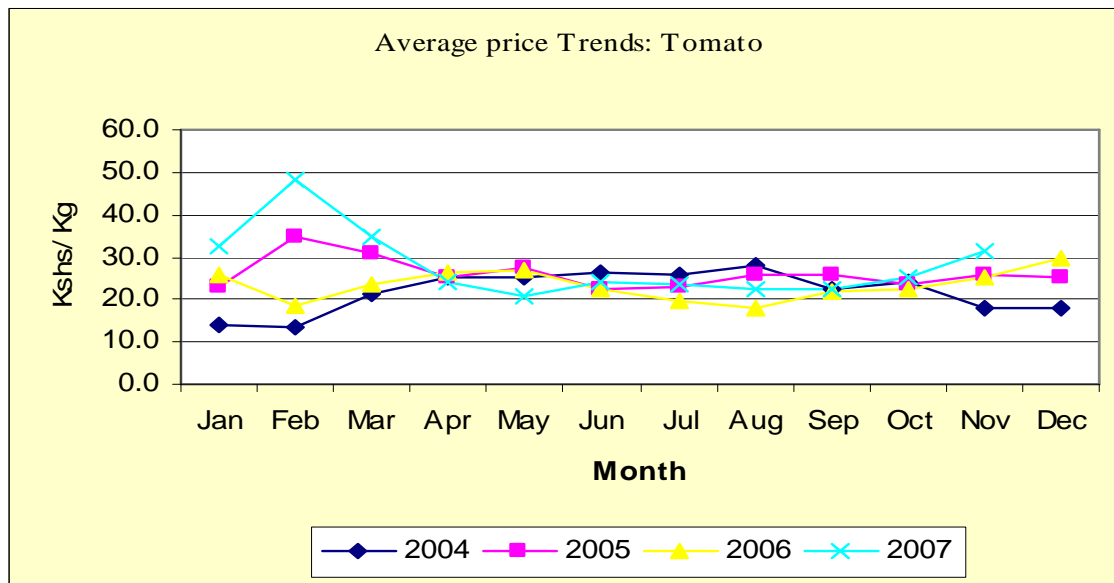
**Fig 5. Tomato production Trends.**



Source of data: Ministry of Agriculture, Annual Report

The graph above shows the production trends of tomato since 2001 to 2005. This is a marked increase of about 100% over that period. The increase in volume is slightly attributed to the expanded area from 16,248 ha in 2001 to 22,784 ha in 2004. In 2005 despite reduction in area, production volume increased to 518,575 tons due to weather and improved production technologies.

**Fig.7 A graph showing tomato wholesale price trend**



Source of data: Ministry of Agriculture, Market Information office and KHDP

Supermarkets pay the highest wholesale prices for high quality tomato at Kshs 40 per Kg (about 40% higher than traditional retailers), but other benefits of selling to supermarkets are even more important to farmers than the higher price. The supermarket price tends to be stable across the year and does not fluctuate irregularly.

The mean wholesale price trend for tomato in traditional markets such as Wakulima wholesale market in Nairobi is computed and shown in the above graph (Fig.7). Price for tomato is greatly affected by productivity and availability especially where farmers depend on climatic conditions to produce as happens for majority of farmers in Kenya.

Generally, average prices for tomato have been relatively stable with no significant changes over the past four years. Comparison of traditional wholesale monthly prices for tomato across a four year period indicate that it is difficult to predict price peaks as an indicator of optimum planting times to plan production so as to have consistent supply. Consistent supply is also one of the requirements of supermarkets in the high segment market.

### 3 Requirements in the high segment market

The tomato high segment market requirements in Kenya consist of quality, quantity and timely supply. There are several quality requirements in the high segment market which closely reflect the consumer preferences. High Segment Market (HSM) requires superior standards for tomatoes. They have to appeal in their taste and appearance based on perceived quality preferences. Consumers like tomatoes that are clean and fresh with soft texture but firm and free from visible damages by pests and diseases. The tomato must have long shelf life after ripening. Most of the varieties that meet the above requirements include Riogrande, Onyx and Alboran.

Consistence in quantity supplied to HSM is a critical issue the suppliers are supposed to meet. Whereas hotels and restaurants demand small units of tomato, the supermarket requires huge volumes per supply. Uchumi and Nakumatt supermarkets commands 70 % of all traded volume in the high segment market equally dived between them. This roughly translates in to about 424,894 tons per year and 35,408 tons per month for each of the supermarkets. It is from this background that small scale farmers have to form tomato producer organization to be able to penetrate these markets.

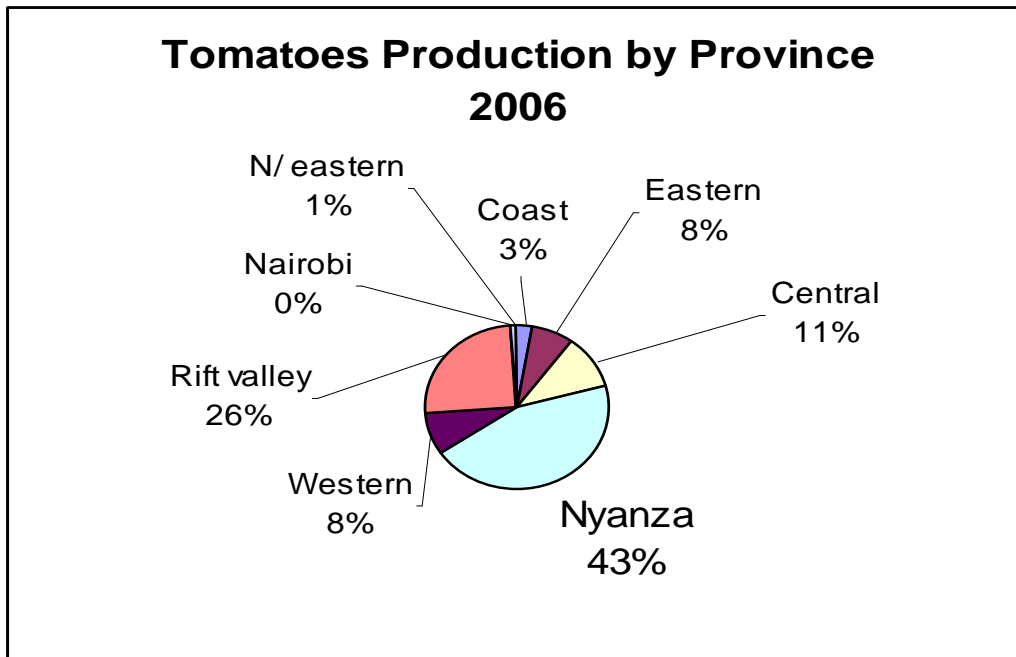
The HSM demand consistence in delivery per supplier usually once per week. The supplier is supposed to deliver the tomato using their own transport which is factored into their selling price. They are also supposed to give one month credit or less depending on the agreed arrangements. The HSM set prices which put into consideration the suppliers' cost of tomato, transport, labor and taxes. This price is usually higher than other market segment. For instance, Uchumi supermarket buys tomato at Kshs 40 per Kg.

#### **4 Sources of vegetables in the HSM**

Tomatoes are produced in a wide range of areas in Kenya, mainly covering medium to high potential areas. Nyanza province at 43% is followed by Rift Valley at 26 % and

Central comes third at 11% are the main sources for tomatoes accounting for about 70% of total national tomato production in 2006.

**Fig 6: Tomatoes production by provinces 2006**



Source of data: Ministry of Agriculture, Annual Report

According to the Ministry of Agriculture (MOA), tomato is an important vegetable with a ready market. It is used in the fresh and processed forms for salads, cooking, sauces, paste and juices.

In Kenya, tomato production is carried out mostly by small scale farmers and also large scale farmers. It is grown under rain fed and irrigated conditions. The most common varieties grown include Cal J, Riogrande, Onyx, Money maker, Fortune, Kentom, Neema 1400, Neema 1200(resistant to nematodes), Caltana, Manset, Zawadi F1 hybrid and Rotade. Other new varieties continue to be introduced for farmers to grow.

Alboran variety is grown under green house and has a higher yield of good quality. Procurement officer in Uchumi points out that growing tomato in the green house is the



sure way of maintaining quality standards demanded by HSM. Usually the tomatoes are not affected by heavy rainfall that damages the developing fruits.

In Nairobi the two major supermarkets (Uchumi and Nakumatt) are the leader in tomato share in the high segment market .Uchumi supermarket was incorporated in 1975 and became a public company in 1992(listed on Nairobi Stock Exchange). The supermarket chain currently has one distribution centre and 10 operational branches in Nairobi. The supermarket procures tomatoes from traders/ brokers and farmers alike. Unlike Uchumi which procures directly from traders / farmers, Nakumatt and Tuskys supermarket procures largely through a department/franchise known as Fresh n Juice. Whereas hotels, restaurants and Up-market groceries sources from brokers who buy from spot market. Uchumi presents orders to suppliers mainly by telephone communication, while Nakumatt through Fresh n Juice has agreements with suppliers.

Uchumi supermarket alone has a yearly turnover of 424,894 kg of tomato. This is a paltry 1% of the total tomato produced in Kenya. The supermarket procures from farmers (60%) and brokers (40%). Most of farmer / suppliers have big land ranging from 5 to 40 acres all under tomato or intercropped with other crops. They also source from small scale farmers who collect more supplies from fellow small scale farmers to meet the supply order. One of the small scale farmer from Kirinyaga supplies tomato on an average of 10 tons per week. The farmer has about 24 farmers spread in 3 villages. He buys from other farmers at farm gate price of about Kshs 13 per kg and supplies Uchumi at Kshs 40 per Kg who in turn sell to consumers at Kshs 59 per Kg. Each supplier is given an order usually over the phone on a specific day to deliver to specified outlets once per week.

## **5 Trends in the high segment market**

In Kenya, the high segment market is not only dynamic in growth but also in procurement and quality of the tomatoes supplied. Experience from across the world has shown that farmers who grow vegetables earn more income than cereals. However, for this potential to be realized these growers need to have ready and efficient access to markets. In order to achieve this, procurement and practices, especially for small scale farmers, need to evolve. Locally, initiatives have been developed to organize farmers into groups so as to meet quantity demanded. Increased access to supermarkets entails increased investment in quality, grades, standards and consistence in supply of tomatoes.

Neven and Reardon (2004) show that the supermarket share for the vegetables is growing at an annual rate of 18% and has a 20% share of the urban food market overall with 4% fresh fruit and vegetable (FF) market in other towns while Nairobi at 7%. At this rate, the current high segment market share for vegetables is less than 10% in Nairobi and well below in the rest of the country. However, the segment is likely to grow due to urbanization, per capita income and growth rate. Furthermore, the changing lifestyle in the urban set -up has led to the proliferation of large chain supermarkets stocking most of the fresh and processed food which attracts both the middle and upper class citizenry. The congestion, untidy conditions and poor management of retail and wholesale markets for fresh produce in Nairobi has seen most people heading for the supermarkets for their vegetable purchase.

Consumers and key sub-sector regulators have become increasingly aware of quality and standards as far as MRL's and hygiene in tomato and general vegetable is concerned. The seriousness exuded on this matter has led to such initiative as the establishment of National Codex Committee whose main purpose includes the development of a comprehensive code of practice (COP) for horticultural Industry. Moreover, a full branch has been established within the horticulture division of Ministry of Agriculture. Consequently key stakeholders comprising KEPHIS, USAID-KHDP and Uchumi Supermarket have an undergoing MRL's testing program covering tomato, cabbages, and kales

## **6 Challenges in high segment market**

The major challenges in the high segment market are varied because some have their origin in the production side at farm level and middlemen in the value chain. Nevertheless, the following challenges face the high segment market in the tomato business:

### 3) Quality

- Poor quality tomato due to poor varieties that have short shelf life
- Inconsistency in supply of quality tomato due to pest and diseases, poor handling and rain damage that lead to spoilage in physical losses and quality deterioration
- Disuniformity in terms of sizes, colour and level of maturity.

### 4) Seasonality and prices

- Fluctuation in supply between dry and rainy seasons resulting in price fluctuation
- Inconsistent supply of required volume ( thus need for several suppliers)

### 3) Standards and hygiene.

- Use of wooden packaging that bruises tomato instead of the polystyrene boxes
- Untidy tomato fruits due to chemical spray or mud

### 5) Selection by consumers

- Consumers have a tendency turning around tomatoes while selecting what they want. In the process they end up damaging ripe tomatoes thus reducing shelf life.

## **7. Recommendations**

The following areas can be addressed by different stakeholders to improve tomato domestic supply chain to high segment market.

### 4) Quality

As identified above, quality issues have origin in variety, harvesting techniques, production techniques, grading and handling. Farmers to be trained on these specific issues.

5) Seasonality and prices

Farmers in Kirinyaga can be encouraged to increase production especially during dry season because they have enough water for irrigation. By doing so it will cushion quantity and price fluctuation. Also identify farming technologies that can set-up production cycles independent of rainy seasons and link farmers to high segment market on contractual farming.

6) Standards and hygiene.

Training farmers on pesticide use and timing to achieve MRL's. This can further reinforced by supporting KEPHIS to carry out sample testing. Also farmers can adopt plastic packaging material weighing less instead of the wooden boxes weighing 60 kg that is prone to damage of tomato during handling and transportation.

7) Selection by consumers

When all of the above has been addressed, tomato quality and consistence is assured and therefore the consumer's trust of the product will go high thus stop selection of the displayed tomato.

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