MARKUP
EU-EAC MARKET ACCESS UPGRADE PROGRAMME

Kenya MARKUP - Market Access Upgrade Programme

Vegetables (French beans and Snow peas) sub sector AS IS value chain analysis

ABOUT THIS REPORT

UNIDO commissioned passion fruit and mango value chain analysis in Kenya under the Market Access Upgrade Programme (MARKUP). The study focused on French beans and snow peas in 6 counties in Kenya. These are Machakos, Taita Taveta, Kajiado, Bungoma and Trans Nzoia for French beans and Taita Taveta, Nakuru and Trans Nzoia for Snow peas.

This report presents findings of the study on passion fruit and mango value chain demand, supply, institutional arrangement & access to support services and proposes respective value chain upgrading strategies and recommendations. The study findings are aimed to among others inform MARKUP project interventions providing measurable performance indicators.

The study was undertaken by Tymax Agribusiness Solutions Ltd on behalf of UNIDO.

We wish to acknowledge the support of UNIDO's MARKUP team led by Stefano Sedola, Ali Qazilbash, Maina Karuiru, Christine Misiko and Christine Mulindi for their support and immense contribution in delivering the assignment.

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We are also very grateful to farmers, producer groups' officials, agro dealers, transporters, financial institutions officials, extension officers and traders for availing invaluable information that will guide formulation of MARKUP intervention.

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ACRONYMS AND ABBREVIATIONS

AFA	Agriculture and Food Authority
ATVETs	Agriculture Technical Vocational Education and Training
EAC	East African Community
FPC	Fresh Produce Consortium of Kenya
FPEAK	Fresh Produce Exporters Association of Kenya
GAP	Good Agricultural Practice
GHP	Good Hygiene Practices
HCD	Horticultural Crops Directorate
HS	Harmonized System
ISO	International Organization for Standardization
ITC	International Trade Centre
JKIA	Jomo Kenyatta International Airport
KAM	Kenya Association of Manufacturers
KEBS	Kenya Bureau of Standards
KEPHIS	Kenya Plant Health Inspectorate Service
KES	Kenya Shilling
Kg	Kilogram
KPIs	Key performance indicators
NTM	Nontuberculous mycobacterial
PPE	Personal Protective Equipment
SA	South Africa
SACCO	Savings and Credit Co-Operative Society
SSPs	Spray service providers
UAE	United Kingdom and United Arab Emirates
UK	United Kingdom
UNIDO	United Nations Industrial Development Organization

EXECUTIVE SUMMARY

French beans value chain

Demand

Kenya exported 34,670 tons of French beans at a unit value of 2,224 Euros per ton in 2019 (ITC). The country has shown a 24% growth in value of exports in the last 2 years and a 2% annual growth in quantities between 2015 and 2019. The UK accounts for 37% of Kenya's French beans exports while others include France (26%), Netherlands (17%), Belgium 6% and Germany 2%. Kenya also exports French beans to the Middle East and Asia that is UAE, Hong Kong and China. Africa countries where Kenya exports to include: SA and Tanzania.

Despite French beans being a mature market in Kenya, there is untapped export potential which according to ITC export potential data, the biggest potential for fresh French beans is in the Netherlands, the United Kingdom and United States of America. Netherlands shows the largest absolute difference between potential and actual exports in value terms, leaving room to realize additional exports worth $9.5 MN. United Kingdom is the market with the highest demand potential. On the other hand, United States of America, Tanzania and Japan have huge untapped market potential for frozen French beans. United States of America is the market with the highest demand potential for the frozen French beans.

With strong demand for Kenyan beans in countries like the UK, one of major issue limiting servicing of such markets is compliance to market requirements mainly GLOBAL GAP certification where only 22% of farmers interviewed were certified. While brokers aggregated approximately 57% of produce, selling through producer groups (21%) and directly to exporters (22%) is a step in the right direction that will contribute towards enhanced compliance to food safety standards by smallholder farmers reversing the trend by exporters of growing more in-house and contracting large and medium scale growers. The average selling price of French beans at farm level was KES. 54.66 Per Kg with an average income of KES. 90,548 per acre.

Supply

The analysis covered five counties namely Machakos, Taita Taveta, Kajiado, Bungoma and Trans Nzoia Counties with a sample size of 52, 59, 69, 50 and 58 respectively totalling to 288 farmers. The average acreage under French beans is 1 acre which is less in proportion to land operated by interviewed households averaging 4.3 acres. The overall yield is 1,790 Kg against a potential of 4,500 Kg per acre. Some of the key constraints leading to lower yield and quality includes:

- Use of recycled/second generation seeds by about 40% of farmers. This is as cost cutting strategy by the farmers and llimited availability of and access to quality seed within reach of the farmers. The germination rate for 2nd generation seeds averaged 74%.
- Low uptake of good agricultural practices negatively affecting productivity and food safety (e.g. soil testing at only 9.7%)
- Limited land under crop
- Low uptake of smart water solutions and limited irrigation systems & reliance on rain fed production; only 42% of farmers irrigate throughout the growing cycle

On average 7.4% of French beans are lost at farm level. This is mainly due to poor storage facilities, limited access to grading/pack house facilities & poor postharvest handling practices. Exporters reported an average pack house yield of 80%.

Institutional arrangement & access to support services

Farmers mainly work individually limiting their bargaining power and access to essential services. Only 26% of the farmers are members of farmer organizations. 93% of farmers individually source farm inputs.

19% of farmers have accessed finance to finance their farm operations which could be scale up to enhance investments in the value chain. On average farmers had 1.36 contacts with extension officers per annum. This limits knowledge that could contribute to increased productivity to meet the escalating demand.

Value chain upgrading strategy recommendations

Recommendations and activities	**Key performance indicators (KPIs)**	**County specific priority areas**
Certification and market linkages to increase quality and quantity.		
• Support exporters to review and optimize new markets opportunities especially the frozen French beans market in the USA and Japan. • Support exporters to enhance compliance and optimize production and processing capacity to competitively exploit the fresh French beans markets in the Netherlands, UK and USA.	• Increase of regional, international trade volume for French beans of targeted farmers and enterprises.	
• Farmer trainings on GAP (GLOBAL GAP); Integrated Pest Management, Biological Control of Pests. • Promote groups certification under GLOBAL GAP option 2. • Link farmers to certifying agencies. • Traceability: strengthen/upgrade the traceability system to reflect market needs.	• Percentage increase in number of GLOBAL GAP certified French beans farmers participating in the international markets	
• Support formation and or strengthening of producer groups for produce aggregation and collective marketing to improve farmer bargaining power and compliance to market standards • Support direct farmers (directly or through their organizations) contracting by exporters.	• Percentage increase of farmers having signed supply agreements directly with exporters and complying to market standards • Percentage increase in income per acre	• Kajiado (Price) • Machakos (Price) • Taita Taveta (price)
Productivity, quality and food safety; target to increase productivity (yield per acre) and food safety through:		
• Accelerate uptake of good agricultural practices and improved access to, demand & effective use of certified inputs and smart farming technologies (through training in	• Percentage increase in production of safe, quality French beans (yield) per acre	• Bungoma (Yield and quantities)

farmer field schools, extension services, collective input purchase by farmers & financial access as highlighted in 4 below). • Build farmers' entrepreneurial capacity to run French beans production as a business adopting market driven production. Demand should guide development of planting calendars to support consistent production. • Work with competent authorities and county governments for policy/regulation formation and enforcement such food safety policy.		• Machakos (yield and quantities) • Taita Taveta (yield) • Trans Nzoia (quantities)
Effective and efficient post-harvest management		
• Identify & support investment opportunities to address postharvest spoilage such as recommended cold storage facilities at farmer level and pack houses at exporters' level. • Trainings of exporters on GHP, FSSC22000, ISO 14001; ISO 45001:2018, traceability, packaging & labelling	• Percentage reduction in post-harvest losses.	
Support formation & strengthening of farmer organizations to facilitate farmers access to essential services		
• Encourage farmers to form groups for easier access to services and inputs capitalizing on their economies of scale. • Promote blended extension services e.g. Spray service providers (SSPs) providing market information. This could be through trainings by the competent authorities such as HCD. • Financial literacy & linkages (tripartite agreements e.g. among banks, farmers and exporters) and tailor made financial products (e.g. cold storage facilities asset financing) • Promote smart services e.g. digital financial services for example Digi Farm & Agri Wallet.	Number of farmers consistently/easily accessing essential support services.	

Snow peas value chain

Demand

Kenya's share of the world snow peas is market 1.7%. Europe is the leading export destination of Kenya's snow peas. Netherlands imports about 30%, France (19%) and United Kingdom (9%) of Kenya's snow peas. Kenya also exports snow peas to the Middle East and Asia that is UAE and Hong Kong. In Africa, Kenya supplies Uganda and Tanzania. Kenya is facing strong competition from snow peas producing countries with the following shares in the world market Guatemala (18%), Netherlands (17.1%), USA (14%), Peru (8.2%), China (7.3%), France (7%), Mexico (4.1%), Belgium (3.2%) and Germany (2.6%). In Africa, Kenya is facing competition from Zambia, Ethiopia, Zimbabwe, Egypt and Morocco.

Despite the stiff competition by international and regional exporters, Kenya has not yet tapped about 46% of its potential to produce and supply both fresh and frozen snow peas to the world market. According to ITC export potential data, the biggest potential for fresh snow peas is in the United Kingdom, the Netherlands, US and Canada while the US, United Emirates Arabs, Saudi Arabia and China has potential for frozen snow peas.

Optimization of the existing and potential markets could have been limited by among others low Kenyan snow peas producers' certification level; of the farmers interviewed only 35% were GLOBAL GAP certified. There is also need for exporters to work closely with producers as the study realized that at 58% brokers are the key market channel for the farmers followed by producer groups (35%). 7% of farmers sell directly to exporters. The average selling price per kg at farm level is KES. 70 with an average income of KES. 146,902 per acre.

Supply

The analysis covered three counties namely Taita Taveta, Nakuru and Trans Nzoia Counties with a sample size of 9, 27 and 93 respectively totalling to 129 farmers. The average acreage under snow peas is 0.8 of an acre which is less in proportion to land operated by interviewed households averaging 4 acres. The overall yield is 2,263 Kg against a potential of 5,200 Kg per acre. Some of the key constraints leading to low yield and quality includes:

- Use of recycled/second generation seeds by about 9% of farmers. This is as cost cutting strategy by the farmers and llimited availability of and access to quality seed within reach of the farmers. The germination rate for 2nd generation seeds averaged 81%.
- Low uptake of good agricultural practices negatively affecting productivity and food safety (e.g. soil testing at only 7%)
- Limited land under crop
- Low uptake of smart water solutions and limited irrigation systems & reliance on rain fed production; only 26% of farmers irrigate throughout the growing cycle

On average 7% of snow peas were lost at farm level. This was mainly due to poor storage facilities, limited access to grading/pack house facilities & poor postharvest handling practices. Processing yield at the pack houses ranges between 75% and 80%.

Institutional arrangement & access to support services

Despite 40% of farmers being members of farmer organizations, 90% individually source farm input limiting bargain power. Additionally, only 10% of farmers have ever accessed credit towards farming operations. This coupled with an average of 1.6 contacts with extension officers per

annum limits optimization of snow peas production at farm level due to limited knowledge and resources (mainly inputs).

Value chain upgrading strategy recommendations

Recommendations and activities	**Key performance indicators (KPIs)**	**County specific priority areas**
Certification and market linkages to increase quality and quantity.		
• Support exporters to review and optimize new markets opportunities especially the frozen snow peas market in the US, United Emirates Arabs, Saudi Arabia and China • Support exporters to enhance compliance and optimize production and processing capacity to competitively exploit the fresh snow peas markets in French beans market in the United Kingdom, the Netherlands, US and Canada	• Increase of regional, international trade volume for snow peas of targeted farmers and enterprises.	
• Farmer trainings on GAP (GLOBAL GAP); Integrated Pest Management, Biological Control of Pests. • Promote groups certification under GLOBAL GAP option 2. • Link farmers to certifying agencies. • Traceability: strengthen/upgrade the traceability system to reflect market needs.	• Percentage increase in number of GLOBAL GAP certified snow peas farmers participating in the international markets	
• Support formation and or strengthening of producer groups for produce aggregation and collective marketing to improve farmer bargaining power and compliance to market standards • Support direct farmers (directly or through their organizations) contracting by exporters.	• Percentage increase of farmers having signed supply agreements directly with exporters and complying to market standards • Percentage increase in income per acre	
Productivity, quality and food safety; target to increase productivity (yield per acre) and food safety through:		
• Accelerate uptake of good agricultural practices and improved access to, demand & effective use of certified inputs and smart farming technologies (through training in farmer field schools, extension services, collective input purchase by farmers & financial access as highlighted in 4 below).	• Percentage increase in production of safe, quality snow peas (yield) per acre	• Nakuru (Yield) • Taita Taveta (yield)

• Build farmers' entrepreneurial capacity to run snow peas production as a business adopting market driven production. Demand should guide development of planting calendars to support consistent production. • Work with competent authorities and county governments for policy/regulation formation and enforcement such food safety policy		• Trans Nzoia (quantities)
Effective and efficient post-harvest management		
• Identify & support investment opportunities to address postharvest spoilage such as recommended cold storage facilities at farmer level and pack houses at exporters' level. • Trainings of exporters on GHP, FSSC22000, ISO 14001; ISO 45001:2018, traceability, packaging & labelling	• Percentage reduction in post-harvest losses.	
Support formation & strengthening of farmer organizations to facilitate farmers access to essential services		
• Encourage farmers to form groups for easier access to services and inputs capitalizing on their economies of scale. • Promote blended extension services e.g. Spray service providers (SSPs) providing market information. This could be through trainings by the competent authorities such as HCD. • Financial literacy & linkages (tripartite agreements e.g. among banks, farmers and exporters) and tailor made financial products (e.g. cold storage facilities asset financing) • Promote smart services e.g. digital financial services for example Digi Farm & Agri Wallet.	Number of farmers consistently/easily accessing essential support services.	

1.0 INTRODUCTION

1.1 Overview

UNIDO commissioned value chain analysis under the Market Access Upgrade Programme. The study focused on French beans and snow peas in 9 counties in Kenya. These are Machakos, Taita Taveta, Kajiado, Bungoma and Trans Nzoia Counties for French beans and; Taita Taveta, Nakuru and Trans Nzoia for snow peas. The study was undertaken by Tymax Agribusiness Solutions Ltd.

1.2 Study background and objectives

The EU in partnership with the EAC launched the Market Access Upgrade Programme (MARKUP) to support member countries improve market access of agro-food products to the EU and regional markets. The MARKUP is structured around two intervention levels: the EAC Regional Window and the Partner States National Window with country specific projects. UNIDO is the implementation partner for the Kenya-Partner States Window.

The main purpose of this project is to contribute to the economic development of Kenya by increasing the value of both extra and intra-regional agricultural exports in selected horticulture sub sectors; (snow peas and peas, mangoes, passion fruit, chilies, herbs and spices, nuts). Recent studies have analysed the reasons for low productivity and competitiveness in these value chains such as the need of specialized extension services and a diffuse lack of knowledge on appropriate good agricultural practices. These value chains for exports are also lacking compliance with market requirements and standards. National quality infrastructure is at advanced development stage including for conformity assessment services; however, some conformity assessment services are not yet fully recognized by the targeted international markets.

This project addresses these challenges through an intervention, and aims to:

- Improve the institutional and regulatory framework for better conformity assessment services in Kenya's horticultural sector;
- Increase revenue and MARKUP for Kenya's smallholder producers and enterprises in export-oriented horticulture sectors.

1.3 Approach and methodology

The consultants undertook the analysis through embedding a participatory approach with the involvement of UNIDO MARKUP team and respective stakeholders. Desk exploratory methods were used to review various documents/reports and other necessary literature relating to the targeted commodity value chain activities. Field data collection and focus group discussions were carried out by enumerators based at the respective counties and guided by the county government officials. The enumerators were trained online prior to data collection. The data was captured using ODK platform for effective and efficient data management after which it was analysed.

1.4 Study area

The study areas were as shown in Table 1:

Table 1: Study areas

No.	*Value chain*	*Location of Producers*	*Location of Exporters*
1	French beans	Machakos, Taita Taveta, Kajiado, Bungoma and Trans Nzoia Counties	Target counties and Nairobi
2	Mango	Taita Taveta, Nakuru and Trans Nzoia	Target counties and Nairobi

2.0 FRENCH BEANS VALUE CHAIN

2.1 Macro environment

2.1.1 Value chain description

Figure 1: French beans

French beans, also known as French beans is scientifically referred to as ***Phaseolus vulgaris***. It belongs to Fabaceae family. Fine bean is an herbaceous plant grown across the globe and commonly consumed as unripe fruit. The ancestors of French beans are native to South and Central Americas. Around 16th century, French beans was introduced to France by the Conquistadors but it was until 19th century, when the French made the bean a household vegetable, the name Haricot Verts ultimately branding the bean as French indefinitely.

Currently, French beans is grown in many countries including Netherlands, Guatemala, United States, France, Spain, Morocco, Kenya and Senegal among others. In Kenya, French beans are grown mostly in warm-wet regions like Kirinyaga, Muranga, Machakos, Kiambu, Nakuru, Nyeri, some parts of Kajiado, Uasin Gishu, Trans Nzoia, Bungoma and Taita Taveta. With irrigation, French beans can be grown throughout the year. There are several varieties of French beans which have different colours, ranging from green, yellow and purple. The commonly grown varieties in Kenya include Samantha, Boston, Serengeti, Amy, Belcampo, Julia, Paulista, Rexas, Lomami, Hawaii, Morgan, Pekera, Picasso, Buffalo, Tokai, Teresa, Gloria, Cupvert, Seagull and Espadia, among others.

2.1.2 Value chain actors and their role

The key actors along French bean value chain in Kenya includes producers (smallholders' farmers, medium and large scale farmers and producer organizations), aggregators and transporters (traders and associations), processors (who also act as exporters), importing agents, wholesale and retailing (Supermarkets, wholesale stores and digital platforms), consumers, influencers and supporting institutions/facilitators (Table 2). The key influencers are the county governments, A.F.A. - HCD, the Kenya Bureau of Standards (KEBS), the Ministry of Industry and Trade, and the Ministry of Agriculture and Cooperatives and the Kenya Plant Health Inspectorate Services.

Table 2: French beans value chain actors and their role

	Value chain node	Actors	Role
Direct actors	Consumer	Consumers	• Buy from producers, local markets & supermarkets for consumption
	Wholesale & retailing	Traders, supermarkets, wholesale & retail stores, digital platforms	• Share planting programs • Buy from producers & aggregators and sell to consumers

	Value chain node	Actors	Role
	Import	Importing agents (for the international markets)	• Imports from diverse regions and distributes to wholesalers and retailers
	Export	Freight agents & airlines	• Exports logistics
	Processing	Exporters	• Source raw materials, process at either company owned or leased facilities and markets in the local, regional and international markets
	Aggregation & transportation	Aggregators/traders & producer organizations	• Aggregates produce from producers, stores at collection centres and transports or distributes to exporters, wholesalers and retailers.
	Producers	Smallholder farmers and medium scale plantations	• Production
	Input supply	Manufactures/importers, distributors, agro dealers/stockists	• Sell inputs to producers and where possible provide advisory services.
Support system	Facilitators	National and county governments ministries and departments; competent authorities (A.F.A., KEPHIS, KEBS); Business associations (such as FPEAK, FPC, KAM); Financial institutions (Banks, SACCOs); Packaging materials suppliers; utility providers; research and learning institutions (Universities, ATVETs); private service providers (e.g. SOCCA); development organizations; certification bodies (GLOBAL GAP)	• Regulation and policy making • Support services to actors along the chain (such as extension services, financial access)

Source: Survey findings

The planting programs guide production where in a case of contractual agreement between an exporter and producer organizations, the market requirements flows as in Figure 1:

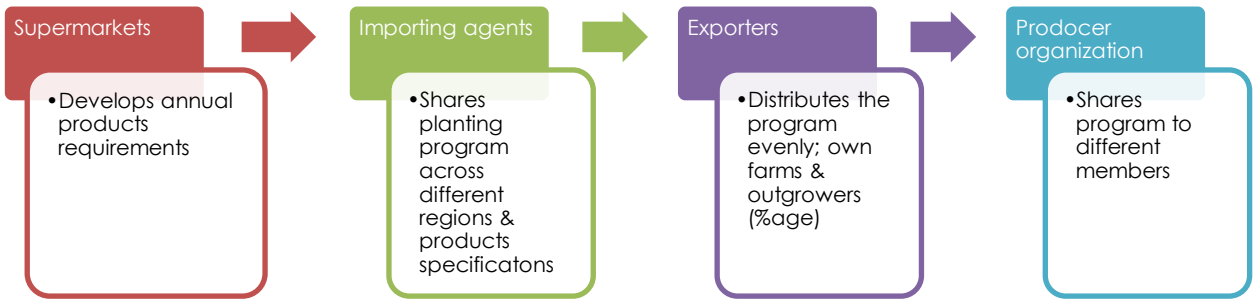


Figure 2: French beans planting programs guide

Source: Survey findings

2.2 Demand analysis

2.2.1 Competitiveness of the value chain Fresh French beans

Kenya exported 34,670 tons of French beans at a unit value of 2,224 Euros per ton in 2019 (ITC). Kenya has shown a 24% growth in value of exports in the last 2 years and a 2% annual growth in quantities between 2015 and 2019(Figure 3). Kenya exports the majority of its French beans to the EU market. The UK accounts for 37% of Kenya market share of French beans while others include France (26%), Netherlands (17%), Belgium 6% and Germany 2%. Kenya also exports French beans to the Middle East and Asia that is UAE, Hong Kong and China. Africa countries where Kenya exports to include: Congo, SA and Tanzania.

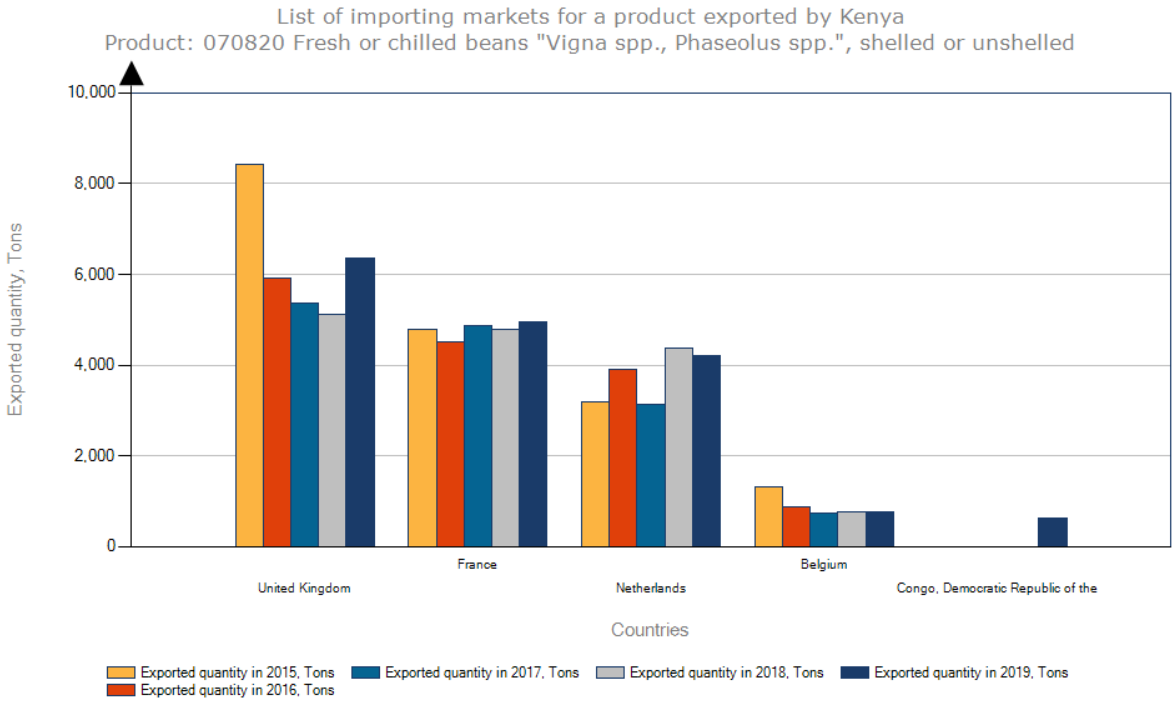


Figure 3: Importing Markets for Fresh French bean exported by Kenya in 2019
Source: ITC

2.2.2 Market requirements and operating environment

A major challenge for French bean farmers in Kenya is to meet the regulatory requirements of various importing countries. These market requirements vary from country to country and they are updated regularly as per the HS and NTM product specification thus making it to be a major challenge. For example, to access the European French bean market, there are about 50 non-tariff requirements/measures that needs to comply with. These measures are grouped as follows; A12 - Geographical restrictions on eligibility; A13 - Systems approach; A14 - Authorization requirement for SPS reasons for importing certain products; A15 - Authorization requirement for importers for SPS reasons; A21 - Tolerance limits for residues of or contamination by certain (non-microbiological) substances; A22 - Restricted use of certain substances in foods and feeds and their contact materials; A31 - Labelling requirements; A33 - Packaging requirements; A41 -

Microbiological criteria of the final product; A42 - Hygienic practices during production related to SPS conditions; A63 - Food and feed processing; A83 - Certification requirement; A84 - Inspection requirement; A85 - Traceability requirements; A851 - Origin of materials and parts; A852 - Processing history; A853 - Distribution and location of products after delivery; B31 - Labelling requirements; B32 - Marking requirements; B7 - Product quality, safety or performance requirement;B84 - Inspection requirement; E1 - Non-automatic import-licensing procedures other than authorizations covered under SPS and TBT chapters; E125 - Licensing for the protection of public health.

While there are multiple market requirements, the study focused on GLOBAL GAP certification which is a key export requirement. Of the farmers interviewed, only 22% of farmers were GLOBAL GAP certified limiting access to international markets. To improve export volumes, there is need to have more farmers GLOBAL GAP certified.

2.2.3 Competition

Kenya's share of the world French beans market is 5.8%. Kenya is facing a strong competition from French beans producing countries with the following shares in the world market Morocco (18.8%) Netherlands (11.1%), Guatemala (9.8%), USA (8.4%), France (6.5%), Mexico (8.4%) and Spain (8%).

Locally, French bean production is negatively affected by factors like inadequate access to quality inputs (use of certified seeds), climatic factors, markets and seasonality in marketing. Other key obstacles to the sectorial development includes traceability challenges. The study revealed that traceability is still relatively low in Kenya with only 33.68% of the farmers reported keeping traceability records. Therefore, in order to compete effectively farmers, need to observe good agricultural practices and the regulators need to demonstrate effective control along the entire supply as proof of compliance to SPS/food measures – which is a global norm.

2.2.4 Marketing and trade

The study revealed that the average price for French beans was KES 54.66 per kg. About 57% of the farmers sold their produce through brokers followed by directly to exporters at 22% and through producer group at 21%. While brokers aggregated above 50%, selling through producer groups and directly to exporters is a step in the right direction that will contribute towards enhanced compliance to food safety standards.

With an overall yield of 1,790 Kg per acre against a potential of 4,500 Kg, the average income per acre per season was KES. 90,548. As highlighted in 2.2.2, low GLOBAL GAP certification has limited access of Kenyan French beans to the international markets as most of the farmers are non-compliant to the market standards.

2.2.5 Key market growth potential; unmet market demand

There are some countries with untapped export potentials for French beans.

Fresh beans; According to ITC export potential data, the biggest potential is in Netherlands, United Kingdom and United States of America. Netherlands shows the largest absolute difference between potential and actual exports in value terms, leaving room to realize additional exports worth $9.5 MN. United Kingdom is the market with the highest demand potential (Figure 4).

Frozen beans: The markets with greatest potential for Kenya's exports of frozen beans (071022 Beans "Vigna spp., Phaseolus spp.", frozen) are United States of America, Tanzania, United Republic of Tanzania and Japan. Kenya has closest export links with Tanzania. United States of America is the market with the highest demand potential (Figure 5).

There is need for Kenya to explore the frozen beans markets especially to the United States of America and Japan which have high demand potential.

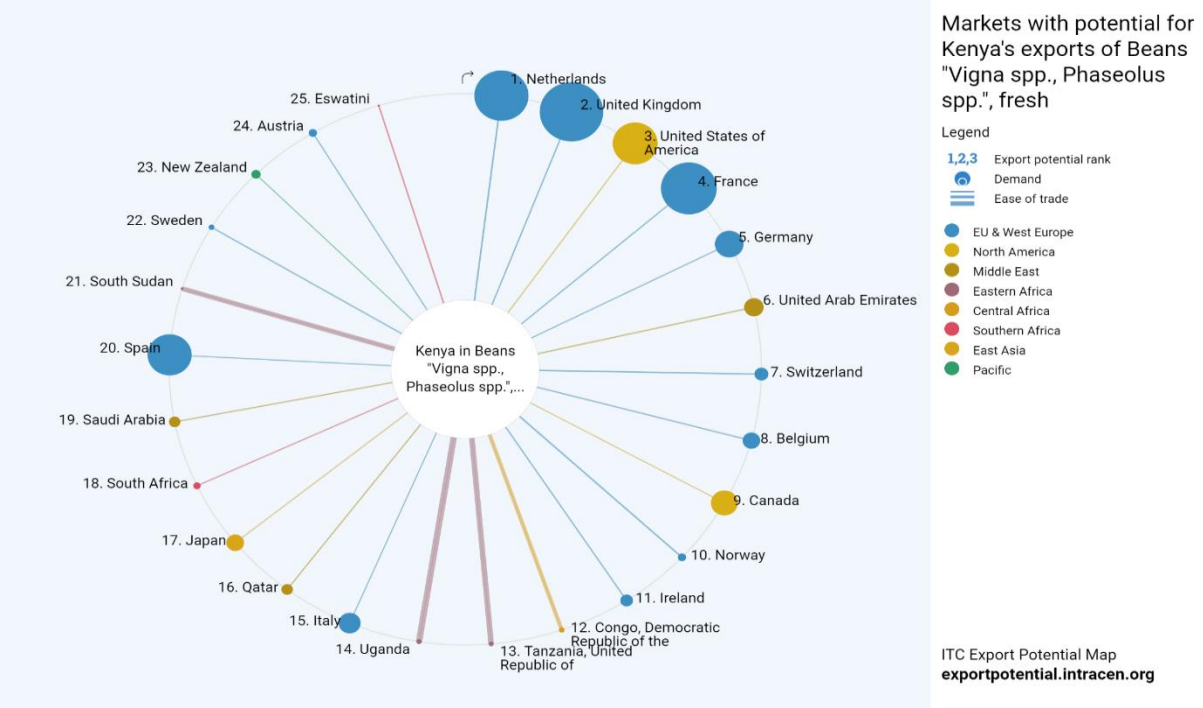


Figure 4: Fresh beans export potential
Source: ITC

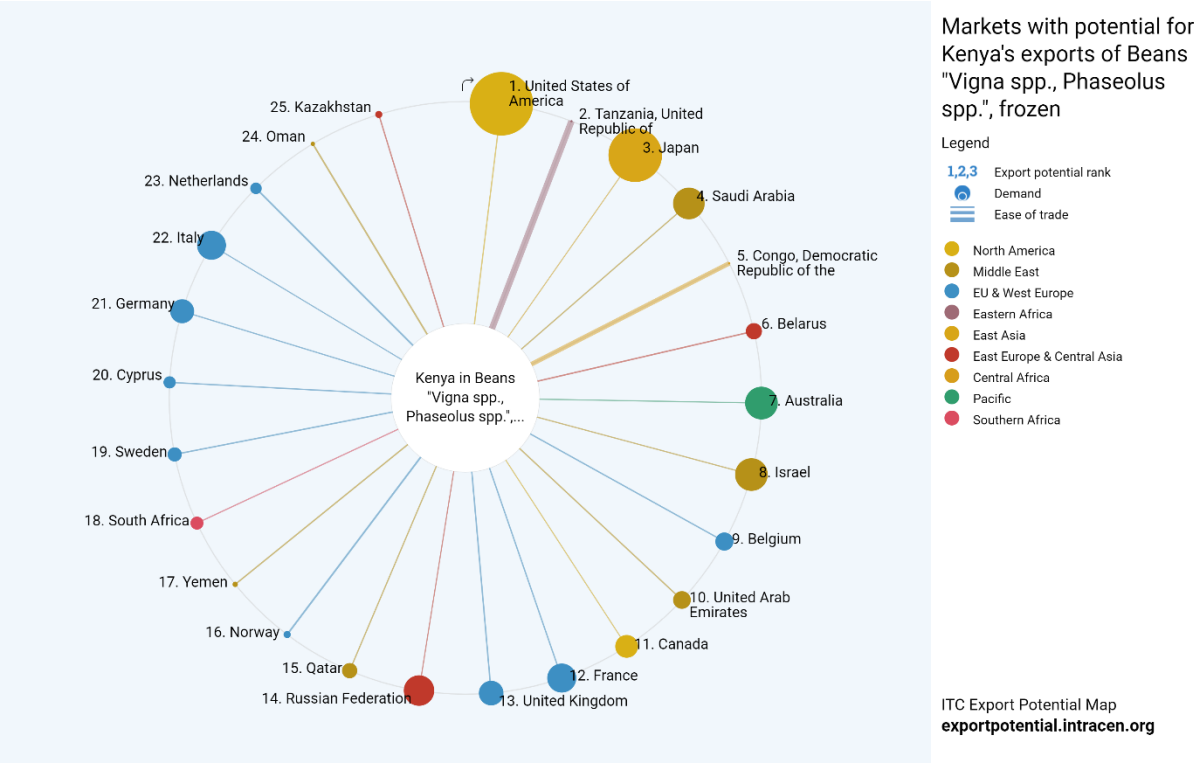


Figure 5: Frozen beans export potential

Source: ITC

2.3 Supply chain analysis

2.3.1 Demographic characteristics

Age

The study results showed that the overall average age of the household decision makers in French beans production is 44 years across Machakos, Taita Taveta, Kajiado, Bungoma and Trans Nzoia Counties. The results showed that Bungoma county had the highest average of the household decision maker (49 years) followed by Machakos (48 years), Trans Nzoia (45 years) then Taita Taveta (44 years) and lastly Kajiado (38 years). This implies that in Kajiado French beans farming is majorly practiced by young farmers as compared to the other four counties.

Household size

The study also revealed that majority of the households have at least five members with Bungoma county having the largest household size (7 members) as compared to Trans Nzoia (6 members), Machakos (5 members), Taita Taveta (5 members) and Kajiado (3 members). The study further divided the household members into two major categories. That is those members under 18 years and those above 18 years. From the study, it was revealed that both Bungoma and Trans Nzoia farmers have at least 3 members each who are below 18 years. The remaining counties that are Machakos, Taita Taveta and Kajiado each household reported 2 members each who are below 18 years of age. It is evident that each household has more members who are above 18 years of age, this could be considered as a bank of manpower to drive the production of French beans in the sub-counties.

Main decision maker

The study sought to establish the key decision maker in terms of time spent in their main occupation. Across the five selected counties, main decision makers in French bean production are those individuals who spend much time farming (52.43%) followed by casual workers and self-employed individuals at 17.36% and 15.97% respectively. Apart from the main three categories for decision makers, the results also revealed French beans farming decisions are also made by private sector employees, housewives, unemployed and public sector employees at 5.56%, 4.51%, 2.08% and 1.39% respectively. The study further revealed that even students and those "stay home men" also had a chance to make a decision on French bean production at 0.35% each. From the findings, it is evident that individuals who operate as farmers are the key decision makers. This could imply that by spending much time in farming, one is able to learn agronomic practices over time.

Education level

Education levels are a critical aspect for consideration especially when evaluating several alternatives. Due to this, the study sought to understand the educational level for various household heads across the selected counties. The results revealed that most (61.46%) French beans farmers attained secondary form four level. 23.61% of the farmers who were interviewed (288) had between primary standard 8 or secondary between forms 1 to 3. Only 5.9% of the French beans farmers have attained college or higher levels of education. However, approximately 9.02% farmers had attained primary standard 7, Primary standards 1 to 6, pre-school or none at 4.86%, 3.47% and 0.69% respectively.

2.3.2 Production

There is a gradual shift from overreliance of smallholder farmers to more medium scale and in-house growing by exporters to enhance food safety in line with market requirements. Despite this, smallholders play a critical role in French beans production. The majority of farmers across the five surveyed counties have been producing French beans for an average of 5 years at the time of this survey.

The average total land size in operation amongst the French bean farmers across the surveyed counties currently stands at about 4.3 acres per farmer with approximately 3.3 acres under agriculture. Households in Trans Nzoia County have the highest (5.97 acres) land under operation followed by Bungoma county and Kajiado County closely at 5.84 acres and 5.24 acres respectively. Farmers from Machakos county and Taita Taveta counties still operate small land sizes of about 2.11 acres and 1.65 acres respectively. Compared to the other three counties (Kajiado, Bungoma and Trans Nzoia) potential for expansion of French beans production is low in Machakos and Taita Taveta.

Out of the total land size under operation across the counties, farmers in Trans Nzoia have allocated up to about 4.90 acres for general agriculture of which out of this about 4.23 acres is under crops. In Bungoma County, out of the entire land under operation, about 4.32 acres is under general agriculture with specifically about 3.99 acres under crops. In Kajiado County, the land under general agriculture stands at 3.71 acres with approximately 3.29 acres under crops. Out of the 1.72 acres under which Machakos farms does agriculture, approximately 1 acre was dedicated to crops. Farmers in Taita Taveta allocated almost the whole land under agriculture (1.11 acres) to crop farming (1.04 acres). Farmers reported to grow French beans in both rented in land and own land.

Due to the small pieces of lands available, farmers needs to diversify in order to increase the production especially in Machakos and Taita Taveta. This is evident from the study findings as most (94.92%) of Taita Taveta farmers incorporate fruit trees in their farms to increase the productivity of the small farm portions. Likewise, in Machakos County, about 55.77% of the land is covered by permanent fruit trees. Farmers in Kajiado, Bungoma and Trans Nzoia reported 26.09%, 24% and 20.69% respectively as the land under permanent fruit trees. This could be attributed to farm mechanization in those regions.

Table 3: Land under French beans production

Land (acres)	***Machakos***	***Taita Taveta***	***Kajiado***	***Bungoma***	***Trans Nzoia***	***Overall***
Total land size operated	2.11	1.65	5..24	5.84	5.97	4.31
Land under French bean production	0.27	0.40	2.88	0.36	0.55	1.03

Source: Household survey findings

The study further narrowed down to establish potential for expansion of French beans production. In doing so, the study sought to establish the total land under agriculture versus the land size currently under French beans production. The study revealed that out of the total land under agriculture (3.29 acres), on average, about 1.03 acres is occupied by French beans (Table 3). In Kajiado County, out of the available land under agriculture (3.71 acres), about 2.88 acres is under

French beans. Other four counties had less than 1 acre covered by French beans. Trans Nzoia county farmers allocated about 0.55 acres of the 4.9 acres agricultural land to French beans followed by Taita Taveta County with 0.4 acres out of 1.11 acres under agriculture. Bungoma county farmers has only practiced French beans farming on 0.36 acres out of the available 4.31 acres' agricultural land and then lastly Machakos county with 0.27 acres of French beans out of the 1.72 acres' agricultural land. From the survey findings, it is evident that there is room for expansion of French beans farming in the surveyed regions especially in Bungoma County.

Crop protection and nutrition

Crop protection entails a range of activities which ensures that crop pests and diseases are managed. The study focused on understanding how French beans farmers protected their crops in order to ensure maximum productivity is achieved while enhancing food safety. Regardless of the type of agro chemical used, the time of application of the chemical is very important as it determines the effectiveness of the chemicals used. The findings revealed that in overall, most (76.74%) of chemical application decisions are made after scouting. All farmers from Machakos and Taita Taveta make chemical application decisions after scouting. In Bungoma, Kajiado and Trans Nzoia, 52%, 52.17% and 82.76% of the interviewed farmers respectively do the agrochemical application after scouting. Approximately 20.83% of the agrochemical applications are made by following the chart. Only 47.83% of Kajiado farmers, 42% from Bungoma and 10.34% from Trans Nzoia follow the chat. 6% of Bungoma farmers and 6.9% of the Trans Nzoia farmers constitute the overall 2.34% of the farmers who apply agrochemicals after the time period.

Other aspects which farmers need to put in consideration while buying chemicals they use in protecting their crops includes the expiry dates, packaging, product labels and if the chemical is among the approved or recommended agrochemicals and the right suppliers. The study revealed that most (88.19%) of the farmers across the surveyed counties ensure that the chemicals they buy and use for crop protection are not expired. This is commonly observed amongst all (100%) Kajiado farmers followed by 96.61% of Taita Taveta then 96.15% of Machakos and 78% of Bungoma farmers. Only 67.24% of Trans Nzoia farmers confirm that they do not buy expired chemicals. Most (93.75%) of the interviewed farmers ensure that the chemicals they buy are packed in a sealed container. This was common amongst all (100%) Kajiado farmers. Out of the total interviewed farmers, 98.08% from Machakos, 94.92% from Taita Taveta, 92% from Bungoma and 82.76% from Trans Nzoia were buying chemicals packed in sealed containers.

On crop nutrition, farmers have adopted use of compost manure and soil testing before planting. The highly (21.18%) adopted technology was compost manure as materials were readily available, affordable and easy to make. Bungoma County led in the use of compost manure at 42% followed by Trans Nzoia at 39.66%. Farmers in Machakos, Kajiado and Taita Taveta also used compost manure at 17.31%, 8.7% and 3.39% respectively. There is very low (9.72%) soil testing especially before planting. Bungoma County led in soil testing followed by Trans Nzoia at 20% and 15.52% respectively.

To access both local and international markets, farmers need to follow G.A.P. These good agricultural practices are observed in terms of amount and type of chemicals used. Above all, these chemicals need to be listed in the approved agrochemicals and from approved suppliers.

Access to agricultural Inputs

The low (26.39%) membership to any crop farmer organization was also evident in farm input access. The study revealed most (92.71%) of the farmers' access farm inputs individually, an indicator of low collective action amongst farmers. This was observed in Machakos, Taita Taveta and Bungoma where all (100%) farmers access farm inputs individually. Kajiado and Trans Nzoia reported individual cases of input access at 73.91% and 94.83% respectively. Economically, it implies that farmers are not enjoying the benefits of pulling resources together and bargaining power for a bigger voice. Despite the poor group membership earlier observed in Kajiado County and Trans Nzoia County, they are the only few who access farm inputs collectively at 26.09% and 5.17% respectively representing the 7.29% of the overall farmers who access farm inputs collectively.

Use of farming technology

French bean farmers use both certified and recycled/second generation seeds. Approximately 60% of the farmers used certified seeds for production. All Kajiado County farmers and about 97% of Taita Taveta French bean farmers reported to have adopted the use of certified seeds. The adoption rate was slightly low in Bungoma, Trans Nzoia and Machakos. This is attributed to inadequate access to certified seeds in terms of affordability and availability. Since French beans are open-pollinated, therefore, the use of recycled seeds is still productive thus some farmers opt for secondary generation seeds as a cost cutting strategy. The germination rate of the recycled/second generation seeds nevertheless is lower (74%) compared to that of the certified seeds (96%). In general, certified seeds had above 90% germination rate except in Taita Taveta where farmers reported 87.88% germination rate. Due to the low germination rate reported for the recycled seeds, farmers should be encouraged to use certified seeds to increase crop population.

The land was prepared either manually (45.83%), tractor-drawn (53.47%), animal-drawn (0.35%), or through minimum tillage (0.35%). Farmers depended on manual labor for planting.

Water management

Approximately more than half (58%) of the Kenya's French bean are grown under rain-fed agriculture. The study findings revealed that only 42% of the farmers use irrigation which varied significantly across the surveyed counties. Out of these, 3% had obtained WRMA license. Apart from rain fed water, French bean farmers also depended on other water sources like river/lake (39.24%), borehole (5.9%), rooftop harvested rainwater (2.08%) and stream (1.04%.) Kajiado County led in both adoption of irrigation technology (97.1%) followed by Taita Taveta County at 88.14%. However, rare case of irrigation was reported in Bungoma County and Trans Nzoia County as 2% and 1.72% of farmers respectively reported to have produced French beans under irrigation. The low adoption of irrigation technology could be one of the contributing factors of low yields.

2.3.3 Harvesting, yield and post-harvest management

Farmers manually harvest the beans.

Current yield per Acre

French beans farmers reported an average yield 1,790 Kg per acre. This is against a potential of 4,500 Kg per acre. Kajiado farmers reported the highest (3.69 tons per acre) productivity compared to the other counties.

Post-harvest management

The farmers reported a post-harvest loss of 7.4% at farm level. Among the contributors to post-harvest losses includes lack of proper storage facility. The study therefore sought to establish how farmers stored their French beans before selling. Majority of producers lose their produce to lack of storage facility after harvest and during transportation to the market. Among storage facilities used are open and closed stores, cold room or left open in the field (Table 4). Use of open store was the most common (44.1%) followed closely by just leaving in the open field (no store) at 30.9% and then closed stored (15.97%). Leaving the product on the road, cool room and charcoal cooler were also used by some farmers. Open store was common in Taita Taveta (100%), Trans Nzoia (56.9%) and in Bungoma (54%). Most farmers in Kajiado (73.91%) and Machakos (57.69%) left their produce in the field as they had no stores.

Table 4: Type of store used by French beans farmers

Type of storage	***Machakos***	***Taita Taveta***	***Kajiado***	***Bungoma***	***Trans Nzoia***	***Overall***
Open store	3.85	100	8.7	54	56.9	44.1%
Close store	0	0	15.94	36	29.31	15.97%
In the field (no store)	57.69	0	73.91	4	10.34	30.9%
On the road	38.46	0	0	0	1.72	7.29%
Charcoal cooler	0	0	0	4	0	0.69%
Cool room	0	0	1.45	2	1.72	1.04%

Source: Household survey findings

2.3.4 Processing

Fresh beans: The exporters are located both within the project target counties (such as Vert Fresh Limited in Machakos) and within Nairobi metropolis. There has been a gradual shift of processing facilities from the Nairobi metropolis to areas closer to producing regions such as Naivasha in Nakuru County. While this is aimed at reducing operating costs, the move also positively contributes to improvement of processing yield which is an average of 80%.

Processed (frozen) beans: There are 2 leading processors in Kenya. One of the key actor interviewed was Meru Greens whose processing facility is in Kajiado County. Currently processing is averaging 50% of total market demand as a result of limited supply of produce from farmers mainly smallholder farmers which the companies target.

2.3.5 Exports operations

Exporters indicated they heavily rely on JKIA to export their consignments. While COVID 19 had at the onset of the pandemic led to sharp increment of freight costs, the freight costs are usually as high as an average of 40% of the sales price. This is an area that requires intervention. Processed beans are shipped using the Mombasa sea port to countries such as France, Belgium & Germany.

2.3.6 Institutional arrangement and access to support services

Group Membership

Membership to any crop farmer organization is still low. Study results revealed that a majority (73.61%) of farmers do not belong to any crop farmer organization. The findings further revealed that only 26.39% of the farmers belong to a crop farmer organization with Machakos farmers constituting the highest (69.23%) of all the interviewed farmers followed by Taita Taveta farmers (47.46%). However, Trans Nzoia, Kajiado and Bungoma reported poor group membership at 8.62%, 7.25% and 4% respectively. For the sake of social networking, the study also sought to establish if the farmers also belong to other social groups. It was found that only about 33% of the farmers belong to other groups which was common in Machakos farmers (75%) and Taita Taveta farmers (69.49%). Kajiado County, Bungoma County and Trans Nzoia County all are badly placed in terms of group membership both for crop farmer organization and other social groups. Only 7.25% belongs to crop farmer organizations and 4.35% belongs to other social groups. The low group membership was also observed in Bungoma (4% and 12%) and Trans Nzoia (8.62% and 10.34%) for crop farmer organization and other social groups respectively. This implied that there is potential to enhance group membership for faster and better dissemination of agricultural related information amongst farmers.

Credit Access

The study revealed a big portion (80.90%) of farmers had little access to credit. Taita Taveta had relatively the highest (37.29%) of farmers who had access to credit compared to Kajiado county (26.09%), Machakos county (23.08%), Bungoma (4%) and Trans Nzoia county (1.72%) all representing the overall 19.1% credit access. This implies that financial power for the enterprise expansion is still very low amongst farmers. This also indicates that there is a lot of potential for growth of financial credit services to farmers across the surveyed regions. Hence it is critical to expose the farmers to as many as possible credit facilities.

Training and extension

Capacity building is one method of upgrading a community out of poverty. This can be achieved through active training and extension services. The study sought to understand the level of access to training services and the extension contacts amongst farmers. The findings revealed that in overall, 67.71% of the farmers have accessed agricultural training services. This constituted about 95.65% of the interviewed farmers in Kajiado, 76.27% of the interviewed Taita Taveta farmers, 66% in Bungoma, 48.08% in in Machakos and 44.83% of the interviewed Trans Nzoia farmers. Those who had received the training services reported to have attended at least 4 training sessions in the last one year.

Farmers in Kajiado county reported the highest (7) training sessions as compared to Taita Taveta (4 sessions), Machakos 3 sessions. Farmers from both Bungoma and Trans Nzoia counties managed 2 training sessions each. To ensure the technologies, innovations and management practices obtained in the training sessions are put in place, constant extension follow up is key. The study therefore further sought to establish how frequent the farmers were receiving extension services. This was measured in terms of extension contacts with the extension offices. Irrespective of the source, the survey revealed that in a span of the last 12 months, at least each farmer has been in contact with extension experts 1.36 times. It is evident that there is still much more potential for further dissemination for both training and extension services amongst farmers across the five regions.

2.3.7 Margin analysis across the supply chain

The farmers sell their produce at an average of KES 55.66, exporters reported buying the beans at between KES. 60-100 to both farmers and aggregators. The average selling prices at the export market is KES 280.

2.3.8 Environmental analysis

The majority of farmers agreed that enhancing the environment improves climatic conditions that lead to food availability, rainfall, and safe and healthy lives and livelihoods.

2.3.9 Gender analysis

Females (both family members and hired) dominates the production of French beans across Kenya specifically. From the survey findings, women specifically are involved in production (planting, weeding, harvesting). On the other hand, chemical application was majorly pre-dominated by men both from the family and those hired. This calls for the need for men empowerment and to do so, funding, mentoring, training and sensitization were identified as the fundamental strategies.

2.4 Value chain upgrading strategy recommendations.

Table 5 below summarizes key value chain opportunities and constraints with respective recommendations (inclusive of specific activities) and key performance indicators.

Table 5: Key value chain opportunities and constraints in French beans

Opportunities and constraints	***Recommendations and activities***	***Key performance indicators (KPIs)***	***County specific priority areas***
1. Marketing	**Certification and market linkages to increase quality and quantity.**		
Untapped markets; *while the French beans is a mature market in Kenya, there are untapped market for both fresh and frozen French beans.* *According to ITC export potential, the biggest potential for fresh beans is in Netherlands, United Kingdom and United States of America while United States of America, Tanzania and Japan have greatest potential for the frozen beans.*	• Support exporters to review and optimize new markets opportunities especially the frozen French beans market in the USA and Japan. • Support exporters to enhance compliance and optimize production and processing capacity to competitively exploit the fresh French beans markets in the Netherlands, UK and USA.	• Increase of regional, international trade volume for French beans of targeted farmers and enterprises.	
Compliance to market requirements (standards): *only 22% of farmers interviewed are GLOBAL GAP certified limiting access to international markets.*	• Farmer trainings on GAP (GLOBAL GAP); Integrated Pest Management, Biological Control of Pests. • Promote groups certification under GLOBAL GAP option 2. • Link farmers to certifying agencies. • Traceability: strengthen/upgrade the traceability system to reflect market needs.	• Percentage increase in number of GLOBAL GAP certified French beans farmers participating in the international markets	
Marketing channels and income*; While brokers aggregated approximately 57% of produce, selling through producer groups (21%) and directly to exporters (22%) is a step in the right direction that will contribute*	• Support formation and or strengthening of producer groups for produce aggregation and collective marketing to improve farmer bargaining power and compliance to market standards	• Percentage increase of farmers having signed supply agreements directly with	• Kajiado (Price) • Machakos (Price) • Taita Taveta (prices)

towards enhanced compliance to food safety standards. *The average selling price per kg at farm level is KES. 54.66 with an average income of KES. 90,548 per acre.*	• Support direct farmers (directly or through their organizations) contracting by exporters.	exporters and complying to market standards • Percentage increase in income per acre	
2. Production	**Productivity, quality and food safety; target to increase productivity (yield per acre) and food safety through:**		
The overall yield is 1,790 Kg against a potential of 4,500 Kg per acre. Overall area under French beans per farmer being 1 acre out of 4.3 acres operated by the households. Some of the key constraints leading to low yield and quality includes: • *Use of recycled/second generation seeds by about 40% of farmers. This is as cost cutting strategy by the farmers and limited availability of and access to quality seed within reach of the farmers. The germination rate for 2nd generation seeds averaged 74%.* • *Low uptake of good agricultural practices negatively affecting productivity and food safety (e.g. soil testing at only 9.7%)* • *Limited land under crop* • *Low uptake of smart water solutions and limited irrigation systems & reliance on rain fed production; only 42% of farmers irrigate throughout the growing cycle*	• Accelerate uptake of good agricultural practices and improved access to, demand & effective use of certified inputs and smart farming technologies (through training in farmer field schools, extension services, collective input purchase by farmers & financial access as highlighted in 4 below). • Build farmers' entrepreneurial capacity to run French beans production as a business adopting market driven production. Demand should guide development of planting calendars to support consistent production. • Work with competent authorities and county governments for policy/regulation formation and enforcement such food safety policy.	• Percentage increase in production of safe, quality French beans (yield) per acre	• Bungoma (Yield and quantities) • Machakos (yield and quantities) • Taita Taveta (yield) • Trans Nzoia (quantities)
3. Harvesting, post-harvest management and processing	**Effective and efficient post-harvest management**		

On average 7.4% of French beans are lost at farm level. This is mainly due to: • *Unavailable/poor storage facilities, limited access to grading/pack house facilities & poor postharvest handling practices* *Processing yield at the pack houses averages 80%.*	• Identify & support investment opportunities to address postharvest spoilage such as recommended cold storage facilities at farmer level and pack houses at exporters' level. • Trainings of exporters on GHP, FSSC22000, ISO 14001; ISO 45001:2018, traceability, packaging & labelling	• Percentage reduction in post-harvest losses.
4. Institutional arrangement & access to support services	**Support formation & strengthening of farmer organizations to facilitate farmers access to essential services**	
Farmers mainly work individually limiting their bargaining power and access to essential services. *Only 26% of the farmers are members of farmer organizations. 93% of farmers individually source farm inputs.* ***Financial access;*** *19% of farmers have accessed finance despite 99% having access to mobile banking (mainly MPESA).* ***Extension services:*** *on average farmers had 1.36 contacts with extension officers per annum.*	• Encourage farmers to form groups for easier access to services and inputs capitalizing on their economies of scale. • Promote blended extension services e.g. Spray service providers (SSPs) providing market information. This could be through trainings by the competent authorities such as HCD. • Financial literacy & linkages (tripartite agreements e.g. among banks, farmers and exporters) and tailor made financial products (e.g. cold storage facilities asset financing) • Promote smart services e.g. digital financial services for example Digi Farm & Agri Wallet.	Number of farmers consistently/easily accessing essential support services.

3.0 SNOW PEAS VALUE CHAIN

3.1 Macro environment

3.1.1 Value chain description

Snow peas botanically referred to as ***Pisum sativum var. saccharatum***, belongs to the legume family (Fabaceae) which originated from Mediterranean then later spread to Europe in the 1800s.

Figure 6: Snow peas

Snow peas is among the commonly grown vegetables known for its tender edible pods. Botanically snow peas are a fruit but they are utilized today in the culinary world as vegetables. Snow peas is an annual crop grown under cool seasons across the globe. Snow peas are higher in vitamin C than any other type of peas. It provides 72 percent of the immunity vitamin C that the body needs daily. Apart from vitamin C, Snow peas also offers protein, carbohydrates, dietary fibre, vitamin K, potassium, magnesium and iron.

In Kenya, Snow peas is grown in Central uplands and lowlands, Rift Valley highlands and lowlands and Western Kenya's forested regions. Major snow peas-producing counties includes Meru, Nyandarua and Kiambu. These regions have the moderate temperature of 20 degrees Celsius, fertile soils and well distributed rainfall patterns that the plants need. This report focused on Taita Taveta, Nakuru and Trans Nzoia. There are many varieties of snow peas grown in Kenya. The main varieties are Kennedy, Oregon pod II, Oregon pod III, Golden sweet, Oregon Sugar Pod. Others include Cascadia and sweet horizon.

3.1.2 Value chain actors and their role

The key actors along Snow peas value chain in Kenya includes producers (smallholders' farmers, medium and large scale farmers and producer organizations), aggregators and transporters (traders and associations), processors (who also act as exporters), importing agents, wholesale and retailing (Supermarkets, wholesale stores and digital platforms), consumers, influencers and supporting institutions/facilitators (Table 6). The key influencers are the county governments, A.F.A. - HCD, the Kenya Bureau of Standards (KEBS), the Ministry of Industry and Trade, and the Ministry of Agriculture and Cooperatives and the Kenya Plant Health Inspectorate Services.

Table 6: Snow peas value chain actors and their role

	Value chain node	Actors	Role
Direct actors	Consumer	Consumers	• Buy from producers, local markets & supermarkets for consumption
	Wholesale & retailing	Traders, supermarkets, wholesale & retail stores, digital platforms	• Share planting programs • Buy from producers & aggregators and sell to consumers
	Import	Importing agents (for the international markets)	• Imports from diverse regions and distributes to wholesalers and retailers
	Export	Freight agents & airlines	• Exports logistics

	Processing	Exporters	• Source raw materials, process at either company owned or leased facilities and markets in the local, regional and international markets
	Aggregation & transportation	Aggregators/traders & producer organizations	• Aggregates produce from producers, stores at collection centres and transports or distributes to exporters, wholesalers and retailers.
	Producers	Smallholder farmers and medium scale plantations	• Production
	Input supply	Manufactures/importers, distributors, agro dealers/stockists	• Sell inputs to producers and where possible provide advisory services.
Support system	Facilitators	National and county governments ministries and departments; competent authorities (A.F.A., KEPHIS, KEBS); Business associations (such as FPEAK, FPC, KAM); Financial institutions (Banks, SACCOs); Packaging materials suppliers; utility providers; research and learning institutions (Universities, ATVETs); private service providers (e.g. SOCCA); development organizations; certification bodies (GLOBAL GAP)	• Regulation and policy making • Support services to actors along the chain (such as extension services, financial access)

Source: Study findings

The planting programs guide production where in a case of contractual agreement between an exporter and producer organizations, the market requirements flows as in Figure 7:

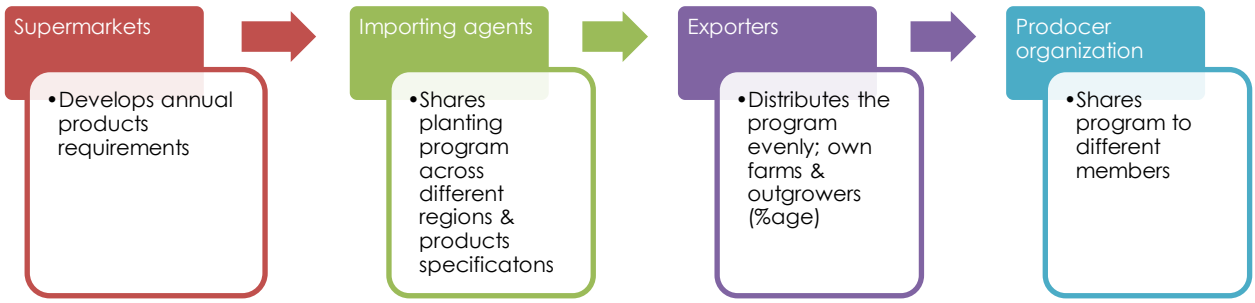


Figure 7: Contractual structure of the key actors along Snow peas value chain

Source: Study findings

3.2 Demand analysis

3.2.1 Competitiveness of the value chain

Most of Kenya snow peas is exported to the European markets. Netherlands imports about 30% of Kenya's snow peas while others include France (19%) and United Kingdom (9%). Kenya also exports snow peas to the Middle East and Asia that is UAE and Hong Kong. In Africa, Kenya also supplies Uganda and Tanzania (Figure 8).

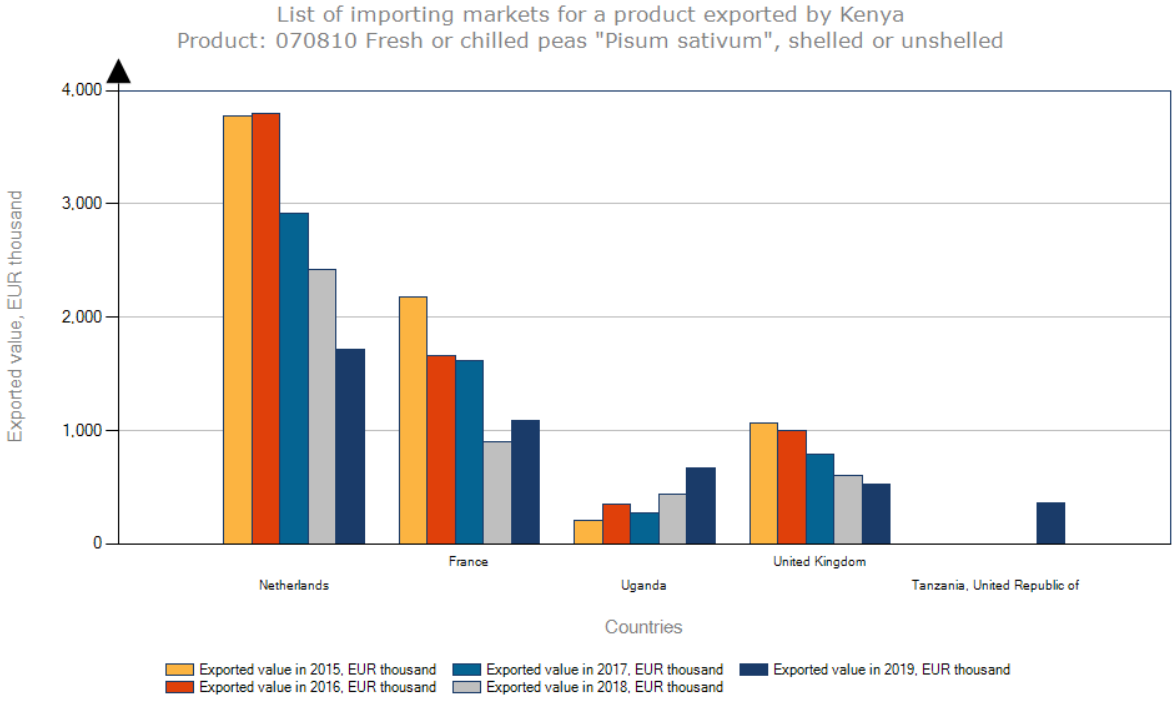


Figure 8: List of countries importing snow peas from Kenya
Source: Study findings

3.2.2 Market requirements and operating environment

While there are multiple market requirements, the study focused on GLOBAL GAP certification which is a key export requirement. Of the farmers interviewed, only 35% of farmers were GLOBAL GAP certified limiting access to international markets. To improve export volumes, there is need to have more farmers GLOBAL GAP certified.

Other key obstacles to the sectorial development includes traceability challenges. The study revealed that traceability is still relatively low in Kenya with only 28.35% of the farmers reported keeping traceability records. Therefore, in order to compete effectively farmers, need to observe good agricultural practices and the regulators need to demonstrate effective control along the entire supply as proof of compliance to SPS/food measures.

3.2.3 Competition

Kenya's share of the world snow peas is market 1.7%. Kenya is facing a strong competition from snow peas producing countries with the following shares in the world market Guatemala (18%), Netherlands (17.1%), USA (14%), Peru (8.2%), China (7.3%), France (7%), Mexico (4.1%), Belgium (3.2%) and Germany (2.6%). In Africa, Kenya is facing competition from Zambia, Ethiopia,

Zimbabwe, Egypt and Morocco. Kenya has not yet tapped about 46% of its potential to produce and supply snow peas to the world market.

3.2.4 Marketing

The key market outlets were brokers (58%) and producer groups (35%). All Taita Taveta farmers sold direct to exporters representing 7% of the total output sold (Figure 9). Table 7 that the average price for snow peas was KES 70 per kg. Trans Nzoia farmers received KES 71 per kg followed by Taita Taveta (KES 70) and Nakuru (KES 68).

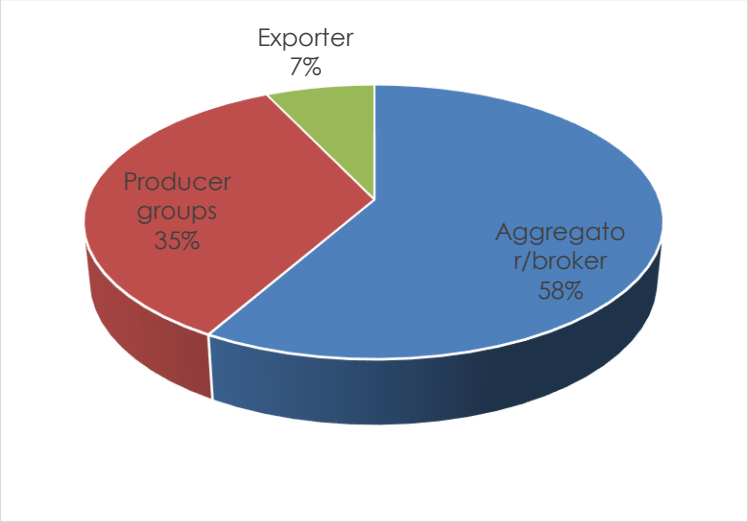


Figure 9: Snow peas marketing channels
Source: Household Survey findings

Table 7: Snow peas yield and pricing

	Taita Taveta	***Nakuru***	***Trans Nzoia***	***Overall***
Production (Kg/Acre)	1,172	905	3,238	2,263
Average selling price in KES per kg	70	68	71	70
Average income per Acre in KES	80,094	59,531	207,645	146,902

Source: Household survey findings

3.2.4 Key market growth potential; unmet market demand

Fresh/Chilled Snow peas

The five major markets with the greatest potential for Kenya's snow peas outside Africa are the United Kingdom, Netherlands, US and Canada. Kenya also has close export links with its neighbouring Africa countries. Two big importers are Uganda and Tanzania. The large trade link between Kenya and Uganda as compared to the rest of the world could be due to ease of trade as a result of less barriers (Non-tariff) and movement logistics. The European countries and North American has the biggest potential for the Kenya Snow peas market but are constrained by a high number of non-tariff requirements as shown in the (figure), the ease of trade (represented by the size of the lines)

Frozen Snow peas

Export potential for frozen snow peas is in the US, United Emirates Arabs, Saudi Arabia and China as shown in the figure 10.

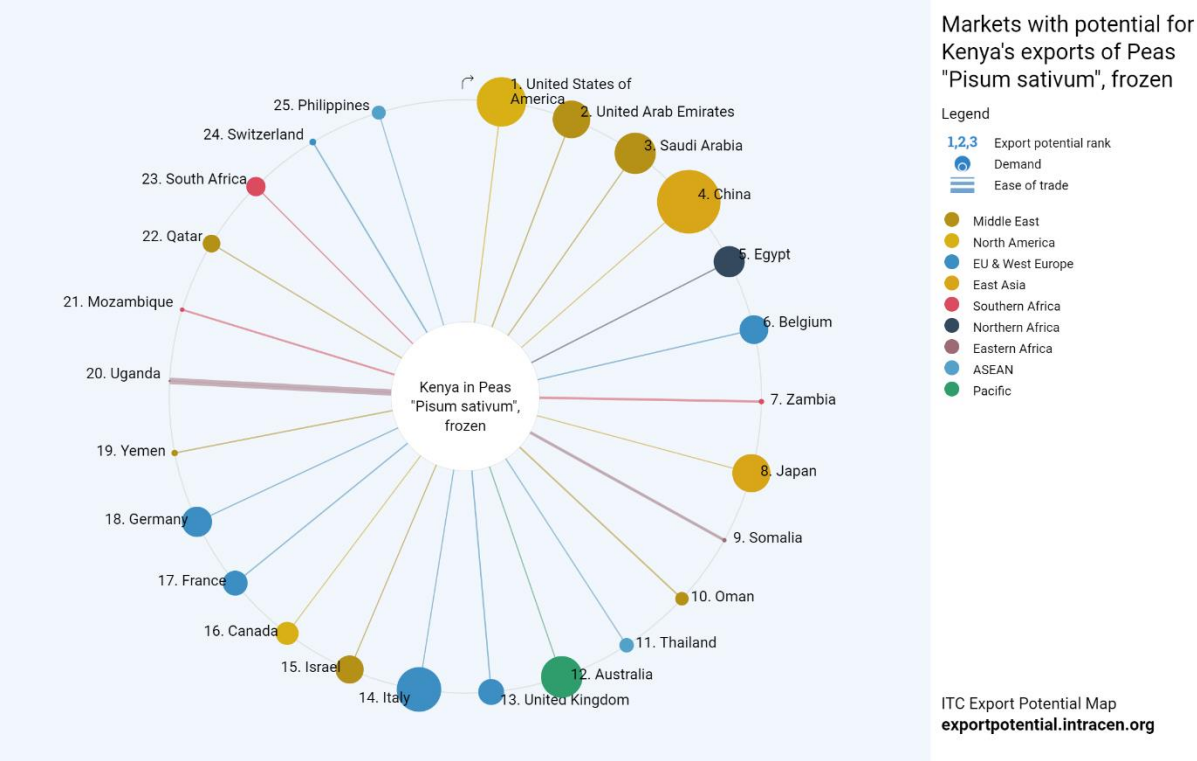


Figure 10: Kenya's snow peas export potential
Source: ITC

3.3 Supply chain analysis

3.3.1 Demographic characteristic

Age

The average age of the household decision makers in Snow peas production is 45 years. Taita Taveta farmers had the highest average of the household decision maker (50 years) followed by Nakuru (48 years) and lastly Trans Nzoia (44 years). This implied that in Trans Nzoia, Snow peas farming was being practiced by young farmers who are more energetic. The study also revealed that the majority of the households have at least five members. Farmers in Trans Nzoia county reported the largest household size (6 members) as compared to Taita Taveta (5 members) and Nakuru (4 members). The study disaggregated the household members into two major categories that is those members under 18 years and those above 18 years. From the study, it was revealed that at least 2 members in each house are below 18 years. This implies that at least three members from each house being above 18 years of age, this could be considered as a bank of manpower to drive the production of Snow pea.

Decision maker's main occupation

The survey established the key decision maker in terms of time spent in their main occupation. Most (59%) of the main decision makers on snow peas production spend much of their time farming which differed significantly across the country. The distribution of other decision makers was casual work or are self-employed or private sector employees at 18%, 17% and 1% respectively. Having farming as the main occupation enables an individual to learn some agronomic practices for respective value chain. Alternatively, dissemination of agricultural related information is easy amongst farmers.

Education level

Education level is a critical aspect for consideration especially when evaluating several alternatives. Due to this, the survey sought to understand the educational level for various household heads. It was revealed that most (96%) of the Snow peas farmers had attained primary education level of standards 1 to 6 and above. Out of the 96%, 9.3% of them have primary education level of between standards 1 to 6, 13% have standard 7 educational level, 29% of primary level of standard 8 or secondary level of between forms 1 to 3 has been attained by about 29% of the farmers across the three surveyed counties. The larger percentage (43%) had form 4 academic level while only 3% (2.33) of the farmers have college or higher levels. However, approximately 4% of the farmers had either pre-school level or no educational level which was common in Trans Nzoia County. Since most of the crucial agronomic practices are learnt from secondary levels, this could imply that most of the snow peas farmers stand a better chance of excelling in the value chain.

3.3.2 Production

In Kenya, Snow peas is grown in Central uplands and lowlands, Rift Valley highlands and lowlands and Western Kenya's forested regions. Major Snow peas-producing counties includes Nyandarua, Meru and Kiambu but the study majorly focused on 3 counties (Nakuru, Taita Taveta and Trans Nzoia).

These regions have the moderate temperature of 20 degrees Celsius, fertile soils and well distributed rainfall patterns that the plants need. There are so many varieties snow peas planted in Kenya. The main varieties are Kennedy, Oregon pod II, Oregon pod III, Golden sweet, Oregon Sugar Pod. Others include Cascadia and sweet horizon (Figure11).

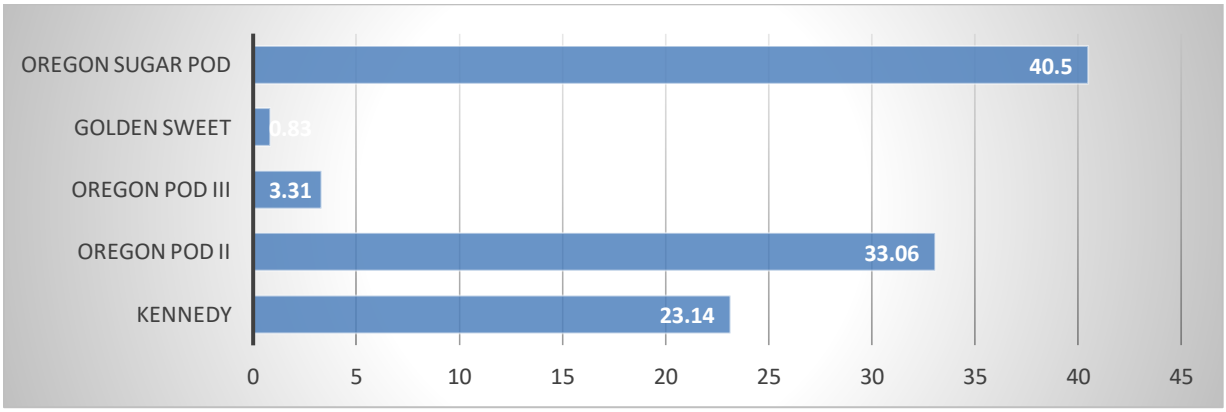
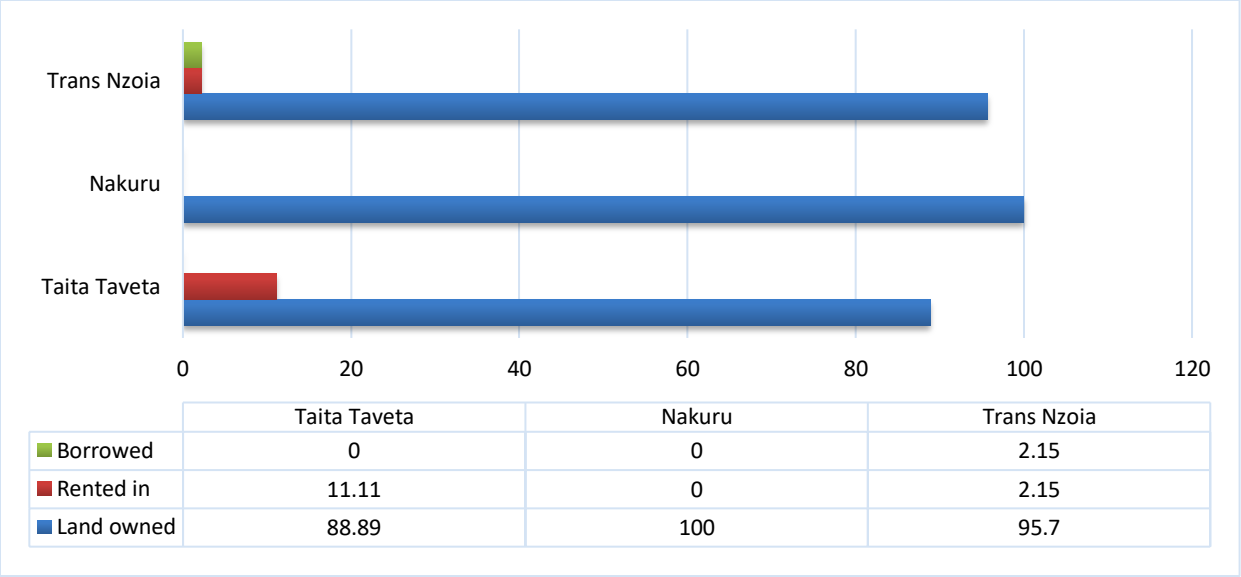


Figure 11: Snow peas varieties planted in Kenya

Source: Survey findings

Majority of the snow peas farmers in Kenya have been producing for an average of 2 years at the time of this survey. Most of the snow peas farmers were producing on their own land. Farmers reported to grow snow peas in rented in land, borrowed and own land. There were also reported cases of rented in land in Taita Taveta and Trans Nzoia (Figure 12).



	Taita Taveta	Nakuru	Trans Nzoia
Borrowed	0	0	2.15
Rented in	11.11	0	2.15
Land owned	88.89	100	95.7

Figure 12: Land tenure system among snow peas farmers
Source: Household survey findings

Farmers operated an average total land size of 4 acres with approximately 2.27 acres under agriculture. Households in Trans Nzoia County had the highest land under operation of about 4.47 acres followed by Nakuru (3.14 acres) and Taita Taveta (1.69 acres). In Trans Nzoia, farmers allocated about 2.43 acres for general agriculture of which about 1.60 acres is crops. In Nakuru County, out of the entire land under operation, about 2.07 acres is under general agriculture with specifically about 1.81 acres under crops. In Taita Taveta the land under general agriculture stands at 1.24 acres with approximately 1.1 acres under crops (Table 8). The study revealed that out of the total land under crops, on average, about 0.80 acres is under snow peas with Trans Nzoia having approximately 0.97 acres followed by Nakuru (0.40 acres) and Taita Taveta (0.33 acres).

Table 8: Land allocation by snow peas farmers

Land (acres)	***Taita Taveta***	***Nakuru***	***Trans Nzoia***	***Overall***
Total land size operated	1.69	3.14	4.47	4.00
Land under snow peas production	0.33	0.40	0.97	0.80
Percentage of land under snow peas production	19.53%	12.74%	21.70%	20.00%

Source: Household survey findings

The big difference between the land under agriculture and land size under snow peas production implies that still there is potential for expansion of snow peas production in the regions. Due to the small land pieces, farmers need to diversify in order to increase the production. This was evident from the study findings as in Taita Taveta all the farmers (100%) of the farmers are fully incorporating fruit trees in their farms to increase the productivity of the farms. In Nakuru County, about 71% of the land is covered by permanent fruit trees

Access of agricultural Inputs

The low (40.16%) membership to any crop farmer organization was also evident in farm input access. The study revealed most (90.11%) farmers' access farm inputs individually, an indicator of low collective action amongst farmers. All farmers in Taita Taveta, Nakuru and 90.11% from Trans Nzoia acquired farm inputs individually. Economically, it implies that farmers are not enjoying the benefits of pulling resources together and bargaining power for a bigger voice. Despite the poor group membership earlier observed in Trans Nzoia County, about 9.89% of the farmers acquired farm inputs collectively representing the 7.09% of the overall farmers who access farm inputs collectively.

Use of farm technology

Snow peas farmers used both certified and recycled/second generation seeds. The adoption of certified seeds is relatively high as approximately 91% of the farmers used certified seeds for production. All Taita Taveta County farmers, 95% of Trans Nzoia and about 74% of Nakuru County snow peas farmers reported to have adopted the use of certified seeds. Since snow peas are open-pollinated, therefore, the use of recycled seeds is still productive thus some farmers opt for secondary generation seeds as a cost cutting strategy. The germination rate of the recycled/second generation seeds nevertheless is 81.34%. In general, certified seeds had above 93% germination rate across the surveyed regions except in Taita Taveta where farmers reported 84.17% germination rate. The significance difference between the germination rates of the two categories of seeds, it is advisable to encourage farmers to adopt the use certified seeds to increase crop population. On the other hand, snow pea farmers prepared their land manually (82%). However, a few used tractor-drawn (16%) or animal-drawn (2%) power in land preparation.

Crop nutrition and protection

On crop nutrition, farmers have adopted use of compost manure and soil testing before planting. Both soil testing before planting and the use of compost manure were adopted on equal measures. Compost manure was mainly used in Nakuru County (22.22%) as compared to Trans Nzoia County. Compared to Nakuru County (3.7%), more Trans Nzoia farmers tested their soil before planting (8.51%). There was no soil testing and use of compost manure in Taita Taveta farmers.

Table 9: Soil management techniques among snow peas farmers

Technologies used	***Taita Taveta***	***Nakuru***	***Trans Nzoia***	***Overall***
Use of compost manure	0.00	22.22	3.19	6.92
Soil testing before planting	0.00	3.70	8.51	6.92

Source: Household survey findings

Production is meaningless if the crops are not protected well. Past studies have revealed that farmers' production effort can be reduced by plant pests and diseases. Plant pests and diseases if not controlled can significantly reduce crop yields and incomes thus posing a major threat to food security. In the event of countering this, crop protection is key. Crop protection entails a range of activities which tries to ensure crop pests and diseases are managed. The study sought to establish how snow peas farmers across the three selected counties are protecting their crops in order to ensure maximum productivity is achieved. Regardless of the type of chemical used, the time of application of the chemical is very important as it determines the effectiveness of the chemicals used. The results showed that in overall, approximately 11% are following the chart and

this was only observed amongst about 15% of the farmers in Trans Nzoia. The remaining farmers were applying the chemical after scouting (43%) and this was evident in Taita Taveta (100%) where all snow peas farmers only apply chemicals after scouting. Elsewhere, farmers were applying the chemicals after a time period (47%) which was common amongst snow peas farmers in Nakuru (51%) and Trans Nzoia (49%).

Among other aspects which farmers need to put in consideration while buying chemicals they use in protecting their crops includes the expiry dates, packaging, product labels and if the chemical is among the approved or recommended agrochemicals and the right suppliers. The study revealed that approximately more than half (56.69%) of the farmers across the surveyed counties ensure that the chemicals they buy and use for crop protection are not expired. This is commonly observed amongst all (100%) Taita Taveta farmers followed by 62.64% of Trans Nzoia farmers and only 22.22% of Nakuru farmers. Out of the interviewed farmers only 62.99% ensures the chemicals bought are packed in a sealed container. 100% of the farmers in Taita Taveta ensure that the chemicals they buy are packed in sealed containers. Not all farmers in Nakuru and Trans Nzoia bother about the package of the chemicals they buy as only 44.44% and 64.84% of the interviewed farmers were able to confirm that the chemicals they buy are packed in sealed containers.

To access both local and international markets, farmers need to follow both Kenya and GLOBAL GAP standards. These production requirements are observed in terms of amount and type of chemicals used. Above all, these chemicals need to be listed in the approved agrochemicals and from approved suppliers. The study focused to confirm if farmers consider these. The results revealed that out of the farmers who were interviewed very few (33.86%) and (23.62%) ensured that the chemicals they apply are from the approved list of agrochemicals and approved list of suppliers.

The study further revealed that most (78.91%) of the farmers do not mix different chemicals. In overall, across the three surveyed counties, only 21.09% of the interviewed farmers mix different chemicals and this was common amongst 25.93% of Nakuru farmers and 21.74% of Trans Nzoia farmers as none of the Taita Taveta farmers mixed the chemicals.

To ensure the plants are not contaminated, the spraying pump needs to be cleaned regularly. The study revealed that most (75.78%) cleans the pump after every job. This was observed in Taita Taveta where all farmers clean the pump after every job. However, 2.34% of the farmers across the surveyed counties clean the pump every season or once a year.

The study findings also revealed that most farmers (97%) highly depend on manual labour as only 3% have adopted motorized spraying. Amongst the few (3%) who have adopted motorized spraying about 4% were from Nakuru County while 9% were from Trans Nzoia. This could be attributed to the size of lands under operation. Since motorized spraying is not economical for small pieces of land, it qualifies manual spraying as the only option and this is in line with the survey findings as farmers in Taita Taveta recorded the smallest land () under operation with all of them practicing manual spraying.

The study also revealed that most (56.25%) farmers are not using PPE. This was mostly common (96.3%) amongst Nakuru farmers and half (50%) of Trans Nzoia farmers. Most (88.89%) of the 22.64% of farmers who are doing incomplete PPE set are from Taita Taveta. 23.83% of the farmers interviewed in Trans Nzoia at least use incomplete set. From the survey findings, 21.09% of the

farmers use the complete set of PPE. Trans Nzoia county farmers recorded the highest (27.17%) followed by Taita Taveta (11.11%) and lastly Nakuru county with only 3.7% of its farmers.

3.3.3 Harvest, yield and Post-harvest management

Harvesting across the 3 counties is manually done.

Current yield per Acre: Snow peas farmers reported an average yield of 2,263 Kg per acre. This is against a potential yield of 5,200 kg per acre. Trans Nzoia farmers reported the highest (3,238 Kg per acre) productivity compared to the Taita Taveta (1,172 kg per acre) and 905 kg per acre in Nakuru County.

The study revealed that post-harvest losses in the previous production stands at 7%. Trans Nzoia farmers reported the highest (9%) of the post-harvest losses. However, Taita Taveta (2%) and Nakuru (3%) did not lose much of their produce after harvesting. Among the contributors to post-harvest losses includes lack of proper storage facility. The study therefore sought to establish how farmers stored their snow peas before selling. Majority of producers lose their produce to lack of storage facility after harvest. Among storage facilities used are open and closed stores, cold room or left open in the field (Table 10). Use of open store was the most common (60.16%) followed closely by closed stores (27.34%). Use of cold room and leaving in the field (no store) were the most unpopular storage methods used by the farmers at 7.03% and 5.47% respectively. Open store was common in Taita Taveta (100%) and Trans Nzoia (61.96%). Nakuru farmers mostly (55.56%) used closed store.

Table 10: Types of storage among snow peas farmers

Type of storage	***Taita Taveta***	***Nakuru***	***Trans Nzoia***	***Overall***
Open store	100	40.74	61.96	60.16
Close store	0	55.56	3.7	27.34
In the field (no store)	0	3.7	6.52	5.47
Cool room	0	0	9.78	7.03

Source: Household survey findings

Record keeping; not all farmers keep records and this could be explained by lack of resources or knowledge. This survey revealed the information on Table 11 about various farm records.

Table 11: Record keeping among snow peas farmers

Record Description	***Taita Taveta***	***Nakuru***	***Trans Nzoia***	***Overall***
Main traceability records	33.33	3.70	35.16	28.35
Pest control records	66.67	3.70	32.97	29.13

Source: Household survey findings

3.3.4 Processing

The exporters interviewed packages snow peas within Nairobi metropolis. However, others are based outside the metropolis but not necessarily within the 3 counties. The pack house processing yield ranges from 70-80%.

3.3.5 Exports operations

Exporters indicated they heavily rely on JKIA to export their consignments. While COVID 19 had at the onset of the pandemic led to sharp increment of freight costs, the freight costs are usually as high as an average of 40% of the sales price. This is an area that requires intervention.

3.3.6 Institutional arrangement and infrastructure

Group Membership

Majority (60%) of farmers across the three surveyed countries are not members of any crop farmer organization. The research findings revealed that only 40% of the farmers belong to a crop farmer organization with Nakuru farmers constituting the highest (85.19%) of all the interviewed farmers followed by Taita Taveta farmers (55.56%). For the sake of social networking, the study also sought to establish if the farmers also belong to other social groups. About 38% of the farmers belong to other groups. This was common amongst Taita Taveta farmers (77.78%) followed by Nakuru farmers (62.96%). Trans Nzoia County is badly placed in terms of group membership both for crop farmer organization (25.19%) and other social groups (26.37%). This implies Trans Nzoia county needs to encourage farmers to join groups as a means of enhancing dissemination of agricultural related information amongst farmers.

The low (40%) membership to any crop farmer organization can further be observed in terms of accessing farm inputs. It was revealed that collective action is very low in the surveyed regions as most (90%) access farm inputs individually. Both farmers from Taita Taveta and Nakuru recorded 100% individual access to farm inputs. It's only in Trans Nzoia County where at least some farmers (9.89%) access farm inputs collectively while the remaining (90.11%) still access the inputs individually.

Credit access

The survey results revealed a big portion (89.76%) of farmers across the surveyed counties have little access to credit. Out of all the respondents interviewed per county, Taita Taveta had relatively the highest (22.22%) of farmers who had access to credit compared to Nakuru county (3.7%) and Trans Nzoia county (10.99%) all representing the overall 10.24% credit access. This implies that financial power for the enterprise expansion is still very low amongst farmers. This also indicates that there is a lot of potential for growth of financial credit services to farmers across the surveyed regions. Hence it is critical to expose the farmers to as many as possible credit facilities.

Training and extension

Training and extension services are the key capacity building for farmers to improve productivity and increase income. Provision of constant and active training accompanied by follow up extension services could be therapeutic to farmers' knowledge gap. The study focused to understand the level of access to training services and the extension of contacts amongst farmers.

The survey findings revealed that in overall, only 48% of the farmers have received agricultural training services. This constituted about 78% of the interviewed Taita Taveta farmers, 74% of the interviewed Nakuru farmers and about 38% of the interviewed Trans Nzoia farmers. Those who had received the training services reported to have attended at least 3 training sessions in the last one year. Taita Taveta farmers were the leading with 5 sessions per farmer followed by Nakuru farmers with 4 and lastly Trans Nzoia with 3. The study further sought to establish how frequent the farmers were receiving extension follow up. This was measured in terms of extension contacts with the extension offices. Irrespective of the source, the survey revealed that in a span of the last 12

months, at least each farmer has been in contact with extension experts twice. This was uniform across the three surveyed counties. It is evident that there is still much more potential for further dissemination for both training and extension services amongst farmers across the three regions.

3.3.7 Margin analysis across the supply chain

The study sought to establish the profitability of snow peas value chain. In doing so, gross margins were computed along with the value chain actors. This analysis was limited to three main actors (producers). At the farm level, the survey revealed that snow peas farmers make an estimated gross margin (Gross profit) of KES 276,852.70 per acre. Harvesting labour cost constitutes the highest cost of production (34%). Other labour costs which constituted sizeable portion of the total cost includes planting, weeding and agrochemicals application at 11%, 10% and 8% respectively. Other significant costs included planting fertilizer (10%), agrochemicals (9%) and foliar fertilizer (7%).

3.3.8 Environmental analysis

The majority of farmers agreed that enhancing the environment improves climatic conditions that lead to food availability, rainfall, and safe and healthy lives and livelihoods.

3.3.9 Gender analysis

Females (both family members and hired) dominates the production of French beans across Kenya specifically. From the survey findings, women specifically are involved in production (planting, weeding, harvesting). On the other hand, chemical application was majorly pre-dominated by men both from the family and those hired. This calls for the need for men empowerment and to do so, funding, mentoring, training and sensitization were identified as the fundamental strategies.

3.4 Value chain upgrading strategy recommendations.

Table 12 summarizes key value chain opportunities and constraints with respective recommendations (inclusive of specific activities) and key performance indicators.

Table 12: Key value chain opportunities and constraints for snow peas

Opportunities and constraints	***Recommendations and activities***	***Key performance indicators (KPIs)***	***County specific priority areas***
1. Marketing	**Certification and market linkages to increase quality and quantity.**		
Untapped markets; *while Kenya is facing increased competition from countries such as Guatemala and Peru, there is untapped market for both fresh and frozen snow peas.* *According to ITC export potential, the biggest potential for fresh snow peas is in the United Kingdom, the Netherlands, US and Canada while the US, United Emirates Arabs, Saudi Arabia and China has potential for frozen snow peas.*	• Support exporters to review and optimize new markets opportunities especially the frozen snow peas market in the US, United Emirates Arabs, Saudi Arabia and China • Support exporters to enhance compliance and optimize production and processing capacity to competitively exploit the fresh snow peas markets in French beans market in the United Kingdom, the Netherlands, US and Canada	• Increase of regional, international trade volume for snow peas of targeted farmers and enterprises.	
Compliance to market requirements (standards): *only 35% of farmers interviewed are GLOBAL GAP certified limiting access to international markets.*	• Farmer trainings on GAP (GLOBAL GAP); Integrated Pest Management, Biological Control of Pests. • Promote groups certification under GLOBAL GAP option 2. • Link farmers to certifying agencies. • Traceability: strengthen/upgrade the traceability system to reflect market needs.	• Percentage increase in number of GLOBAL GAP certified snow peas farmers participating in the international markets	
Marketing channels and income*;* *The key market outlets were brokers (58%) and producer groups (35%). 7% of farmers sell directly to exporters.*	• Support formation and or strengthening of producer groups for produce aggregation and collective marketing to improve farmer bargaining power and compliance to market standards	• Percentage increase of farmers having signed supply agreements directly with	

The average selling price per kg at farm level is KES. 70 with an average income of KES. 146,902 per acre.	• Support direct farmers (directly or through their organizations) contracting by exporters.	exporters and complying to market standards • Percentage increase in income per acre	
2. Production	**Productivity, quality and food safety; target to increase productivity (yield per acre) and food safety through:**		
Overall average area under snow peas per farmer being 0.8 of an acre out of 4 acres operated by the households. The overall yield is 2,263 Kg against a potential of 5,200 Kg per acre. Some of the key constraints leading to low yield and quality includes: • *Use of recycled/second generation seeds by about 9% of farmers. This is as cost cutting strategy by the farmers and llimited availability of and access to quality seed within reach of the farmers. The germination rate for 2nd generation seeds averaged 81%.* • *Low uptake of good agricultural practices negatively affecting productivity and food safety (e.g. soil testing at only 7%)* • *Limited land under crop* • *Low uptake of smart water solutions and limited irrigation systems & reliance on rain fed production; only 26% of farmers irrigate throughout the growing cycle*	• Accelerate uptake of good agricultural practices and improved access to, demand & effective use of certified inputs and smart farming technologies (through training in farmer field schools, extension services, collective input purchase by farmers & financial access as highlighted in 4 below). • Build farmers' entrepreneurial capacity to run snow peas production as a business adopting market driven production. Demand should guide development of planting calendars to support consistent production. • Work with competent authorities and county governments for policy/regulation formation and enforcement such food safety policy.	• Percentage increase in production of safe, quality snow peas (yield) per acre	• Nakuru (Yield) • Taita Taveta (yield) • Trans Nzoia (quantities)
3. Harvesting, post-harvest management and processing	**Effective and efficient post-harvest management**		

On average 7% of snow peas are lost at farm level. This is mainly due to: • *Unavailable/poor storage facilities, limited access to grading/pack house facilities & poor postharvest handling practices* *Processing yield at the pack houses ranges between 75% and 80%.*	• Identify & support investment opportunities to address postharvest spoilage such as recommended cold storage facilities at farmer level and pack houses at exporters' level. • Trainings of exporters on GHP, FSSC22000, ISO 14001; ISO 45001:2018, traceability, packaging & labelling	• Percentage reduction in post-harvest losses.
4. Institutional arrangement & access to support services	**Support formation & strengthening of farmer organizations to facilitate farmers access to essential services**	
Despite 40% of farmers being members of farmer organizations, 90% individually source farm input limiting bargain power. ***Financial access;*** *10% of farmers have accessed finance.* ***Extension services:*** *on average farmers had 1.6 contacts with extension officers per annum.*	• Encourage farmers to form groups for easier access to services and inputs capitalizing on their economies of scale. • Promote blended extension services e.g. Spray service providers (SSPs) providing market information. This could be through trainings by the competent authorities such as HCD. • Financial literacy & linkages (tripartite agreements e.g. among banks, farmers and exporters) and tailor made financial products (e.g. cold storage facilities asset financing) • Promote smart services e.g. digital financial services for example Digi Farm & Agri Wallet.	Number of farmers consistently/easily accessing essential support services.

ANNEX

Data set