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GOOD AGRICULTURAL PRACTICES, POST-HARVEST HANDLING AND EXPORT **REQUIREMENTS IN THE FRENCH BEAN VALUE CHAIN IN KENYA**





















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FOREWORD

The European Union (EU) in partnership with the East African Community (EAC) launched The European Union (EU) in partnership with the East African Community (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. UNIDO is the implementation partner for the Kenya-Partner States Window. The sub-sectors of interest in the MARKUP program include: French beans, groundnuts, macadamia nuts, snow peas and peas, mangoes, passion fruit, chilies, herbs and spices. Recent studies have analyzed the reasons for low productivity and competitiveness in these value chains and among others identified lack of specialized extension services and a diffuse lack of knowledge on appropriate good agricultural practices (GAP). These value chains also lack compliance with market requirements and standards posing a challenge to exploiting potential benefits from the more lucrative export market. The MARKUP project aims at improving 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.

The main purpose of this training manual is to contribute to the economic development of Kenya by increasing the value of both extra and intra-regional export of French beans. The training focuses on building capacity in good agricultural practices with specific focus on good agronomic practices, integrated pest and disease management, pesticide application postharvest management in the French bean value chain as well as legal and technical requirements for export of the produce. In addition, the training manual aims at building capacity for extension officers and producers in spraying regimes with a view to promoting economical and safe use of pesticides in order to support safe trade of French beans both locally and internationally. Through this initiative, extension officers and producers will be trained; after which they will be expected roll out the learned knowledge to other extension officers and producers through in situ trainings in the major French bean producing counties in Kenya. Selection of the initial trainees (Master Trainers) is be based on good understanding of food safety, production of French beans, application of pesticides, post-harvest management, export of the beans, and ability to mentor others. Overall, the training endeavors to contribute to production of high quality French beans that are compliant with market requirements under the MARKUP project in order to enhance Kenyan exports and increase market access. To achieve this, the training aims at increasing the number of extension officers and French bean growers at county level to be part of suppliers' control and monitoring plans.

At the initial stages, the trainees will be mentored by experts through a practical on-site training session followed by an independent implementation phase during which the mentee will be supported remotely. It is anticipated that the mentees will train other extension officers and farmers leading to an increase in French bean yield, improved quality of the produce, enhanced compliance with market requirements and ultimately an increase in domestic, regional and international trade.

Director General, AFA

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EXPECTED LEARNING OUTCOMES

• Extension agents are expected to:

- Effectively train farmers on good agricultural practices in production of French beans.
- Effectively train French bean farmers on integrated pest management and pesticide application.
- Effectively train farmers on post-harvest handling of French beans including sorting, grading, storage, transportation and marketing.
- Effectively train French bean farmers on practices that promote compliance with market requirements and quality standards at pre-harvest and post-harvest stages.

• Producers are expected to:

- Have an in-depth understanding of good agricultural practices and post-harvest practices for production of quality French beans.
- Understand integrated pest management and pesticide application in French beans production.
- Understand the role of compliance with quality standards on trade and health.
- Have an in-depth understanding of practices that contribute to compliance with market requirements and quality standards at pre-harvest and post-harvest stages.

• The Regulators/Inspectors are expected to:

- Have a good understanding of pesticides and pesticide residues, and their effects on health and trade in the French beans value chain.
- Effectively inspect and test for pesticide residues in the French beans.
- Definitively explain the steps towards compliance with standards set for French beans by local, regional and international markets.

ABBREVIATIONS AND ACRONYMS

AFA:	Agriculture and Food Authority
AGOA:	African Growth and Opportunity Act
BEPI:	Business Environmental Performance Initiative
BRC:	British Retail Consortium
BSCI:	Business Social Compliance Initiative
CAN:	Calcium Ammonium Nitrate
COMESA:	Common Market for Eastern and Southern Africa
CSR:	Corporate Social Responsibility
DAP:	Diammonium phosphate
EAC:	East African Community
EC:	European Commission
e-COI:	Electronic Certificate of Inspection
ETI:	Ethical Trading Initiative
EU:	European Union
FPEAK:	Fresh Produce Exporters Association of Kenya
GAP:	Good Agricultural Practices
GFSI:	Global Food Safety Initiative
GGN:	Global-GAP number
GMS:	General Marketing Standards
HACCP:	Hazard Analysis and Critical Control Points
HCD:	Horticultural Crops Directorate
IFS:	International Featured Standards
IPM:	Integrated Pest Management
ISID:	Inclusive and Sustainable Industrial Development
ISO:	International Organization for Standardization
KAVES:	Kenya Agricultural Value Chain Enterprises
KEBS:	Kenya Bureau of Standards
KEPHIS:	Kenya Plant Health Inspectorate Service
KESWS:	Kenya National TradeNet System
KIFWA:	Kenya International Freight and Warehousing Association
KRA:	Kenya Revenue Authority
MARKUP:	Market Access Upgrade Programme
MRLs:	Maximum Residue Levels
NPPO:	National Plant Protection Organization
PCPB:	Pest Control Products Board
PHI:	Postharvest Interval
RASFF:	Rapid Alert System for Food and Feed

SDGs:	Sustainable Development Goals			
SIFAV:	Sustainability Initiative for Fruits and Vegetables			
SMETA:	Sedex Members Ethical Trade Audit			
SQF:	Safe Quality Food			
TRACES: Trade Control and Expert System				
TSP:	Triple Super Phosphate			
UK:	United Kingdom			
UNECE:	United Nations Economic Commission for Europe			
UNIDO:	United Nations Industrial Development Organization			
USAID:	The United States Agency for International Development			
VAT:	Value Added Tax			

1. General aspects of French beans

French beans are the immature green pods of *Phaseolus vulgaris* also referred to as green beans or snap beans, and locally in Kenya as mishiri. The colour of French beans can vary from green to yellow, purple, or speckled depending on the variety. Yellow French beans are sometimes called wax beans. French beans are grown by both small- and large-scale farmers and are a major export crop. French beans contain proteins, soluble fiber, fat, starch, calcium, iron, phosphorus and are rich in vitamins A, B, D. The beans are grown for fresh consumption and processing mainly canning and freezing. They take 45 to 60 days to mature, making them a good crop for farmers seeking short production cycles and hence faster income.



Figure 1: French bean plant in the field (A) and harvested French bean pods (B).

1.1 Status of French beans production in Kenya

French bean is by far the largest vegetable export crop from Kenya and accounts for 19 percent of the value and 25 percent of the volume of total fresh vegetable exports (USAID, 2015). The sector employs between 45,000 and 60,000 people - depending on the season - in commercial farms, out grower schemes, processing and logistics operations (EU, 2018). Production of the crop in the country is dominated by small-holder farmers who account for approximately 80% of the growers. In 2019, Kenya produced approximately 40,416 tons of French beans cultivated on 3,179 hectares of land, giving an average yield of 12,700 kg/ha. However, according to Kleih et al. (2017), French bean yield in Kenya varies from 4,000 kg/Ha to 12,500 kg/Ha, depending on farming practices, varieties grown and general agricultural production conditions (especially water availability through rainfall or irrigation). Kenya is also among the leading exporters of French beans in the world particularly to Europe; the others being Egypt, Morocco and Senegal. The high production of the crop in Kenya is largely attributed to favourable climatic conditions, geographic advantage, investments in certification schemes, value-addition through packaging, and investments in marketing. Although French beans are mostly produced for the export market, there is increasing demand for local consumption of the crop particularly in urban areas.

1.2 Timing of French beans production for the European market

The major market for French beans produced in Kenya is Europe with the United Kingdom, Germany, Netherlands, France and Belgium being the leading countries. The key production and export windows for Kenya are:

- High demand season from September to March, where major supply is mainly from irrigation. During this period, EU markets face winter and therefore, they have to import. During this period, Kenyan farmers and exporters achieve higher returns from export of the produce.
- ii. Low demand season from June to September, during the long rains when supply is high and therefore lower prices. In addition, during this period, the European countries can produce their own.

1.3 Common varieties of French beans grown in Kenya and their characteristics

The most common cultivars of French beans grown in Kenya have cylindrical pods and belong to either climbing, unbranched (pole) type or the dwarf (bush) type. Pole type cultivars are indeterminate and grow up to 3m high and must be supported. Bush type cultivars are determinate, are 20-60 cm tall and have short nodes. The commonly grown green bean varieties in Kenya for fresh market are Amy, Serengeti, Vanilla, Star 2052/3, Pekara, Teresa, Paulista, Rexas, Samantha and Cupvert; while processing varieties include Julia, Vernandon, and Sasa. Characteristics of the common French bean varieties grown in Kenya are outlined in Table 1:

	Variety					
Characteristic	Teresa	Alexandra	Amy	Samantha		
Spacing (cm)	30*8	30*8	30*8	30*8		
Pod quality	Fine and extra fine 14cm long beans	and extra .4cm long s Extra fine/ Fine/ Bobby Standard extra fine bean Fine and fine 10-1 long bea		Fine and extra fine 10-13cm long bean		
Pod characteristic(s)	Shiny green pods	14-15cm long pods	Suitable for punnet packs; average pod length of 12cm	Uniform green rich pods		
Yield potential (ton/acre)	6	7	5	5		
Time to maturity (days)	60	55 – 60	60	60		
Harvesting duration (days)	21	21	21	21		
Growth characteristics ^a	Strong plant type	Good growth vigour	-	-		
Climatic requirements ^a	-	Warm climatic conditions	-	-		
Tolerance to diseasesAnthracnose, bean common mosaic virus (BCMV), rustBCMV, anthracnose, strong rust tolerance		BCMV, anthracnose, strong rust tolerance	Anthracnose, Anthracno BCMV BCMV			
Susceptibility to diseases	Halo light	-	-			
	Variety					
Characteristic	Paulista	Julia	Wax bean 1411			
Spacing (cm)	30*8	30*8	30*8			
Pod quality	Fine and bobby bean	Ideal canning variety	Rich deep yellow extra fine bean			
Pod characteristic(s)	Average pod length of 13cm	10-12cm long pods; Good shelf life	10-12cm long pods; suitable in punnet mixes, gives a good colour break			
Yield potential (ton/acre)	5	7	5			
Time to maturity (days)	60	55 – 60	60			
Harvesting duration (days)	rvesting ration (days) 21 21 21					
Growth characteristics ^a Highly vigorous strong bean Good growth vigour Good vigour, uniform matu		Good vigour, uniform maturity				
Climatic requirements ^a		Warm climatic conditions	Excellent colour change in all weather - warm and cool			
Tolerance to diseases	Tolerance to diseases BCMV, halo blight BCMV, anthracnose, Anthracnose, BCMV, halo blight blerance BCMV					
Susceptibility to diseases	-	-	-			

Tahle	1.	Characteristics	٥f	common	French	hean	varieties	arown	in	Ken	un
iubie	1.	CHURUCLEHSUICS	ΟJ	COMMON	FIEIICII	Dean	vurieties	yrown	111	Nen	/u

^a Unique characteristics/requirements from other varieties

1.3 Climatic requirements

French beans grow in environments with temperatures ranging from 14 to 32 °C depending on the variety. However, the optimum temperature for growth is 20 to 25 °C. Temperatures higher than 25 °C cause poor flower development and pod set. Indeed, French beans will not set pods in temperatures above 26.7°C; while at seedling stage, the crop does not tolerate temperature lower than 10°C.

The crop grows at altitude ranging from 1000 to 2000 meters above sea level but matures faster in warm areas. For best production, French beans grow well in lower midland to lower highland zones at altitudes ranging from 1500-2000 metres above sea level. Well distributed rainfall of about 300-400 mm per crop cycle is required to attain good production. Excessive rainfall can lead to flower abortion and increased incidence of diseases. However, French beans can be grown under irrigation throughout the year. Farming under irrigation requires about 50mm of water per week. In Kenya, French beans are commonly grown in warm areas such as Machakos, Thika, Murang'a, Kajiado, Kirinyaga, Naivasha, Nyeri and Embu (Figure 2).



Figure 2: Map of Kenya showing the major French beans production regions, highlighted in red

1.4 Key challenges in the French bean value chain

- The French beans sub-sector in Kenya is faced with various challenges including:
- Requirement for maintaining high hygienic standards
- Requirement for compliance with low (or no) chemical/pesticide residual levels as per specifications of the country of destination
- Requirement for high quality standards of the produce leading to product rejection both at farm and processing levels in case of lack of compliance
- Poor and inappropriate disease and pest management practices including use of banned pesticides
- Declining soil fertility in production areas
- Poor handling of the produce at farm, processing and packaging zones
- Limited or lack of marketing information
- Stringent regulations by the Kenya regulatory authorities and the countries of destination

2. Production of French beans

2.1 Soil characteristics

- French beans can grow in different soil types ranging from sandy, loam to clay
- However, they grow best in well drained silty loams to heavy clay soils that are high in organic matter and at near neutral pH of 6.5 7.5
- French beans can tolerate low pH of up to 4.5
- Below a pH of 4.5, plant growth is impaired mainly through limitation of development of rhizobia bacteria that are responsible for nitrogen fixation in the galls formed on the bean roots

Before planting French beans, it is important to analyze the soils in a Soil Chemistry Laboratory to determine nutrient levels. The results of the analysis should inform the appropriate fertilizer application program.

2.2 Pre-planting activities and considerations

2.2.1 Timing of production in Kenya

In Kenya, French beans can be grown all-year round; but the main export season is from October to May. Therefore, for best returns from the export market, the crop should be planted from August to March.

2.2.2 Crop rotation considerations

Crop rotation is highly recommended to manage soil health and to reduce incidence of diseases and pests. The crops to rotate with French beans and the sequence are critical considerations. Indeed, certain crops must not precede French beans because they are attacked by similar pests and diseases. There are also other crops that are not host to pests and diseases affecting French beans but are of little benefit to the crop. Crop rotation should be done with crops that do not belong to the Fabaceae family. It helps in weed control, pests and disease management, reduction of soil erosion, and rejuvenation of soil organic matter. Table 2 summarizes crops that are suitable and those that are unsuitable for inclusion in a rotation program with French beans.

Recommended as preceding crop	Crops that should not precede French beans	Crops that are harmless but have little beneficial effect on French beans
 Cereals (e.g. maize, sorghum, millet, wheat) Fodder crops Cabbage and kale Root crops (e.g. turnip, beetroot) Tuber crops (e.g. cassava, sweet potato) Strawberries 	 All legumes (e.g. peas, common beans) Lettuce Irish potato Cucumber Sweet and water melon Zucchini Okra 	 Groundnut Pepper Celery Carrot Onion Shallot Garlic

Table 2: Suitable and unsuitable crops for	for rotation with French beans
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2.2.3 Selection of production site

- French beans should be grown in fields with direct sunlight, 8 hours of sun or more each day
- French beans will grow in partial shade but the harvest will not be full
- Do not grow French beans in a field with a history of soil borne diseases
- Fields prone to water logging should be avoided. Grow beans in well-drained soil rich in organic matter
- Avoid planting beans where soil nitrogen is high or where green manure crops have just grown; the crop will produce green foliage but few pods

2.2.4 Field preparation

- French beans are planted directly in the field
- The filed should be ploughed and harrowed to a fine tilth
- Any perennial weeds like couch grass should be removed

2.3. Planting: Spacing and seed rate

- Spacing varies depending on the variety
- However, the standard spacing for single rows is 30 *15cm (a seed per hole) and 60*30 cm for double rows
- Single rows are planted in blocks of four with a 50cm path separating the blocks
- The recommended spacing is achieved at a seed rate of 25-30 kg per acre of certified seed depending on the variety
- For highest production, always plant certified seed
- French bean seeds will germinate in 7 to 14 days

2.4 Manure and fertilizer requirements

- To achieve optimum yields, timely application of basal and foliar fertilizers is essential
- In production of French beans, it is important to use aged organic manure in order to provide nutrients and improve soil drainage
- The manure should be free of gravel and stones; and should be mixed with soil thoroughly before planting
- The type and rate of fertilizer application at planting should be based on the soil analysis results
- Generally, di-ammonium phosphate (DAP) or triple superphosphate (TSP) are applied at a rate of 100kg per acre at planting
- The fertilizer should be applied along the rows before planting as per the recommendations given in the soil test results
- Contact between fertilizer and seed should be avoided by mixing the former thoroughly with the soil in the planting furrow
- DAP is preferred because it contains considerably higher levels of phosphorus which helps the crop with root development
- French beans fix their own nitrogen through the symbiotic association with the nitrogen-fixing rhizobia bacteria, which produces the soil nitrogen required by the crop
- Fertilizing French beans with a nitrogen-rich fertilizer will result in green leafy growth and few pods
- It is therefore important to avoid using green manures or nitrogen-rich fertilizers when planting the crop
- In rare cases, the crop can be top dressed as per the recommendations given after the soil test
- For top-dressing, 50kg of Calcium Ammonium Nitrate (CAN) per acre can be applied two weeks post-emergence or when the crop reaches the 3-leaf stage
- Other nitrogen-based fertilizers like urea can also be used for top-dressing
- Alternatively, foliar fertilizers can be applied especially at flowering stage

2.5 Water and irrigation requirements

Rain-fed cultivation of French beans is possible in areas with well-distributed, medium to high annual rainfall of 900-1,200mm per annum. However, to ensure year-round production especially in semi-arid areas and during off-season, irrigation is essential. Moisture availability affects uniformity, yield and quality of the produce and therefore watering is essential in cases where rainfall is inadequate. For optimal production, up to 50mm of water per week is required. Furrow, overhead or drip irrigation can be used (Figure 3). Lack of water during flowering and pod formation causes flower abortion and curved pods leading to reduced yields. However, drip irrigation is most preferred as it saves water and reduces incidence of diseases. Rain or overhead irrigation during flowering can cause flowers and small pods to fall off. Overhead watering also increases susceptibility of the crop to diseases. It is also advisable to grow the crop on ridges and use furrow irrigation in heavy clays because French beans are very sensitive to water logging.



Figure 3: French bean production under drip (A) or Furrow (B) irrigation

2.6 Supporting French beans

- Not all green bean varieties require support
- However, climbing varieties that grow to about 1.8m (6ft) high require support
- This is done by use of trellises, poles, or other means at least 200cm (8ft) high

2.7 Weed management

- Weeds compete with the crop for nutrients and water
- There is therefore need to carry out timely weeding and maintain a weed-free field (Figure 4)
- Weeding can be done manually by hand or using selective herbicides
- The first weeding should be done two to three weeks after emergence followed by a second weeding after three weeks
- Shallow tillage is recommended to avoid damaging the roots. There should be no weeding during flowering to avoid abortion and dropping of flowers
- In addition, weeding should be avoided when the fields are wet in order to prevent spread of diseases and hardening of the soil



Figure 4: A weed-free French bean crop Photo credit: USAID-KAVES

2.8 Key considerations and practices to produce high quality French beans

In order to produce high quality French beans, the following practices are recommended:

- i. Plant the crop in a well-prepared fertile land to promote plant vigour
- ii. Select a good site with direct sunlight and not prone to water logging
- iii. Maintain fertility levels based on soil test recommendations
- iv. Use the recommended manure and fertilizer regimes
- v. Plant clean and certified seed free of diseases or pests
- vi. Follow the recommended spacing to attain good crop population
- vii. Maintain consistent and adequate supply of water to the crop to avoid water stress
- viii. Ensure the production field is free of weeds
- ix. Control pests and diseases to prevent yield loss and deterioration in quality
- x. Plant disease and pest resistant or tolerant varieties if they are available

3. Major pests and diseases of French beans and their management

3.1 Major pests and diseases of French beans

The major pests and diseases of French beans, their key symptoms and management options are outlined in Table 3.

A. PESTS				
Pest	Description	Key symptoms	Management practices	Image and photo credit
Bean fly (Ophiomyia phaseoli)	 Also referred to as stem maggots They are tiny about 3mm long, shiny bluish-black insects Crops are at a greater risk for 3-4weeks after emergence 	 The larvae/ maggots mine into the base of the stem then into the cotyledon affecting seedling emergence In case seedlings emerge, they are stunted, wilt and die Older plants attacked by the flies usually become stunted; yield is reduced Female flies lay eggs on the leaves and suck plant sap causing yellowing of the leaves Affected plants are yellow, stunted Stems are cracked at the soil level 	 Early planting can help the crop escape attack by bean fly as their numbers are lower at the beginning of the growing season Add manure to improve soil fertility and promote vigorous plant growth to enhance tolerance to attack and damage Remove crop residues or debris which may act as hiding areas for the pupae Plough the land before planting to expose and kill the pupae Practice crop rotation with non- host crops Spray biological insecticides like neem Use sticky traps to capture adult flies Plant resistant varieties (if available) Spray insecticides containing Imidacloprid or Lambda cyhalothrin 	Sean fly maggots in the stem PC: A. M. Varela, icipeSean fly maggot stem PC: CIAT – Tanzania

Table 3: Common pests and diseases of French beans, their symptoms and management practices

Aphids (<i>Aphis</i> <i>craccivora</i> and <i>Acyrthosiphon</i> <i>pisum</i>)	 They are soft bodied green, black or brown insects They form clusters on stems, leaves and pods where they suck plant sap They are key vectors of viruses such as bean common mosaic virus 	 Aphids produce honey dew which promotes growth of sooty mold Sooty molds reduce photosynthetic efficiency and quality of French beans Sucking plant sap leads to stunted growth and malformation of infested parts 	 Timely weeding to remove potential hosts Keep the field clean and free of weeds Practice crop rotation with nonhost plants Use bio insecticides like neem sprays Use of insecticides such as Acetamiprid, Imidacloprid Plant resistant varieties (if available) 	Clusters of aphids on bean stem and leaves PC: GreenLife Kenya
Thrips (Frankliniella occidentals, Megalurothrips sjostedti, Hydatothrips adolfifriderici, Frankliniella williamsi)	 They are tiny slender insects that feed by puncturing their host and sucking the sap Females lay eggs that hatch into larvae on flower buds 	 Affected flower buds become deformed and fail to open Heavy infestation can result in stunted growth 	 Keep the field free of debris and weeds Use sticky traps for monitoring thrip population Plant tolerant varieties like Paulista Spray insecticides containing Imidacloprid, deltamethrin and Lambda- cyhalothrin 	Thrips on a bean flower PC: Pestnet

Whiteflies (Bemisia tabaci)	 Thy are white winged insects that suck plant sap Adult and immature whiteflies feed exclusively on leaves, especially on the undersurface They are found in groups and quickly fly in small white clouds upon disturbance They also spread viruses 	They suck plant sap causing yellowing and downward curling of leaves	 Keep the field clean of weeds as they act as alternate host Mount yellow sticky traps to capture the adults Practice crop rotation with non- host crops Spray insecticides containing Imidacloprid, alpha- cypermethrin and Lambda-cyhalothrin 	PC: Infonet Biodivision White flies on the underside of a French bean leaf PC: A.M. Varela, ICIPE PC: Infonet Biodivision
Red spider mites (Tetranychus urticae)	 They are minute reddish, greenish to yellow insects that have 8 legs They form webs on the foliage Mite damage may be particularly severe during the dry season 	 Infested leaves curl downwards Leaves have yellow discoloration Affected leaves have a golden- brown appearance Heavy infestation results in wilting and death of plants 	 Remove and destroy old crop and infested plants and weeds Use of predatory mites like <i>Phytoseilus</i> and <i>Amblyesius</i> Spray with Abamectin and Amitraz 	Adult red spider mites and webbing. PC: GreenLifeState PC: A.M. Varela, icipe

Bean pod borer (Maruca vitrata)	 The larva/ caterpillar are pale cream, with two rows of black dots on their backs They feed inside the flower buds and then move into the pods where they feed on the seeds They grow to 18mm and then exit the pods to pupate in the soil 	 Larvae bore and feed on flowers and pods creating holes on the affected parts Affected pods become distorted and frass are often found on the affected areas 	 Plant beans in clean fields Remove all debris and weeds after harvesting Use biological control products like neem spray and Spinosad Hand picking and killing the larvae Use resistant varieties (if available) Use insecticides containing cypermethrin 	Pod borer Larvae PC: Infonet Biodivision
Cutworms (<i>Agrotis</i> spp.)	 They are brown to black caterpillars usually found in the soil They are active at night and hide under debris during the day If disturbed, they will often roll into a tightly coiled "C" shape 	 They cut the stem of young plants below or above the soil level Some may also climb up plants to feed on the foliage, leaving ragged holes in leaves 	 Eliminate weeds within and adjacent to the field well before planting Drench the soil with appropriate insecticide Use insecticides containing lambda- cyhalothrin or zeta- cypermethrin 	A cutworm PC: UC IPM Cutworm feeding on a bean pod PC: Fred Springborn

A. DISEASES				
Disease	Description	Key symptoms	Management practices	Image and photo credit
Rust (Uromyces appendiculatus)	 Rust is a fungal disease that is characterized by minute raised white spots known as pustules on the lower leaves mainly on the underside 	 Rust-coloured spots within yellowed areas The leaves usually turn yellow and drop off prematurely The yellow spots change color to red or dark brown a few days after the onset of the disease The disease can cause pods to get deep dark pits 	 Practice crop rotation with non- host plants Plant resistant/ tolerant varieties like Theresa and Super monet Spray fungicide containing Difenoconazole, Tebucanazole or Azoxystrobin 	White to brown raised spots on bean leaves PC: Howard F. Schwartz, Colorado State University, Bugwood.org
Anthracnose (Colletotrichum lindemuthianum)	 This disease causes brown to black sunken lesions on pods and stems while lesions on the leaves are dark brown 	 Small yellowish watery spots on pods and stems that enlarge rapidly to become brownish Infected pods become shriveled Infected seeds in the pods become discolored Lesions develop on the stems often resulting in death of the plant 	 Destroy crop debris after harvest Practice crop rotation with non- host crops Plant clean certified seeds Plant resistant varieties like Paulista Spray fungicides containing Difenoconazole, Tebucanazole or Azoxystrobin 	Anthracnose infected bean pods PC: Infonet Biodivision

Angular leaf spot (Phaeoisariopsis griseola)	 Angular leaf spot lesions that are angular in shape Lesions are most characteristic on leaves 	 Angular leaf spot lesions that appear as gray or brown irregular spots that may be bordered by a chlorotic halo Lesions become necrotic and assume the angular shape characteristic of the disease Pod lesions are large, oval to circular, reddish brown spots, usually surrounded by a darker-colored 	 Plant clean certified seeds Plant resistant cultivars where available Rotation with nonhost crops Use resistant cultivars where available Avoid handling plants when they are wet, and limit overhead irrigation 	Irrugular angular leaf spot lesions on green bean leaves PC: Howard F. Schwartz
Powdery mildew (Erysiphe polygoni)	 Small yellow lesions limited by leaf veins occur on the upper side of the leaves The disease is prevalent under cool and wet conditions 	 Large yellow blotches on the pods The disease produces whitish or grey fungal mass on the leaf surface 	 Rotation with non-host crops Keep the field clean of debris and weeds Plant resistant cultivars where available Treat with approved fungicides 	Whitish fungal mass on French beans PC: Qingren Wang

Common bacterial blight (Xanthomonas axonopodis pv. phaseoli)	• This is a bacterial disease	 Irregularly shaped spots (2.5 cm wide) that are bordered by a lemon yellow ring Symptoms first appear on leaves as small, water-soaked spots, light green areas, or both As the spots enlarge, the tissue in the center dies and turns brown 	 Use disease-free seed Plant tolerant or resistant cultivars Practice crop rotation of 2 or more years between green bean/legume crops Eliminate alternate hosts such as volunteer beans and weeds Avoid overhead irrigation Avoid walking through wet fields Use a registered bactericide spray if weather conditions favor disease development Use copper fungicides on a 7 to 10 day schedule 	Common bacterial blight symptoms on leaves PC: Howard F. Schwartz; R. W. Samson
Bean Common Mosaic (Bean common mosaic virus and Bean common mosaic necrosis virus)	 The two viruses can be transmitted by seed This is a viral disease which is majorly transmitted by aphids 	 Mottled dark and light green patterns on leaves (mosaics) Leaves may be distorted (leaf curling and rolling) Yellow dots may be present on leaves Stunted growth of the crop 	 Plant only virus-free seed Control of aphid vectors Plant resistant varieties 	Bean common mosaic virus symptoms on bean foliage PC: Howard F. Schwartz

Damping off (<i>Pythium</i> spp., <i>Rhizoctonia</i> solani and <i>Fusarium</i> spp.)	 It is a soil borne fungal disease Caused by <i>Pythium</i> spp., <i>Rhizoctonia</i> solani, and <i>Fusarium</i> spp. The pathogens are transmitted by irrigation water, soil and equipments 	 Infected seeds do not germinate Seeds may rot prior to germination (seed decay) or soon after emergence (post-emergence damping-off) Stem of the seedling becomes infected and tissues become discolored and soft, resulting in the seedling toppling over after it has emerged from the ground Seedlings rot and eventually die White cottony growth is seen on the roots of the infected young plants 	 Destroy crop debris after harvest Practice crop rotation with non- host crops Plant clean certified seeds Avoid excess irrigation or long drought stress Seed treatment with fungicides containing tetramethylthiuram disulfide or dicarboximide Drench soil with a suitable fungicide 	Symptoms of bean damping-off PC: UC IPM
Root rot (Fusarium, Rhizoctonia and Pythium)	 Caused by a complex of <i>Fusarium, Rhizoctonia</i> and <i>Pythium</i> fungi Infected plants have a skimpy root system with most small roots missing 	 Seedlings emerge from the soil and then turn yellow and die A dark area of decay may be present on the main stem near the soil line Plants begin to wilt on hot days and show little new growth Even with watering, plants die within a few days Often one or two plants die while others nearby show no symptoms 	 Destroy crop debris after harvest Practice crop rotation with non- host crops Plant clean certified seeds Avoid excess irrigation or long drought stress Seed treatment with fungicides containing tetramethylthiuram disulfide or dicarboximide 	Green bean plants infected by <i>Fusarium</i> , <i>Rhizoctonia</i> and <i>Pythium</i> fungi PC: Howard F. Schwartz

Fusarium wilt/ Fusarium root rot (Fusarium oxysporum f.sp. phaseoli)	 It is both seed-borne and soil- borne Fungus can survive in soil for several years It may become established in many types of soil, but it is likely to cause most damage on light, sandy soils 	 Young plants stunted with chlorotic leaves Sudden yellowing of leaves which eventually fall off Severely decayed roots which are hollow and dry The vascular tissues are discoloured which cause death of the plant after sometime If an infected plant is uprooted, the roots are partially or totally reddish- brown in colour 	 Practice long term crop rotation (4 to 6 years) Deeply plough the fields and leave them fallow for 2-3 months, where feasible Use certified, disease-free seeds Avoid over or under watering plants Raise soil pH by applying lime or farmyard manure where soil is acidic Keep fields weed- free Some bean varieties exhibit some tolerance 	Fusarium wilt of beans PC: A.M. VarelaFoots of beans showing advanced symptoms of Fusarium root rot PC: Yuan-Min Shen
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PC - Photo Credit

3.2 Major quarantine pests of French beans

The major quarantine pests of French beans include:

- i. Bollworms (Helicoverpa spp.)
- ii. Leaf miner (*Liriomyza* spp.)
- iii. White flies (Bemisia tabaci)
- iv. Thrips (Frankliniella occidentals, Megalurothrips sjostedti, Hydatothrips adolfifriderici and Frankliniella williamsi)
- v. Spider mites (*Tetranychus urticae*)

4. Harvesting

- French beans are ready for harvesting in 45-60 days before the pods are fully grown
- Harvesting continues for the next 21 days
- Picking of the pods is usually done two to three times in a week to maintain export quality
- The harvesting interval is based on the market specifications, for instance, twice a week for the fine French beans and three times a week for the extra fine beans
- Harvestable bean pods should be straight, tender, bright green with tender beans
- The colour of French beans is an important visual quality parameter; after harvest the pods should be light green or yellowish in colour
- The seeds in the pods enlarge and become harder as they mature
- Therefore, it is important to avoid harvesting mature bean pods which are fibrous, less tender and lose green colour
- An acre can produce 4 to 6 tonnes of French beans

To ensure good quality of harvested French beans, the following considerations and practices are important:

- i. Harvest frequency should be adjusted to the type of bean exported
- ii. Extra fine beans (Kenya) are picked every day
- iii. It is advised that Bobby beans should be picked every three or four days and filet beans every two days
- iv. These intervals should be maintained throughout production so as not to penalise commercial performance by large amounts of sorting rejects
- v. Proper harvesting of pods entails holding the plant by one hand and striping the pods with the other hand
- vi. The stalks should remain attached to the pods
- vii. Harvesting should be done early in the morning to prevent heat injury; but not if the plants are too wet
- viii. The pickers must be made aware of the specific quality requirements of these beans.
- ix. Workers should wash hands or wear gloves to prevent pod contamination
- x. Mechanical injury and bruising of pods should be minimized by avoiding use of harvesting containers with sharp edges
- i. Particular care is needed to conserve the quality of the harvest:

- Harvest boxes should not be over-filled (to avoid any risk of crushing)
- Freshness should be conserved by not leaving produce in the sun

ii. The bean pods should be kept under a shade immediately after harvest (Figure 5). This is because the pods begin to lose their quality immediately after harvest



Figure 5: Temporary French beans holding sheds

5. Post-harvest handling

5.1 Handling French beans immediately after harvest

- Post-harvest control starts in the field
- French beans are harvested immature and therefore, they are highly perishable due to the high moisture content of the pods
- Poor handling often results to shrivelling due to moisture loss as well as decay due to microbial growth and injury of the pods
- Therefore, care should be taken in order to conserve quality of the produce
- The harvested beans should not be left in direct sun, and the harvest boxes should not be overfilled

- The harvested bean pods should be stored in clean plastic containers covered with a damp cloth to prevent shrivelling
- Storage at lower than recommended temperature results in chilling injury
- After harvest, green pods should be immediately cooled under shade and ventilated area to remove field heat, reduce microbial growth and shrivelling
- French beans can also be refrigerated for up to 21 days



Figure 6: Poorly stored harvested French beans (A), and well stored and arranged produce (B)



Figure 7: Well packaged French beans wrapped in a punnet to prevent shrivelling

5.2 Sorting and grading

Sorting is done to remove immature, over-mature, broken, twisted, perforated, diseased pods as well as plant debris while grading should be done according to size of the produce. Sorting enhances quality and reduces potential spread of postharvest diseases. Sorting can be done on a table or a conveyer belt; while grading can be done either in the farm immediately after harvest or at a collection centre. French beans are graded in three categories:

- i. Extra fine The pods are less than 6mm in width, minimum 10cm long, straight, tender and seedless with no strings
- **ii. Fine grade** The pods have a width of 6-9mm, length of between 12-14cm, are short with soft string and may have small seeds
- iii. Booby Grade Pod width is more than 9mm, longer than 14cm, tender with small seeds



Figure 8: Sorting and grading of French beans

5.3 Packaging

For the export market, operations involved in packing result in boxes of produce that must be in conformity with the European Union quality standard for French beans (standard EC 912/2001¹). For this, the produce must be sorted after picking in order to:

- i. Remove pods that are broken, perforated, twisted, etc
- ii. Remove plant debris (leaves and stalks)
- iii. Grade the beans by size

The pods are packaged in different containers based on the target market. The most common packaging is fibreboard boxes, perforated plastic bags or plastic prepacks. Uniform sizing in the crate or carton is vital for acceptance by the buyers. Packaging boxes for export should be labelled with information such as the origin of the produce, name of producer(s) and category size. Temperature loggers are often placed at the base of the bottom and top of the packaging unit to monitor temperature.



Figure 9: Examples of different types of boxes used for packaging French beans

There are various suppliers of food grade packaging containers in Kenya as outlined in Table 4.

^{1 &}lt;u>https://op.europa.eu/en/publication-detail/-/publication/6f424c13-aa8b-4e8d-8e16-ee2a16164a72/</u> language-en
Table 4: Examples of key suppliers of food grade packaging containers in Kenya (as at August 2022)

S/No	Company name	Web address
1	General Plastics Limited	https://www.genplastkenya.com/
2	Propak Kenya Limited	http://www.propack-kenya.com/
3	Nampak Kenya Limited	http://www.nampak.com/products/metals/kenya
4	Flexipac Limited	http://www.flexipac.co.ke/flexipac-kenya-limited/
5	Techpak Industries Limited	https://www.techpakindustries.com/
6	Statpack Industries	https://www.statpack.co.ke/
7	Platinum Packaging	https://www.ppl.co.ke/
8	Dune Packaging Limited	https://www.dunepackaging.com/
9	Packaging Industries Limited	https://www.pil.co.ke/
10	Thermopak Kenya	https://thermopakkenya.com/
11	Blowplast Limited	https://blowplastkenya.com/
12	East Africa Packaging Industries	https://eapi.co.ke/

5.4 Labelling

Each box packed for the export market must show the product characteristics by displaying the following information:

- Name of producer/exporter and address
- Name and variety of the produce (if the produce is not visible from the outside of the packaging)
- Product quantity
- Class and size (referring to the marketing standards)
- Country of origin
- Lot number for traceability or GGN if certified GLOBALG.A.P. (recommended)
- Official control mark to replace name and address of the packer (optional)
- Organic certification, including name of inspection body and certification number (if applicable)
- Recyclable symbols and the green dot where they apply

5.4.1 Labelling for the EU market

- Food placed on the EU market must meet the legislation on food labelling
- Trade packages and cartons of fresh fruit or vegetables must mention the following particulars:
- xi. Name and address of the packer or dispatcher
- xii. Name and variety of the produce (if the produce is not visible from the outside of the packaging)
- xiii. Country of origin
- xiv. Class and size (referring to the marketing standards)

- xv. Lot number for traceability or GGN if certified GLOBALG.A.P. (recommended)
- xvi. Official control mark to replace name and address of the packer (optional)
- xvii. Organic certification, including name of inspection body and certification number (if applicable)

When fruits or vegetables are processed or directly packed for consumption, you must include appropriate labelling for consumers:

- i. Common name of the product
- ii. Full name of the country of origin
- iii. Name and address of the producer, packer, importer, brand owner or seller (retailer) in the EU who places the product on the market, and the wording "Packed for:", if applicable
- iv. Net content in weight
- v. Minimum durability a best-before date (on all processed fruits and vegetables)
- vi. Producer identification or lot number
- vii. List of ingredients (if applicable), including additives and post-harvest treatment
- viii. Allergenic declaration (if applicable)
- ix. Declaration of nutritional value (when mixed with other foodstuffs)
- x. Packed in protective atmosphere, if applicable
- The EU requires that the text on the label must be written in one of the official languages of an EU Member State and be understandable for the consumer
- Packaging marketed within Europe must comply with the general requirements and specific provisions
- These aim at protecting the environment and preventing any risk to the health of consumers
- The packaging must protect the product against contamination, leakage and dehydration
- Also pay attention to your buyer's preference for presentation, such as individual wrapping or sortation (for example, one side up)
- Products and packaging should be uniform

5.5 Storage at the warehouse

- Storage temperature affects the quality of bean pods
- Soon after packing, the produce should be kept in a cold room
- The optimum refrigeration conditions for French bean pods are 5-8 °C and 95-100% relative humidity
- Pods can remain under these storage conditions for at least 12 days without change in the acceptable appearance
- Indeed, bean pods can be kept for up to 4 weeks without major deterioration in quality
- For short term storage, French beans can store for a week at 4 °C and 80% relative humidity



Figure 10: Storage of packaged French beans in a warehouse before transportation

5.5.1 Storage conditions for the export market

It is important to observe the following during storage of French beans for the export market:

- Whatever the transport method chosen (air or sea), it is essential that the produce is placed in cold store as soon as it has been packed
- The minimum storage temperature is about 4°C which makes it possible to store French beans for about a week
- This approach is applied for export of French beans by sea
- For shorter marketing channels (air freight) and for fine grade beans, storage temperature should range from 10 to 12°C
- In addition to the question of temperature, the storage atmosphere for packed products should have relative humidity of around 80% for storage at 4°C and 90 to 95% for storage at 10 to 12°C
- Excessive humidity can cause changes in appearance of the pods; and can also result in growth of moulds on the pods
- This is especially important for produce transported in refrigerated containers
- Packed produce is stored in cold rooms with moderate ventilation to avoid drying of the pods
- It is important not to break the cold chain when the produce has reached its destination in order to conserve quality of the beans

5.6 Transportation and marketing

- Transportation of French beans from the field after harvest should be done as soon as possible to reduce water loss and prevent shrivelling
- Depending on the volume of the harvest and the location of the farm, the harvested French beans can be transported to a central collection point where they are picked up by a truck
- Sometimes a truck picks up the beans from the farms located near the road
- Farms far away from the road usually transport their produce to a central collection point
- This transport can take place before or after grading and packing
- Transportation to the main market takes place mainly in the evening when temperatures are lower
- Where possible, use of refrigerated transportation is encouraged



Figure 11: Enclosed transport truck (A) loaded with packed French beans (B)

5.6.1 Logistics providers

There are several logistics companies in Kenya that would support transportation of French beans to the desired destination. The leading global logistics companies in Kenya are outlined in Table 5; while other logistics companies can be assessed on: <u>https://azfreight.com/country-facility/</u><u>freight-forwarders-in-kenya/</u>. The top 50 Global Third-Party Logistics Providers (as of September 2021) are listed in the website: <u>https://www.3plogistics.com/3pl-market-info-resources/3pl-market-information/aas-top-50-global-third-party-logistics-providers-3pls-list/</u> (Armstrong and Associates Inc).

S/No	Company name	Web address
1	Maersk Logistics	https://www.maersk.com/local-information/africa/kenya
2	Kuehne + Nagel	www.home.kuehne-nagel.com
3	Hapag-Lloyd Container Shipping	https://www.hapag-lloyd.com/en/
4	Jansen & Heuning Bulk Handling Systems	https://www.jh.nl/en/contact/
5	DB Schenker	https://www.dbschenker.com/ke-en

Table 5: Examples of global logistics companies in Kenya

6. Requirements for export of French beans from Kenya

Export of fresh fruits and vegetables in Kenya is regulated by the Agriculture and Food Authority (AFA) under its Horticultural Crops Directorate (HCD). HCD as the competent authority of the horticultural sub-sector in Kenya is charged with the responsibility of promoting the development of horticultural crops, licensing exporters and disseminating information on horticultural marketing. To export French beans from the country, there are various documents that are required and fall in different categories:

6.1 Required documents, permits, licenses and business premises

6.1.1 Legal documentation and licensing requirements

To export horticultural products, including French beans, the following legal documents and licenses are mandatory:

- i. A Certificate of Business Incorporation/Registration from the Registrar of Companies
- ii. Obtain an Export Permit from the Horticultural Crops Directorate (HCD), Agriculture Food Authority (AFA) on the fulfilment of the following conditions:
 - Submit copies of Certificate of Incorporation/Registration
 - Photocopy of ID cards of all the Directors (passport or work permit if they are foreigners)
 - Packing facilities inspection report
 - Register the contract (between the producer and exporter) with the HCD indicating produce price, quantity and quality requirements
 - Company stamp and authorized signatory of the applicant
 - Details of a bank account
 - Declaration of source of produce
 - i. If you are a grower, indicate the location of the land and the total acreage under production
 - ii. If not, provide written contracts with farmers for supply of produce of a certain quality and standard, unless you are producing the export crop yourself
 - You will also need to have or demonstrate access to:
 - i. Packing facilities (shed, grading hall, cold store, etc)
 - An adequate knowledge of quality standards for horticultural produce on the market (Good Agricultural Practices, GAP; Traceability; Maximum Residue Level, MRLs; Post Harvest Handling procedures, KEBS etc)
 - iii. Documentary evidence from your overseas client, that you are ready to start an export business e.g. an order from the client, or agreement to start business etc.
 - Export Licence fees payable to the HCD:
 - i. Export License fees
 - ii. New/Renewal forms are obtained in the AFA Website, HCD Section (<u>http://</u> <u>horticulture.agricultureauthority.go.ke/index.php/export-import-guidelines</u>)

6.1.2 Business infrastructure

- Acquire a trading premise (office, pack house, cold store)
- Establish communication infrastructure Address, Telephone, Fax, Email address, Skype

6.1.3 Technical requirements for all applications

- i. Farm inspection for all produce source
- ii. Pack house inspection for packing facility The facility where the produce is handled,

must be inspected by HCD to ensure that the facility is clean and the staff observe hygiene. Once the facility has been inspected and is in full compliance to the standards, HCD will issue a packhouse inspection report. Before pack house inspection by the HCD officials, the farmer or exporter must have met all the requirements, including a food hygiene licence, valid medical certificates for the personnel of the premises and protective clothing and equipment

- The owner must give a list of:
 - Produce handling staff
 - Traceability procedure (copy) which should contain farm codes, produce collection notes and codes, stock records, protective clothing and equipment for personnel handling the produce and packing facility
- iii. PS I or II form (farm/farmer details) and a soft copy forwarded to: <u>hcdtechnical@gmail.</u> <u>com</u> (Excel format)
- iv. Produce contracts for contracted sources between the farmer and buyer witnessed by HCD
- v. Inspection of transport facility
- vi. Seed and pesticide purchase receipts (for French beans and peas)
- vii. Demonstrate traceability system (farm to packhouse)
- viii. Declaration of clearing and forwarding agents

Please note:

- All documents should be put in order as per the Vetting Checklist
- Registration fee of Ksh. 5,000/= per year
- Cess deposit fee of Ksh. 5,000/=



THE AGRICULTURE FOOD AUTHORITY (AFA) HORTICULTURAL CROPS DIRECTORATE

Nairobi Horticultural Centre P.O. Box 42601 - 00100 Nairobi

	PS I FORM [(COMPANY OWN FARM(S)]									
COMP	ANY NAME							Physical busines	ss location:	
Phone	No.							Date:		
			farm ((s) details				crop	production det	tails
No	No Farm name Crace County Count/Ward Location Own row)				Area of Crop (acre)	No of Trees (for fruit trees)	Production perseason (Kg)	Certification Status		
	NOTE:									

Name

Email: directorhcd@afa.go.ke

Website: www.afa.go.ke

Email: directorhcd@afa.go.ke Website: www.afa.go.ke

Signature

Stamp



THE AGRICULTURE FOOD AUTHORITY (AFA) HORTICULTURAL CROPS DIRECTORATE

Nairobi Horticultural Centre P.O. Box 42601 - 00100 Nairobi

	PS II FORM [(CONTRACTED FARM(S)]									
COMP	COMPANY NAME Physical business location:									
Phone	No.							Date:		
			farm	(s) details				crop	production det	tails
No	Farm name	Trace code	County	Sub County/ward	Specific farm Location	Crop (provide information for each crop in its own row)	Area of Crop (acre)	No of Trees (for fruit trees)	Production per season (Kg)	Certification Status
NOTE:										
Name				Signature			Stamp			

Figure 12: Samples of PS I or PS II forms for company farm and contracted farmers, respectively

6.1.3.1 Legal and non-legal technical quality requirements for export of French beans

French beans destined for the export markets have to meet several legal and non-legal technical quality requirements. The legal requirements include:

- i. MRLs for pesticides and contaminants
- ii. Traceability
- iii. Product conformity
- iv. Product integrity
- v. Pod size specifications
- vi. Labelling
- vii. Packaging

The produce is subjected to official control to ensure food safety and compliance with the legal requirements, including:

- i. Documentary checks
- ii. Identity checks
- iii. Traceability
- iv. Conformity to the required market standards

The required documentation includes

- i. Bill of landing
- ii. Phytosanitary certificate
- iii. Codex Alimentarius food safety standards certification
- iv. Packing list
- v. Customs clearance
- vi. A unique traceability code In most cases, lot number or Global-GAP Number (GGN) are used as the traceability code.
 - The non-legal requirements address social and environmental compliance.

6.1.4 Prerequisite licenses and certificates required for export of French beans

The following are the prerequisite licenses and certificates required for export of fresh fruits and vegetables, including French beans:

i. Export licence from HCD

Requires a registration fee of Ksh. 5,000 yearly

ii. Phytosanitary and conformity certificates from KEPHIS

This is a phytosanitary certificate that certifies that the French beans are free from regulated pests and conforms to other phytosanitary requirements of the importing country. Issuance of the phytosanitary certificate is regulated by Kenya Plant Health Inspectorate Service (KEPHIS). Traders are required to obtain a phytosanitary certificate for each consignment. The phytosanitary certificate must guarantee that a product is:

- Properly inspected
- Free from quarantine pests; within the requirements for regulated non-quarantine pests and practically free from other pests

• For export to the EU, the certificate guarantees that the product is in line with phytosanitary requirements that are laid down in the EU Regulation 2019/2072²

iii. Euro 1 Certificate (For EU Market)

- Issued for those exporting to EU markets
- The certificate demonstrates that goods are of preferential origin

iv. GlobalGAP Certification

• This certificate shows that the exporting farmer has engaged in Good Agricultural Practices that ensures that crops have been grown in safe, healthy and responsible way

v. MRL limit compliance (EU)

- This certificate is important for exporters to EU markets
- It confirms that farmers are abiding to the right pesticides and herbicides application when they are growing their produce

vi. BRC certification

• For UK supermarkets, exporters require BRC certification which guarantees the standardization of quality, safety and operational criteria and ensure that producers or exporters fulfil their legal obligations and provide protection for the end consumer

6.2 Procedure and documents required to export French beans from Kenya

The checklist of the documents required to export French beans from Kenya and the stepwise procedure of applying for the export license can be accessed from the HCD website³ or infotradekenya.go.ke⁴. The required documents fall under two categories depending on whether it is a new application or a renewal:

6.2.1 Documents required for new applicants

- i. Certified copy of Certificate of Business Registration from the Registrar of companies
- ii. A certified copy of the company KRA pin
- iii. Certified copies of memorandum and articles of association
- iv. Copies of Identity Cards of all the Directors. A photocopy of passport and work permit if a Director or Directors are foreigners
- v. Documentary evidence from overseas clients e.g. a letter, fax or e-mail that you are ready to start an export business
- vi. Knowledge of the requirements from overseas market
- vii. County Government business permit
- viii. Typed application form 1A and 1B

4 https://infotradekenya.go.ke/media/HCD%20EXPORTER%20REGISTRATIONS%20CHECKLIST.pdf

^{2 &}lt;u>https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32019R2072</u>

^{3 &}lt;u>http://horticulture.agricultureauthority.go.ke/index.php/export-import-guidelines</u>

- ix. Certified Tax compliance certificate
- x. KEPHIS phytosanitary statement for one calendar year

6.2.2 Documents required for renewals

- i. Clearance of outstanding cess amount receipt from HCD Finance
- ii. Dully filled Export Quarterly returns (EQS forms) for the last two years
- iii. Tax Compliance Certificate
- iv. County Government business permit
- v. Dully filled Form 1A (Typed)
- vi. Dully filled Form 2A (Typed)
- vii. Clearance letter/recommendation from a relevant horticulture association
- viii. No outstanding farmers claims
- ix. No outstanding non conformity issues raised for systems audit on notifications and interceptions

FORM 1A FORM 1A AGRICULTURE, FISHERIES AND FOOD AUTHORITY HORTOLITUREL ACCORD SIDNELFORMET Nords Horicolural Gamer water (SA) 24 A Dae Cold - 00 ID Nainda, Hopbane 120 - 308649, 620-213 IS/0 Enail: and according and any interference of the second state of the s	FORM 1 B CARRICULTURE, FISHERIES AND FOOD AUTHORITY HORTICULTURAL CROPS DIRECTORATE Nairabi Horticultural Model Qualities / Website: www.lccla.or.kg
1. Full Name of Applicant:	
2. Postal Address:	APPLICATION FOR EXPORT LICENCE FOR THE YEARS
E-mail:	
	Name of applicant
3. Location of premises:	a) List of shareholders / Directors, their Citizenship and percentage shareholding for each
4. When was the exporting firm established:	NAME CTTIZENSHIP % OF SHARES
5. is the Applicant engaged in any other business:	
6. If so give particulars:	b)Location of offices including Telephone ,Fax and Telex numbers.
Name	Location
	Tel. No
Address	Email
7 Jf so give particulars	c) Overseas markets to be supplied and terms of payment
Name:	Specify the prices of the customers
Address	Name and Address of your bankers
8. How long has the applicant been exporting fruits, vegetables and flowers?	
Name and Address of your Bankers:	
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Figure 13: Samples of forms 1A and 1B that need to be filled by new applicants who intend to export French beans from Kenya.

6.3 Enforcement and facilitation of phytosanitary and quality regulations in Kenya

Government institutions that enforce phytosanitary and quality standards in fresh vegetables in Kenya include:

- i. Horticultural Crops Directorate (HCD)
- ii. Kenya Plant Health Inspectorate Services (KEPHIS)

- iii. Ministry of Agriculture
- iv. Pest Control Products Board (PCPB)
 - The Fresh Produce Exporters Association of Kenya (FPEAK) and Kenya-GAP are private institutions and standards that facilitate the implementation of phytosanitary and quality regulations.
 - KEPHIS is the National Plant Protection Organization (NPPO) in Kenya, and it is mandated to enforce compliance with phytosanitary and quality requirements in the export of agricultural produce. Harvested French bean pods are subject to checks for pesticide residues at an accredited KEPHIS laboratory and inspection for the presence of pests at the port of exit.
 - KEPHIS, in collaboration with stakeholders in the horticultural sub-sector, ensures early detection of pests and pesticide residues and trains smallholder farmers on produce quality management and traceability.
 - KEPHIS is also responsible for the certification of fresh produce exporters to ensure compliance with phytosanitary and quality standards along the commodity value chain.

6.4 Stepwise summary of exporting French beans from Kenya

- The farmer or exporter must meet all necessary requirements including a food hygiene licence, valid medical certificates for the personnel of the pack house premises and protective clothing and equipment.
- Pack house inspection by the HCD officials HCD must ensure that the pack house is safe, free of waste materials, has adequate ventilation, temperature control, lighting and designed to prevent entry of animals, pests, insects and dust.
- iii. Farm inspection the farm is assessed to check if it has good security, hygiene, grading facility, storage area, plastic crates and pallets, ventilation and a waste disposal facility.
- iv. Farmer fills and submits an application for export licence at HCD This step requires nine other documents to be attached; including the already obtained reports, business permit, and tax compliance certificate.
 - A notification for approval is given before a farmer pays Ksh. 10,000 Ksh. 5,000 is export licence fee and a similar amount for advance cess fee, a form of levy imposed on all horticultural crops for export.
- v. Register to become an exporter at KEPHIS. The application costs Ksh 15,000, which comprises a deposit for phytosanitary certificates and farm inspection.
- vi. KEPHIS will subsequently carry out an audit, then training on electronic certification system, which can be done physically or on phone, and later they give the farmer an export authorisation letter via mail.
- vii. Compulsory three-day training done by KenTrade, aimed at acquainting the trader with the industry.
 - For training in Nairobi and Mombasa, one pays Sh10,000, while those trained in regional offices have to pay Ksh. 18,000.

- viii. A farmer or exporter registers their company with the Kenya National TradeNet System (KESWS), where one can transact online and access trade-related procedures and updates.
- ix. Obtaining a European Union (EU) certificate of origin. This is obtained from KRA after submitting an application and then the taxman has to verify the origin of the product at the premises.
 - KRA gives a registration letter and payment authorisation slip, which one is required to produce while making payment of Ksh 300 at the bank for issuance of the EU certificate of origin.
 - Since the original EU certificate of origin must be typed and not handwritten, an entity known as Typesetting Company is mandated to do the typing.
 - It should then be submitted for signing at KRA Forodha House in Nairobi.
- x. Obtaining export clearance from HCD HCD tests the export samples and issues the trader with a laboratory analysis and evaluation sheet.
 - Only after approval can one get an export clearance, which is sent via mail.
- xi. Issuance of phytosanitary certificate by KEPHIS.
 - A request for inspection of consignment is placed and once cleared, an application for a phytosanitary certificate is also done
 - Ksh. 500 is paid for the licence that comes out after an hour.
- xii. Certificate of conformity while this certificate is not a mandatory requirement, it may be needed by some markets such as the EU and is therefore issued upon the request of the applicant.
- xiii. Export health certificate one pays Sh1,500 to KenTrade to get this certificate.
- xiv. Another consignment inspection is done by PHS.
 - This paves the way for the final stage of clearance of the consignment.
- xv. Contract a clearing agent at the Kenya International Freight and Warehousing Association (KIFWA).
 - The clearing agent is paid 1% of the total value of the goods.
- xvi. Customs entry is lodged at KRA before payment for airline concession fee of Ksh. 250 at the bank.
- xvii. A trader submits the documents for verification, still at the customs shed, followed by physical verification of the consignment.
- xviii. A pass entry is obtained and documents submitted for perfection.

Stringent regulations

- xix. A farmer/exporter obtains a certificate of export number, which is a confirmation that the export procedure is complete.
 - The exporter can use it to claim VAT from the government where applicable.
 - The certificate is issued to the applicant upon request at a cost of Ksh. 500, otherwise the Department only issues the certificate number.

At the end of it all, one ends up with 11 documents namely:

- i. Food hygiene licence
- ii. Pack house inspection report
- iii. Farm inspection report
- iv. HVD export licence
- v. Export authorisation letter
- vi. User credentials
- vii. Authentication EU certificate of origin
- viii. Export clearance
- ix. Phytosanitary certificate
- x. Export health certificate
- xi. Certificate of export number

At the end of it all, you will have paid approximately Ksh. 40,000 minus the costs of transport.

6.5 Export documentation requirements

Every consignment of French beans (and horticultural products) requires the following documents that are mandatory:

- i. Phytosanitary Certificate (from Kenya Plant Health Inspectorate Services) issued at the ports of exit after inspection
- ii. Certificate of Origin (depending on the destination market)
 - COMESA Certificate of Origin for products destined to COMESA countries
 - EAC Certificate of Origin for products destined to EAC Countries
 - EUR 1 Form for products destined to European Union
 - GSP form for products destined to USA, Japan, Australia, and Canada etc
 - Ordinary Certificate of Origin for products destine to Middle East, India, Central Europe, etc
 - AGOA certificate of origin for products destined to the US
- iii. Commercial Invoice
- iv. Bill of lading (sea freight), Airway bill (for air freight)
- v. Packing List

6.6 Requirements and standards for exporting French beans to the EU market

When exporting fresh fruits and vegetables to Europe, you have to comply with the requirements for food safety and product quality. For a full list of legal requirements, consult My Trade Assistant of Access2Markets⁵, where you can select French beans code under Chapters 07 and 08.

6.6.1 French beans specifications for the EU market

To export French beans to the EU market, the exporter must comply with the following specifications:

- The length should be a minimum 8 cm and maximum 10 cm with a diameter of between 4 mm and 6 mm
- The colour should be mid to dark green with a pest and disease tolerance of 0-5 percent rust and 0-5 percent anthracnose
- However, most supermarkets demand totally blemish-free French beans

More specifically, the following specifications apply to the various French bean grades for the European market:

- i. Extra fine
 - Length: minimum 8 cm, maximum 10 cm
 - Diameter: minimum 4 mm, maximum 6 mm
 - Turgidity: should be less than 5% flaccid
 - Colour: mid to dark green colour
 - Straight pods with very slight curvature
 - Pest and disease tolerance: 0-5% rust and 0-5% anthracnose
 - However, most supermarkets demand totally blemish-free

ii. Fine

- Length: minimum 10 cm, maximum 17 cm
- Diameter: minimum 6 mm, maximum 9 mm
- Flesh mostly juicy and crisp
- Pest and disease tolerance: < 5% (pest damage, pest infestation and mechanical damage).
- However, most supermarkets demand totally blemish-free crunchy and moist (with < 3% dehydration visible)
- iii. Bobby
 - Length: minimum 14 cm, maximum 17 cm
 - Diameter: minimum 8 mm, maximum 10 mm
 - Most supermarkets demand totally blemish-free

6.6.2 Private standards in European Union and other countries

Private standards in EU, non-EU and other countries (e.g. USA, Japan, and Middle East) keep on changing with time, and therefore, individual markets may have additional private standard requirements (check with HCD and/or your contracted export company). Specifications may vary within the EU countries and other European countries.

6.6.3 Buyer requirements for French beans in the European market

Exporting fresh fruits and vegetables to Europe requires you to keep high standards of food safety and quality. Responsible social and environmental conduct has also become a pre-condition to do business, and buyers often ask for certifications as a guarantee. However, there are also opportunities to distinguish yourself by applying additional or niche market standards. Buyer requirements can be divided into:

- i. Musts/compulsory (e.g. legal requirements), which must be met in order to enter the market
- ii. Common requirements (which have been implemented by most competitors), with which you should comply in order to stay abreast of the market
- iii. Niche market requirements for specific segments

The following requirements and standards are mandatory in order to export to the EU market:

6.6.4 Limited use of pesticides

- This is a mandatory requirement in the EU market.
- According to the Rapid Alert System for Food and Feed (RASFF) Annual Report 2020⁶, pesticide residues were the main reason for food safety notifications for fruits and vegetables in Europe
- To avoid health and environmental risks, the EU) has set maximum residue levels (MRLs) for pesticides in and on food products
- Products containing more pesticides than allowed will be withdrawn from the European market
- MRLs can become stricter with new insights from Europe's food safety authorities.
- Buyers in the UK and several EU member states such as Germany, the Netherlands and Austria use MRLs which are stricter than the MRLs laid down in the European legislation Supermarket chains maintain the highest standards and generally demand 33% to 100% of the legal MRL
- The German supermarket chain Lidl is one of the strictest, with a limit of 33% of the EU legal standard for single active substances
- Pesticide management takes a lot of responsibility on your part as a producer or exporter
- More and more buyers ask for upfront information about your pesticide spray records, and shipments are checked before they are sent to the retailer
- For future business, you must take into account that your responsibility as an exporter will play an important role as retail chains put more pressure on their suppliers

6.6.4.1 Regulations of use of pesticides: Example of Chlorpyrifos

- One of the major pesticide challenges in 2020 was residues of Chlorpyrifos
- Chlorpyrifos and chlorpyrifos-methyl are insecticides used to control insect pests on a range of crops
- The EU made a decision not to renew the approvals of chlorpyrifos and chlorpyrifosmethyl

^{6 &}lt;u>https://food.ec.europa.eu/safety/rasff-food-and-feed-safety-alerts/reports-and-publications_en</u>

- Around October 2020, the new lowered MRL became applicable both to food produced in the EU and to imports
- It is therefore important to observe the following:
 - Use the EU Pesticide Database to find out the MRLs that are relevant for French beans. You can select French beans or a pesticide and the database shows the list of associated MRLs
 - Always check whether your buyers have additional requirements for MRLs and pesticide use
 - ii. Apply integrated pest management (IPM) to reduce the amount of pesticide
 - IPM is an agricultural pest control strategy which is also part of GLOBALG.A.P. certification
 - IPM uses natural control practices such as the application of pests' natural enemies
 - The fewer chemicals you use, the better your marketing position will be for export to Europe

6.6.5 Regulations on maximum residue level (MRL) in French beans

- Maximum residue level (MRL) is the highest level of a pesticide residue or a contaminant that is legally tolerated in or on food or feed.
- Contaminants include heavy metals such as cadmium, lead, mercury and tin, which may contaminate the commodity during production, packaging, transportation, or storage.
- The European Commission directive 2009/128/EC gives a general default MRL of 0.01 mg/kg where a pesticide is not explicitly mentioned (EC, 2009) for most fresh fruits and vegetables.
- The amounts of pesticide residues in or on food must be safe for consumers and must be as low as possible.
- The MRLs requirements dictate that the produce should not contain banned or higher amounts of agrochemical pesticide residues.
- Pesticide residues in French bean pods destined to the EU should not exceed the set legal MRLs (Figure 14; Table 6).



Figure 14: Maximum residue levels (mg/kg) in French beans destined to the EU market Source: PCPB, 2019

Table 6: Maximum residue levels and postharvest interval (PHI) for selected synthetic pesticide	S
used in French beans production	

Active ingredient	Maximum residue levels (mg/ kg)	Post-harvest interval, PHI (Days)
Abamectin	0.01	7
Acetamiprid	0.06	7
Alpha-difenoconazole	0.01; 0.5	3.7
Azoxystrobin+ difenoconazole	1	7
Permethrin	1	7
Carbendazim	0.2	9
Chlorantranilliprole	0.1	3
Bifenthrin	0.5	7
Tebuconazole	0.14	14
Imadacloprid	2	8
Emamectin	0.01	7

Source: PCPB, 2019; Pesticide Residues in Food, 2019; USAID, 2014

- The EU's MRL harmonization advocates to improve access for countries like Kenya exporting French beans to the trading block.
- However, importers in the UK and within EU member states like Germany apply stricter MRLs rules than those of the EU.
- For example, the set MRLs by supermarket chains in the UK, Germany, the Netherlands, and Austria usually demand 33–70% of the legal MRL and upfront information on the commodity spray programs and pesticide application records.
- The non-uniform and always changing MRLs requirement in international markets is a challenge to Sub-Saharan African countries like Kenya that export fruits and vegetables.
- Data from the rapid alert system for food and feed (RASFF) shows Kenyan fruits and vegetables have been rejected at the ports of entry of the importing EU member countries (PRF, 2016) and the most affected vegetable due to border rejection are the fresh green beans.
- Detection of dimethoate in fresh green beans caused the highest number of border rejections in 2013 (PRF, 2016).

6.6.6 Avoiding contaminants

Contaminants are substances which have not been intentionally added to food but which may be present as a result of the various stages of its production, packaging, transport or holding. Similar to the MRLs for pesticides, the EU has set limits for several contaminants (Table 7). For fresh fruits and vegetables, the main concern will be the contamination with lead, cadmium and nitrate.

Contaminant	Maximum level (mg/kg)
Lead	0.10
Cadmium	0.02
Nitrate (NO₃):	0.05

 Table 7: The current limits for lead and cadmium in French beans (January 2022)

- To address the challenge of contaminants in French beans, the following tips are important:
 - i. Maintain good contact with your buyers, because they will often keep you up to date with changes in regulation which affect the French beans business
 - Read more about contaminants on the website of the European Commission⁷
 and find an overview of the maximum contaminant levels in the Annex of
 Regulation (EC) 1881/2006⁸. Try to check this information on an annual basis
 - iii. Find out more about the prevention and reduction of Lead contamination in the Code of Practice published by the FAO Codex Alimentarius

^{7 &}lt;u>https://food.ec.europa.eu/safety/chemical-safety/contaminants_en</u>

^{8 &}lt;u>https://eur-lex.europa.eu/eli/reg/2006/1881/2022-01-01</u>

6.6.7 Marketing standards

- European legislation sets general and specific marketing standards for the minimum quality of fresh fruits and vegetables
- A marketing standard determines the characteristics of "Extra Class", Class I and Class II products, the minimum maturity, the different size codes, and the allowed tolerances in quality and size
- Over the years, the marketing standards have been aligned with the United Nations Economic Commission for Europe (UNECE) standards for fresh fruits and vegetables
- These standards provide guidance to businesses
- The preferred sizes sometimes vary between the different European markets, but the quality is generally "Extra Class" or Class I
- You might find a market for Class II products in some Eastern European countries, the processing industry or less formal segments
- Fresh products such as French beans that are not covered by a specific marketing standard have to comply with: The general marketing standards (GMS) in Annex I, Part A of EU Regulation No 543/2011; or the applicable UNECE standard (sometimes less strict than the EU standard)

6.6.8 Labelling and packaging specifications for French bean pods destined for EU markets

- The labelling and packaging specifications for French bean pods destined for EU markets require that the produce meets the specifications as per the legislation on food labelling (VCAD, 29018)
- The packaging materials should be new, clean, transparent, and should keep the pods intact without causing any damage (CBI, 2018; USAID-KHCP, 2011)
- Each package of freshly harvested pods should have a sticker label including:
 - i. The name and address of the packer
 - ii. Name and variety of the produce
 - iii. Country of origin
 - iv. Class and size
 - v. Lot number or the Global-GAP number (GGN) for traceability
 - vi. Official control mark.
- The premium quality requirements for French beans include pods being fresh, intact, and free of any foreign matter and pests, aesthetically acceptable, free of strange smell and taste, free from abnormal external moisture, and free from parchment (UNECE, 2017).
- The market standards also set out the minimum quality and maturity of the commodity and spell out the characteristics of the various quality classes such as Extra Class, Class I, and Class II products, the different size codes, and the allowed tolerances in quality and size (CBI, 2018).
- The produce must have a certificate of conformity with the commodity-specific standard.
- Fresh produce that is not covered by the particular standard must comply with the General Marketing Standards (GMS) of EU Regulation No. 543/2011 or the applicable UNECE standard (CBI, 2018; UNECE, 2017).
- French bean pods may be classified as extra class, class I, and class II, while pod size classes are extra-fine, fine, and bobby (UNECE, 2017; Infonet-Biovision, 2022) (Table 8).
- Uniformity as a provision of French bean presentation is paramount, and hence when

packaging the pods should be from the same origin, variety, class, and size (UNECE, 2017).

Table 8: Classification of French bean pods, size, and their attributes and quality tolerances

	Quality	Attributes	Quality tolerance
Quality classes			
Extra class	Superior quality	Turgid, quickly snapped, very tender, practically straight and stingless	5% of Class I
Class I	Good quality	Turgid, young and tender, practically stingless and slight defects in shape and colour accepted	10% of Class II No bean spot
Class II	Neither superior nor good quality	Reasonably tender and meets minimum requirements	10% of either class and or minimum requirements No bean spot
Size classes			
Extra fine		6 mm	
Fine		9 mm	10% not satisfying
Bobby/Medium		12 mm	Siver Size

Source: UNECE, 2017

6.7 Certification required for export of French beans to the European market

Food safety is a top priority in all European food sectors. Besides the EU legislation requirements, most buyers request extra guarantees from the exporter in form of certification. There are four categories of certification:

6.7.1 Voluntary certification requirements

- Food safety, environment, social and sustainability are high on the agenda of retailers
- In most cases voluntary industry standards are a minimum requirement
- However, several EU retailers require exporters to adhere to their internal standards which can exceed industry standards

6.7.2 Business-to-business (B2B) certification

All buyers in the supply chain, such as traders, food processors and retailers require implementation of a food safety management system based on hazard analysis and critical control points. Examples of such certification include:

6.7.2.1 GlobalGap certification

- It is the most commonly requested certification scheme, essential for exporting fresh produce to Europe
- It is considered a minimum requirement by importers, retailers and most European supermarkets
- Therefore, any producer and exporter should have GlobalGap certification
- GlobalGap is business-to-business pre-farmgate standard that covers the whole agricultural production process from before planting to the unprocessed product, including a chain of custody to enable full traceability
- GlobalGap focuses on food safety as well as the environment, labour conditions and product quality
- All products should be accompanied by a GGN number This is a 13-digit number that uniquely identifies each producer and individual member of a producer group in the GLOBALGAP database (<u>https://www.globalgap.org/uk_en/index.html</u>)

6.7.2.2 Hazard analysis and critical control points (HACCP)

Buyers may ask for the implementation of a food safety management system based on hazard analysis and critical control points (HACCP). The objective of this preventive strategy is to guarantee the safety of food for consumers by preventing, eliminating and reducing food safety risk to an acceptable level of hazard of any kind. Although HACCP is not a certified standard, it serves as a reference for the definition of standards such as ISO 9000 on food safety management. The objectives of the HACCP method are:

- i. To guarantee quality of the food marketed or served
- ii. To ensure safety of the consumer
- iii. To have a knowledge of the risks documented permanently and to control them based on certain procedures and preventive measures
- iv. Respect the regulations in force
- v. Avoiding food poisoning linked to the consumption of food contaminated by pathogenic micro-organisms

6.7.2.3 Food safety management systems

- In addition to GlobalGap, other food safety management systems may be required as well; for example, for the handling or processing of fresh fruits and vegetables
- Almost all buyers in the north-western European market (including the UK) require you to comply with the BRC Global Standards, which are widely applied as a standard for hygiene and food safety
- In Germany, the IFS food standard is common
- Alternative food safety management certification includes the Safe Quality Food (SQF) programme and FSSC 22000, an industry-standard developed by the International Organization for Standardization (ISO)
- All the mentioned management systems are recognised by the Global Food Safety Initiative (GFSI), implying that they are generally accepted by the major retailers

- Compliance with certification schemes varies between countries, trade channels and market situations
- Compliance with these standards will only become stricter and more widespread in the future

6.7.3 Social and environmental certification

- There is growing attention to the social and environmental conditions in the producing areas
- European buyers often have specific requirements, depending on their sales channels and product segments
- Most European buyers have a code of conduct, with which they expect producers and exporters to comply with
- Although product quality is the top priority, social and environmental compliance are becoming more and more important
- Initiatives in and attention to corporate social responsibility (CSR) vary across various parts of Europe
- In Eastern Europe, fewer buyers require strict social compliance, while in Western Europe, there are multinational buyers which have their own compliance programme
- Examples include Unilever's Sustainable Agriculture Code and Tesco's Nurture accreditation
- In some cases, the increasing attention to social and environmental conditions requires specific actions; for example, in water management in arid areas and in achieving 'living wages' in low income supply countries
- As an exporter you need to implement standards, especially when dealing with buyers that are linked to retail chains

6.7.3.1 Social business standards

The most common social or sustainable business standards for fresh fruits and vegetables include:

- i. SMETA (Sedex Members Ethical Trade Audit), a social audit
- ii. GLOBALG.A.P., including add-ons such as GRASP for social compliance and SPRING for sustainable irrigation and groundwater use
- iii. Rainforest Alliance, a certification that supports climate-smart agriculture and help reduce climate impacts
- iv. ISO 26000, a standard for social responsibility and ISO 14001 for environmental management
- v. Corporate Carbon Footprint of TÜV Rheinland
- vi. Fairtrade and environmental labels These certification labels are consumer-focused and are the most applicable to products from smallholder farms and main fruit and vegetable categories. Well-known fairtrade and environmental labels include:
 - **a.** The BRC Global Standard Provides technical standards for food safety, consumer protection and environmental protection.

b. International Featured Standards (IFS) - A safety standard for food processors and packers that corresponds to ISO 9001, but focuses on food safety, HACCP, hygiene, the manufacturing process and the company's environment.

6.7.3.2 Buyer initiatives for social compliance

Buyer initiatives which affect you as a supplier in terms of social compliance include:

- The IDH Sustainable Trade Initiative This is a Sustainability Initiative for Fruits and Vegetables (SIFAV), a pan-European covenant with over 30 partners, including retailers, brands, traders and civil-society organisations. The 2025 strategy focuses on reducing the environmental footprint across the supply chain, improving working conditions, wages and incomes, and strengthening due diligence reporting and transparency.
- ii. Amfori BSCI (Business Social Compliance Initiative) in north-western Europe,
 which includes a Code of Conduct for all its participants, and amfori BEPI (Business
 Environmental Performance Initiative) for environmental performance.
- iii. Sedex, a non-profit membership organisation to evaluate and manage your performance on labour rights, health and safety, the environment and business ethics.
- iv. The Ethical Trading Initiative (ETI) in the UK.

Table 9 summarizes the requirements by common EU buyers for compliance with social and environmental standards; while Table 10 provides details of the major horticultural products certification bodies in Kenya.

Name of certification	Туре	Markets where certification is mostly required
GLOBALG.A.P.	Agricultural practices	 Europe in general in particular northern Europe Supermarket segments
International Featured Standards (IFS)	Food Safety	 Germany France Also recognised in many other European markets
British Retail Consortium Global Standards (BRCGS)	Food Safety	 UK retail market Also very common in mainland Europe

Table 9: Examples of certification requirements by common buyers in the European Union market for compliance with social and environmental standards

Sedex Members Ethical Trade Audit (SMETA)	Social audit focused on working conditions	 UK Germany Most of the European buyers recognise the SMETA audit as a valid assessment
Business Social Compliance Initiative (amfori BSCI)	Social audit focused on working conditions	GermanyThe Netherlands
Rainforest Alliance	Environmental	 Large retail chains in northwest Europe
Fairtrade	Sustainability and ethics	The United KingdomGermanyBenelux
Organic	Sustainability and environmental	 European Union All European countries have their own national organic labels

Table 10: Major horticultural products certification bodies in Kenya

	Company name	Email/Telephone	Web address
1	SGS Kenya Ltd	0709633000	https://www.sgs.co.ke/
2	AfriCert Limited	info@africert.co.ke	www.africert.co.ke
3	Bureau Veritas Kenya Ltd	cer.nairobi@ke.bureauveritas.co	https://www.bureauveritas.ke/
4	Naturland- Verband	naturland@naturland.de	https://www.naturland.de/en/
5	Soil Association Certification Ltd	goorganic@soilassociation.org	https://www.soilassociation.org/certification/
6	EnCert Ltd	info@encert.co.ke	http://www.encert.co.ke/

The listed certification bodies may be accredited for GlobalGAP and/or organic production.

6.7.4 Organic certification

- More and more consumers in Europe prefer organic fruits and vegetables because of their natural and sustainable production methods and their connection to a healthy diet
- In countries such as Italy, Ireland, France, Germany and Sweden, organic fruits and vegetables represent around a fifth of the total organic demand
- To market organic products in Europe, you have to use organic production methods according to European legislation
- In order to sell organic certified French beans (and other fruits and vegetables), it is important to be aware that a commitment must be made to cultivate the crop organically
- Smallholders must demonstrate to inspectors of certification bodies that they used

organic farming methods such as crop rotation and natural pesticides for at least two years

- All organic products imported into the EU must have the appropriate electronic certificate of inspection (e-COI)
- These certificates are managed through the Trade Control and Expert System (TRACES)
- Starting 2021, the new organic regulation (EU) 2018/848 entered into force together with the new Official Control Regulation
- Under this regulation, inspection of organic products will become stricter to prevent fraud
- Kenyan small holders are required to comply with the same set of rules as large scale farmers as well as those producing in the European Union
- To get certified as an organic farmer or exporter, you must be registered and certified through a recognised control body or accredited certifier
- This control body is responsible for verifying that you comply with the organic rules through an annual inspection and a set of checks
- After being audited by an accredited certifier, you can use the EU organic logo on your French beans, along with the logo of the standard holder
- European countries may prefer a national organic standard, which is in line with the EU certification but often exceeding its requirements
- National standards can be an addition when supplying specific markets, for example Naturland in Germany, KRAV in Sweden, BioSuisse in Switzerland



Figure 15: The official organic label for organic products in Europe Source: European Commission

6.7.5 The green deal

- In the coming years, the European Green Deal will influence how resources are used and greenhouse gas emissions are reduced
- The new EU policies on sustainability will prepare Europe in becoming the first climateneutral continent by 2050
- The Farm to Fork Strategy is at the heart of the European Green Deal, aiming to make food systems fair, healthy and environmentally friendly
- It will ensure sustainable food production and address, for example, packaging and food waste
- EU trade agreements with several countries already include rules on trade and sustainable development

• For suppliers of fresh fruit and vegetables, it is important to look ahead of the increasing standards and try to be ahead of the developments

6.8 Soft skills and company performance

- Complying with the food safety requirements, quality standards and certifications is a pre-condition to market fresh products in Europe, but it is still not a guarantee for success
- Buyers look for trust and reliability and large retailers want to be unburdened
- This means that your soft skills and performance are just as important as your product and certifications
- Some of the most important aspects in the fresh trade are a timely delivery, proactive communication and commitment to agreements
- It is also crucial that you can deal professionally with claims, whether they are justified or not

6.9 Major causes of shipment interceptions in the European Union

The major causes of shipment interceptions in the EU include:

- i. Non-compliance with regulations
- ii. Presence of quarantine pests in consignment Major threats to horticultural produce for exports include bollworms, leaf miner, white flies, fruit flies, thrips and spider mites
- iii. Pesticide residues above the acceptable limits in and/or on produce
- iv. Other quality considerations
- v. Inappropriate documentation

7. Pedagogical skills, teaching techniques and dissemination channels

Pedagogy means the practice of teaching. This Section outlines the skills, approaches and tools required to effectively deliver the content in this training manual to the trainees.

7.1 Pedagogical skills

Pedagogical skills are a trainer's ability to instruct trainees and manage their training environment. In the context of this training manual, it is important to for the trainers to:

- i. Learn and understand the material content
- ii. Understand the existing knowledge and skills of the trainees
- iii. Effectively communicate with the trainees
- iv. Collaborate with fellow trainers
- v. Form their own fair and consistent guidelines

7.1.1 Characteristics of an effective trainer

Effective trainers continuously practice and develop qualities that improve their understanding of learner and organizational needs including the objectives of the training. They understand that the more they exercise these qualities, the better equipped they will be to deliver training with accuracy and engagement, create an active learning atmosphere and incorporate current learning trends. Some of the characteristics of an effective trainer include:

- i. Be a good (and patient) listener
 - This is a non-negotiable quality of a good trainer.
 - The trainer should have the ability to listen, ask the right questions, and understand the needs of the trainee.
- ii. Approach training strategically
 - One of the most important qualities of a good trainer is their ability to keep their eye on the goal and handle limitations without compromising on the training quality.
- iii. Encourage engagement
 - Training should be a two-way engagement rather than a one-person show.
 - For skill development to really happen, trainees need opportunities to share their ideas, answer questions and practice what they have learned.
 - The traditional "top-down" lecture style simply is not effective for achieving meaningful learning, no matter how knowledgeable the trainer is.
- iv. Be organized
 - Well-organized lessons and materials help the trainer to remain focused on the topic at hand, instead of training in a haphazard way.
 - This prevents facilitated sessions from becoming dragged out and losing attention of the audience.
- v. Appreciate good instructional design
 - The ability to design well-structured courses and build fit-for-purpose content is one of the frequently overlooked qualities of a good trainer.
 - A top-notch trainer will have the savvy to design courses that suit the mode of delivery (e.g. face-to-face, blended, or fully online), and create a wide variety of materials that engage and motivate all the trainees.
- vi. Have a finger on the pulse of learning trends
 - Effective trainers keep up with current research in adult education and digital delivery and look out for opportunities to incorporate proven trends into their training.
 - While exceptional trainers need to know which trends are gaining traction, it is much more important that they have the ability to be critical about which trends they choose to incorporate.
 - However, incorporating trends just because they are trendy easily undermines the effectiveness of training.

vii. Analyze and improve

- Self-improvement is one of the most impactful qualities of a good trainer.
- Great trainers are not only focused on developing their trainees, but also developing themselves.
- You can improve your performance by taking advantage of surveys and other forms of feedback.

- Do not shy away from constructive feedback but take it as an opportunity to reexamine your methods and do better the next time around.
- Good trainers do not just improve themselves but also evaluate their training materials regularly.
- Old or irrelevant materials are phased out in favor of content that is more engaging and aligned with trainee feedback about the course.

viii. Embrace lifelong learning

- Trainers who regularly undertake their own learning are more in touch with their trainees.
- You cannot take a single course once and aim to reach your goal.
- Regular learning makes a trainer more effective in choosing content types, topics, and convenience features when planning a course.

7.1.2 Preparing a good presentation

- A good trainer should always aim to give a clear, well-structured presentation.
- You should know exactly what you want to say and the order in which you want to say it.
- Having thought about and planned a good structure will also help to alleviate any nervousness you may be feeling in the build up to your talk.
- In preparing a good presentation, the following considerations are important:

a. The venue – Location and size of the training room

- It is important to have advance information about the place where you are going to do the training.
- It can be helpful to arrange to see the venue before the training session.
- It helps to quell fear if you can visualize the training venue while you are preparing your talk.
- Establish the seating arrangements theatre-style, with rows of seats; or round-table in the training venue.
- Availability of equipment e.g. microphone, laptop, projector and flip chart.
- Availability of power points and if an extension lead/cable is required for any equipment you intend to use.
- Establish if the room has curtains or blinds. This is relevant if you intend to use visual aids, and so that you can ensure the correct ambiance for your presentation.
- The position of the light switches. Check if you need someone to help if you are using audio/visual equipment and need to turn off the lights.
- Likelihood of outside distractions e.g. noise from another room.
- Availability of parking facilities so you do not have a long walk carrying any equipment you might need to take.
- If this information is not available ahead of time, it will help to get there a bit early, to give you time to set up.

b. The audience

- Before preparing material for a presentation, consider your prospective audience.
- Tailor your talk to the audience and consider the following points:
 - ^(b) The number of expected trainees

- ③ The age range
- ^(b) Gender will the audience be predominantly male or female?
- ^(b) Is it a captive audience or will they be there out of interest?
- ^(b) Will you be speaking in their work or leisure time?
- Do they know something about your subject already or will it be totally new to them? Is the subject part of their work?
- ^(b) Are you there to inform, teach, stimulate, or provoke?
- ⁽²⁾ Can you use humour and, if so, what would be considered appropriate? If you are in any doubt about this, it is probably best to avoid anything even remotely risqué.

c. Time for the training session

- There will often be no flexibility in the time of day that a presentation is made.
- However, it does affect what you can do, and how you might organize your presentation, because of the likely state of your audience:

Morning:

- The morning is the best time to speak because people are generally at their most alert.
- However, as it gets towards lunch time, the trainees begin to feel hungry and lose concentration. This is particularly true if the event has not included a coffee break.

Afternoon:

- After lunch, people often feel sleepy and lethargic.
- If you are given a slot immediately after lunch, it is a good idea to get your audience involved.
- A discussion or getting your audience moving about will work a lot better than simply presenting a lot of slides.
- A flip chart may also be a more useful tool than a laptop and projector, especially if it means you can open blinds and use natural light.
- Towards the end of the afternoon, people again tend to lose concentration as they start to worry about getting home, the traffic or evening responsibilities.

Evening or Weekend:

- Outside regular office hours, people are more likely to be present because they want to be rather than because they have to be there.
- There is a better chance of audience attention in the evening.
- However, if the presentation goes on for too long, people may have to leave before you have finished.
- People will also be less tolerant of a poor presentation because you are in their time, not their employer's.

7.1.3 Steps for planning a training meeting

- a. Communication skills
 - It is necessary to identify three different levels in the communication situation:
 - What the trainer thinks (intention) what the trainer wants to signify by the message
 - What is transmitted the trainer's message
 - What the trainee perceives (effect) what the trainee understands

Verbal, non-verbal and paraverbal communication

The paraverbal factors that influence the effectiveness of the message are directly linked to the way in which the trainer uses their voice. These factors include:

- i. Volume The volume of the trainer's voice must be loud enough to be heard by all the listeners and to permit the message to be listened to comfortably.
- **ii. Rhythm** This relates to word flow. During a presentation, the trainee must grasp words without needing to hear them again. This means that speaking too quickly hinders comprehension of the message.
- **iii. Tone** The tone used to express a phrase has a strong influence on the meaning that it is given (e.g. affirmative, interrogative, aggressive, authoritarian). The intonation that is used should therefore correspond to the meaning that the trainer wishes to give to words.
- iv. Articulation and pronunciation This refers to the way in which the trainer enunciate words. In order to be understood, it is necessary to articulate clearly and without exaggeration the sounds that make up the words.

The non-verbal factors that influence the effectiveness of the message include:

- i. Looking at the audience Visual contact should be established with the audience rather than simply looking at them. This demonstrates that the trainer is interested in the trainees and captures and holds their attention.
- **ii. Silences** When trainers speak in public, they often tend not to use silence as an expression. This is either because they want to say too much in too little time, or because they want to fill in this frightening vacuum.
- iii. Gestures Gestures by a trainer always express something.
- iv. **Movements** The fact of moving, of being in motion, lends a certain dynamism to the presentation. However, it is preferable not to move constantly or to make movements that are too predictable.
 - a. Training checklist
 - A checklist is a list of things that need to be done and/or evaluated.
 - Checklists are used to reduce human error by compensating for limitations found in human memory.
 - The list can be simple, such as a to-do list, or be more advanced and include other factors e.g. who is responsible for specific tasks, deadlines and supplementary descriptions.

The following elements should be included in a training checklist:

- i. A skilled and effective training program manager or leader
- ii. Assessments of learning needs for the target group
- iii. Training alignment with training objectives

- iv. Goals and metrics that show training effectiveness
- v. Relevant learning content
- vi. Creative ideas for training initiatives
- vii. Ongoing mobilization to encourage participation in training
- viii. Reinforcement of what the trainees learn

7.2 Teaching/Training methodologies

The trainer may consider the following methodologies in training depending on the target groups. The methodologies broadly include but not be limited to:

7.2.1 Formal face to face interactions

There are different methods that can be used in training under a formal face to face setup such as during workshops, seminars and conferences. The approaches involve various modes of delivery such as presentations, lectures, exercises and group discussions.

7.2.1.1 Instructor-led training

This is the traditional type of training that occurs in a classroom setup, with a teacher or instructor presenting the material. This can be a highly effective method of training, especially for complex topics. A trainer can answer specific questions by trainees or direct them to further resources. It also allows for highly-skilled trainers to match the training level and style to the trainees in the room. However, instructor-led training has some drawbacks, including cost and time to implement. It can also be unnecessary for concise topics.

7.2.1.2 Lectures

- They are important for getting big chunks of information to a large trainee population.
- Lecture-style training can be an invaluable resource for communicating required information quickly.
- Unlike under the instructor led approach, lectures are characterized by less interaction between a trainer and a trainee.

7.2.1.3 Group discussion and activities

- For the right group of trainees, group discussions and activities can provide the perfect training option.
- It allows multiple people to train at once, in an environment that better fits their current Departments or groups.
- These discussions and activities can be instructor-led or facilitated by online prompts that are later reviewed by a supervisor.
- This type of training is best used for challenges that require a collaborative approach to complex issues.

7.2.2 Hands-on training

Hands-on training includes any experiential training that is focused on the individual needs of the trainee. Hands-on training can help trainees with enhancing their current skills. It is a time-intensive method of training, however, it is best used when there are enough resources available to support the costs during the program.

The trainees in the groundnut value chain should have hands on training on good agronomic practices, procedures for proper handling, processing, inventory and storage of groundnuts among others. This will be important for the actors to understand the importance of maintaining the integrity of groundnuts in the short and long term. There is therefore need to include specific laboratory and field based hands-on exercises for specific target groups.

7.2.3 Informal face to face interactions

7.2.3.1 Barazas and farmer field and business schools

Some content and specific topics in this Manual will best be offered through a public meeting mainly aimed at sensitizing the general population on various aspects of groundnuts production, handling and storage. Other approaches such as farmer field schools can be used where there is need to teach specific groups such as farmers with the aim of improving their skills through observing, analysing and trying out new and innovative ideas on their own fields for better groundnut production, processing, handling and storage.

7.2.3.2 Field visits/Exposure learning

Field visits/exposure learning should be included in the training with a view of exposing the trainees to practical activities by groundnut producers and processors. Key aspects that are best handled under this approach include: diagnosis of groundnut pests and diseases, determination of groundnut maturity, post-harvest handling, grading, packaging and packaging materials, and storage. Observation of quality management systems such as HACCP can also be included in this form of learning. Where necessary, specific hands-on exercises should be included in this approach.

7.2.4 eLearning

- eLearning relies on courses, online videos and tests to deliver a training. Trainees can do their training with a smartphone or on their computers.
- It is one of the easiest types of training to roll out to larger populations, especially for people who are remote or have high-turnover rates.
- With interactive, tests, videos, activities, or even gamified components, it can also go a long way towards keeping your team engaged with the training.
- However, eLearning has its own challenges. Without a solid instructional design strategy behind it, the graphics and visuals that make eLearning fun can also make it gimmicky or quickly outdated.

- Keeping it up-to-date is also a necessary best practice.
- In addition, this approach will not be appropriate for smallholder producers and older trainees who are likely to have technological challenges.

7.2.5 Coaching or mentoring

- Coaching or mentoring can share similar qualities to hands-on training, but in this type of training, the focus is on the relationship between the trainee and a more experienced professional, such as their supervisor, a coach, or a veteran team member.
- The one-on-one mentoring style creates a relationship between trainees that carries far beyond training.
- It also allows the trainees to ask questions that they may not feel comfortable asking in a classroom, instructor-led training.
- This training method can be done in person or virtually, through online coaching sessions.
- For all its benefits, mentoring is costly in terms of the hours and should be used appropriately to reduce those associated costs.
- Coaching bringing in a trained professional can sometimes provide a more timeefficient alternative, but without the relationship building that is valuable in mentoring.

7.2.6 Case studies or other required reading

- Some training topics are readily accessible through required readings.
- Such topics require detailed reading to understand concepts that may not be covered during the formal training due to limitation of time.
- Case studies, in particular, can provide a quick way for trainees to learn about real issues.
- Trainees can read through these at their own pace.
- Case studies are a great option for focused topics, but more complex topics will likely require more advanced types of training.

7.3 Training tools

To achieve an effective training, a trainer should ensure availability of required training tools and use the right approaches:

7.3.1 Use of teaching aids

Visual aids are effective tools that trainers can use either in the classroom or the field to enhance trainee interest, comprehension, and retention of information and concepts. Visual aids help trainers establish, explain, connect, and associate ideas and concepts to make the process of learning more interesting, enjoyable, and effective. Examples of teaching aids include posters, videos and flip charts. Some of the benefits of visual aids in teaching and learning include:

- i. Helping inspire trainees to learn more effectively
- ii. Helping trainees retain information for a longer period of time
- iii. Providing an example to think about concepts
- iv. Increasing the trainee's vocabulary

- v. Helping trainees gain a proper view of topics and concepts
- vi. Providing hands on experience for trainees
- vii. Creating an atmosphere of interest
- viii. Making the process of teaching easier for trainers

7.3.1.1 Visual aid posters and photos

- Classroom learning can be enhanced significantly through the time-tested use of visual aid posters and photos that teach information and concepts.
- These educational posters can hang on a classroom wall, serving as a convenient point of reference for trainees and also enhance the visual appeal of the classroom.
- The posters can include photos of key agronomic practices, pests, symptoms of diseases, proper storage facilities among others
- Posters and photos are appropriate in training extension personnel and farmers.

7.3.1.2 Educational charts

- These are another effective visual aid for learning.
- If a trainer needs to convey data and what it means to trainees, these charts are effective at helping them comprehend the information.
- With educational charts, a trainer can present information and numerical data in the form of reports, handouts, and presentations.

7.3.1.3 Leaflets

- A Leaflet is a small sheet of printed paper that puts across a short message clearly and concisely.
- Leaflets would be a good tool to pass specific information to farmers during or after training.
- The leaflet may containing short messages regarding key aspects of groundnut production, harvesting, drying, handling, grading, and storage among others.

7.3.1.4 Flip Charts

- Flip charts are large sheets of paper, usually positioned on a tripod, to be used with thick and differently coloured marking pens.
- They are a simple tool that may seem "old school", but they have many advantages when making presentations.
- Flip charts, like chalkboards and whiteboards, allow for a certain amount of spontaneity.
- They are appealing for drawing out concepts to enable better understanding and to get input directly from a group.

7.3.1.5 Videos

- In an ever-changing world, the way we learn is always changing, impacted by new methods of teaching and learning.
- As a trainer, it therefore becomes important to find new ways to reach your trainees, ensuring that your message is delivered in a timely manner.
- Videos is one of the most useful teaching aids, particularly if your goal as a trainer is to engage with leaners in a way that is easy for them to understand.

• In the context of this Manual, the trainer can use a video on proper spacing, sampling to assess maturity, shelling, grading groundnuts among others.

7.4 Dissemination channels

Dissemination of information, knowledge and skills on groundnuts production, post-harvest handling, processing, transportation and marketing should aim at achieving the following broad goals: (1) increase the target groups' motivation to use and apply the knowledge and skills; and (2) to increase the target group's ability to use and apply the acquired knowledge and skills. The dissemination channels proposed should be the most effective for dissemination of the knowledge and skills during and after training for the various target groups. Emphasis should be laid of the target group in the choice of the dissemination cannel. The channels can broadly include but not limited to:

7.4.1 Print dissemination channels

There is a wide range of print dissemination channels depending on the content to be shared and size of documents and preference of the audience. For example, some producers may prefer to store hard copy content e.g. fliers, posters, the main instructive manual due to limited access to technology.

7.4.2 Audio-visual dissemination channels

The training session should make use of audio-visual tools to enhance training, for example public address, short videos, and role pays where technological gadgets are missing.

7.4.3 Digital platforms

Depending on prevailing circumstances, and nature of target audience, some trainings/ sessions can be delivered using virtual platforms such as zoom, Teams and Google classroom. Sessions can be recorded and shared with trainees and be supplemented with other modes of dissemination such as exposure learning.

8. Training Time Table

The training proposed in this manual on good agricultural practices and post-harvest handling in the French beans value chain will be conducted as a module for the same cohort undertaking training on good agricultural practices and post-harvest handling in the chillies, herbs and spices value chains. The following training schedule will be followed:

DAY ONE			
Time	Sunday	Duration	Remarks/Facilitator
Afternoon/ Evening	Arrival of participants		Boarding of participants/UNIDO
DAY TWO			
Time	Monday	Duration	Remarks/Facilitator
8.30-9.00 am	Arrival of participants and registration	30 Minutes	Training venue & materials ready for use Facilitators/UNIDO
9.00-9.30 am	Welcome participants, introduction and levelling expectations	30 Minutes	Lead Facilitator
9.30-9.45 am	Official opening	15 Minutes	UNIDO Representative
9.45-10.00 am	Brief on the training program and formation of working groups	15 Minutes	Lead Facilitator
10.00-10.30 am	Health Break & Group Photograph		
	Module 1: French Beans Value Chain		
10.30-11.00 am	Status of French beans in Kenya: Current production, markets and climatic requirements	30 Minutes	Facilitator
11.00-12.00 pm	Agronomic practices in production of French beans	1 Hour	Facilitator
12.00-1.00 pm	Major pests and diseases of French beans and management options	1 Hour	Facilitator
1.00-2.00 pm	Lunch Break		
2.00-3.00 pm	Harvesting of French beans and post-harvest handling practices	1 Hour	Facilitator
3.00-3.30 pm	Group Work: Participants to discuss and list key challenges encountered by producers and exporters of French beans Each group to present results - 5 minutes per group	30 Minutes	Facilitator
3.30-4.00 pm	Health Break		
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	Module 2: Chillies Value Chain		
4.00-5.00 pm	Status of chillies in Kenya: Current production, markets, challenges climatic requirements and considerations for production site	1 Hour	Facilitator
	DAY THREE		
Time	Tuesday	Duration	Remarks/Facilitator
8.30-9.00 am	Recap	30 Minutes	Participant
9.00-10.00 am	Agronomic practices in production of chillies	1 Hour	Facilitator
10.00-10.30 pm	Health Break		
10.30-11.30 am	Major pests and diseases of chillies and management options	1 Hour	Facilitator
11.30-12.30 pm	Harvesting and post-harvest handling of chillies	1 Hour	Facilitator
12.30-1.00 pm	Aflatoxin contamination of chillies: Risk factors, implications on trade and management options	30 Minutes	Facilitator
1.00-2.00 pm	Lunch Break		
	Module 3: Herbs and Spices Value Chains		
2.00-3.00 pm	Status of herbs and spices in Kenya: Major herbs & spices, current production and markets	1 Hour	Facilitator
3.00-3.30pm	Group Work: Participants to discuss and list key challenges encountered by producers, traders and exporters of chillies Each group to present results - 5 minutes per group	30 Minutes	Facilitator
3.30-4.00 pm	Health Break		
4.00-5.00 pm	Production of major herbs and spices (Basil, Mint, Thyme, Rosemary, Oregano, Dill, Parsley, Sage, Tarragon)	1 Hour	Facilitator

DAY FOUR				
Time	Wednesday	Duration	Remarks/Facilitator	
8.30-9.00 am	Recap	30 Minutes	Participant	
9.00-10.00 am	Harvesting of major herbs and spices (Basil, Mint, Thyme, Rosemary, Oregano, Dill, Parsley, Sage, Tarragon)	1 Hour	Facilitator	
10.00-10.30 am	Health Break			
10.30-11.30 am	Post-harvest handling of major herbs and spices (Basil, Mint, Thyme, Rosemary, Oregano, Dill, Parsley, Sage, Tarragon)	1 Hour	Facilitator	
11.30-12.00 pm	Group work: Participants to list the major herbs & spices produced in their respective counties and highlight keys challenges encountered by producers, traders and exporters	30 Minutes	Facilitator	
12.00-1.00 pm	Major pests of herbs & spices and management options	1 Hour	Facilitator	
1.00-2.00 pm	Lunch Break			
2.00-3.00 pm	Major diseases of herbs & spices and management options	1 Hour	Facilitator	
3.00-3.30 pm	Group work: Participants to identity harvesting, drying, storage, handling, processing, transportation and marketing practices that compromise quality of herbs & spices Each group to present results - 5 minutes per group	30 Minutes	Facilitator	
3.30-4.00 pm	Health Break			
4.00-5.00 pm	Documents, permits and licenses required to export horticultural products from Kenya	1 Hour	Facilitator	

DAY FIVE					
Time	Thursday	Duration	Remarks/Facilitator		
8.00-8.30 am	Recap	30 Minutes	Participant		
8.30-9.00 am	Procedure for exporting horticultural products from Kenya	30 Minutes	Facilitator		
9.00-10.00 am	Standards and specifications to export horticultural products to the EU market	1 Hour	Facilitator		
10.00-10.30 am	Health Break				
10.30-11.30 am	Certification requirements for export of horticultural products to the EU	1 Hour	Facilitator		
11.30-12.30 pm	Phytosanitary regulations	1 Hour	Facilitator		
12.30-1.30 pm	Lunch Break				
1.30-5.00 pm	Field visit to a farm(s) producing either of the following: French beans, chillies, herbs and spices -Focus of the visit: GAP, varieties, types, pests & diseases (diagnosis and symptoms), harvest, drying & post-harvest practices	3 Hours 30 Minutes	Facilitator/Extension Officer		
5.00-5.30 pm	Health Break				
DAY SIX					
Time	Friday	Duration	Remarks/Facilitator		
8.30-9.00 am	Recap	30 Minutes	Participant		
9.00-10.00 am	Pedagogical skills, techniques and tools for effective training	1 Hour	Facilitator		

10.00-10.30 am	Health Break		
10.30-11.00 am	Niche market for horticultural products	30 Minutes	Facilitator
11.00-11.30 am	Training Evaluation/Feedback	30 Minutes	Facilitator
11.30-12.30 pm	Review of the Training Manuals	1 Hour	Lead Facilitator
12.30-1.00 pm	Way Forward	30 Minutes	Lead Facilitator
1.00-2.00 pm	Lunch Break		
2.00-2.30 pm	Issuance of certificates and workshop closure	30 Minutes	UNIDO Representative
PARTICIPANTS LEAVE AT THEIR PLEASURE			

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