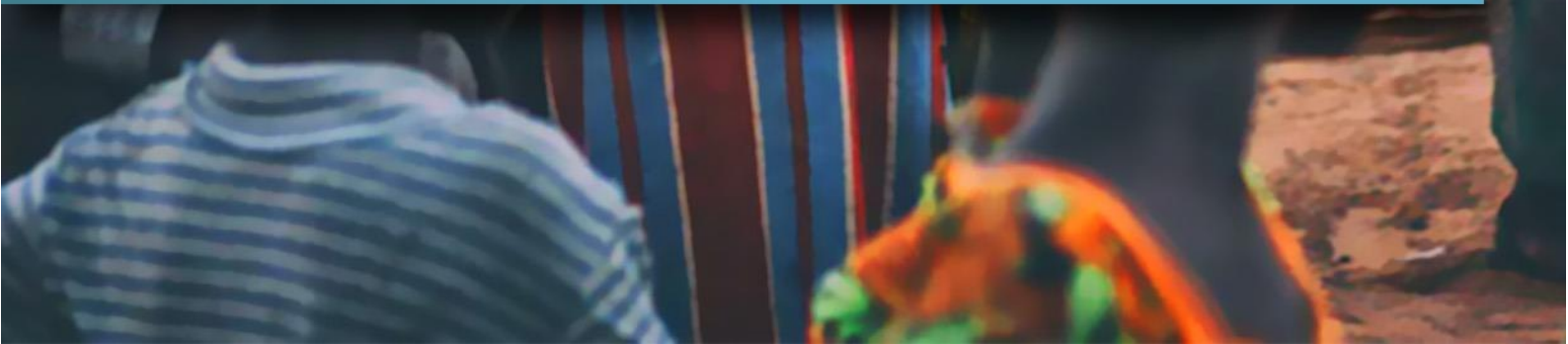
EMEA GROUP

KENYA

An assessment of the Seed Production and Regulatory Environment



EXECUTIVE SUMMARY

The project brief required analysis of the possibility of utilizing Kenya as an alternative vegetable and flower seed production destination for US companies, determine the current shortcomings and obstacles in the regulatory environment, infrastructure, support systems, skill levels, environmental challenges, and global seed production environment. It was also required to make specific recommendations to enable ASTA and its members to approach different parties to facilitate future engagements with relevant roleplayers.

Qualitative and Quantitative research methodology was used to gather the relevant information needed for this study. Qualitative research was conducted utilizing interviews and on-site visits to the fresh vegetable and seed production areas, government, and other role players — quantitive research methods using desktop research and analysis of resource papers and statistics.

An assessment of the complete process was completed. This involved engagement of all stakeholders and investigation into the value chain to discuss possibilities of vegetable and flower seed production.

This provided valuable insights into the practical issues of the seed production environment on different functional engagement levels. Engagement with farmers (small and large commercial) provided insight, and it was observed that Kenya was left behind in developing a practical vegetable and flower seed production industry.

The country seed regulatory system has been observed and analyzed. KEPHIS, the regulatory body is very active, strict, and actively enforces the regulatory policy. KEPHIS is member ISTA, OECD, ISF and UPOV 1991. KEPHIS's primary function is to ensure the quality of seed and agriculture produce to safeguard all role players but especially the smallholder farmers, who have little means to protect their livelihood without good quality seed. This is a modern internet-based system; however, drawing on feedback from interviews was often described as overregulated. Currently, the system is primarily developed for commercial seed sales, agronomic seed production, and cleaning and general import and export of seed and produce. Several issues that would hamper development in vegetable and flower seed production were identified. This includes the handling of parent seed for vegetable seed production, small seed lot handling, OECD certification for vegetable seed sector, long and vigours DUS testing, requirement of yield improvement for registration. The seed regulatory details are discussed and recorded in Chapter 1.

Currently, small quantities of vegetable seeds are produced in Kenya. However, many Indigenous vegetable seed varieties (Amaranthus, African eggplant, Okra, etc.) and certain public vegetable seed varieties (collards, eggplant, tomato, beans, etc.) are produced in Kenya. Kenya mainly operates in the production of fresh produce for most European markets which are a well developed high volume industry; therefore, suggesting that they have the required skill levels to produce high-quality export quality vegetables. Farmers are allocated in three categories, prominent commercial export estates, semi-commercial growers and smallholder farmers. In assessing the infrastructure of farmers, the limited use of irrigation was noted which seems to be a key stumbling block for the industry.

Seed production was assessed in three main groups, Open field OPV crops, Open field Hybrid crops, and Greenhouse Hybrid seed production. Although some companies have tried to produce some hybrid vegetable seed in Kenya (tomato, eggplant, pepper, onion) in open field and greenhouse, this activity is currently prolonged or stopped. The seed production environment is assessed in Chapter 2. The conclusion is that Kenya has a good environment and regulatory system to produce vegetable and flower seed (tropical and sub-tropical) but requires investment in seed production research and adaptation, infrastructure, knowledge, and advisory systems to make vegetable and flower seed production successful. Dedicated seed production areas need to be developed. Currently the general assumption is that seed production can be successful in the same regions allocated to fresh vegetable production. However this assumption is not always correct as discussed in the assessment.

The skillset of growers, input suppliers, government agencies, supporting personnel, and services in Kenya was broadly assessed in Chapter 3. The country is used to produce hybrid maize seed, and people, in general, are aware of the concepts of hybrid seed production. This has, of course, little reference to vegetable seed production but concepts are known. In general, a good knowledge base for fresh produce production exists, but little experience is accessible for vegetable and flower seed production. Vegetable seed production is limited, but some successful Indigenous vegetable seed production projects were done and are ongoing. Commercial farmers do have the infrastructure to do greenhouse seed production but currently, do not have the skillset or equipment to do that successfully. A regional approach to include Tanzania as part of an East African Community seed production strategy will contribute majorly to establish a prosperous seed production region and not limit it to Kenya only. Good grower skillset and some infrastructure exist in the region of EAC.

Small scale growers are the vast majority of active farmers in Kenya. Small scale grower development was compared to Chinese vegetable seed production systems 30 years ago. As the Chinese went through a development cycle to stimulate their vegetable seed production industry, it was felt relevant to draw from their experience. A more detailed study should be made on this subject, but Kenya can

learn a lot from the Chinese smallholder production system. Kenya can implement as similar smallholder seed production system and are even in a better position to regulate the system in a more professional way, given the current shortcomings in China. The key stimulators for this project are investment by existing international seed production companies in Kenya /EAC and the establishment of proper seed production adaptability trails to determine the correct species to focus on. Investment in irrigation systems in temperate and semi-arid areas of Kenya together with general seed production knowledge transfer is required. Establishment of region-based companies for contract seed production will stimulate the production of vegetable and flower seeds in the country. Several international contract seed production companies showed interest in considering investing in Kenya. A summary was made in Chapter 4, but I would recommend a more detailed study if this comparison is found to be useful.

Several discussions were conducted with local farmers and input suppliers to understand the current position and gauge their interest in seed production. Roleplayers are in general very positive to get involved and participate in a vegetable and flower seed production expansion; however, proper seed production research should be conducted, minimum requirements on investments determined and training in seed production practices considered. If a proven concept of contract vegetable and flower seed production can be shown to be sustainable, financiers are interested in engaging in financing as this is a closed-loop system with given market and product price. See Chapter 5.

The political, macro-economic, social, tax, and legal environment were evaluated and found as a stable and feasible environment to stimulate vegetable and flower seed production. Kenya does have some investment incentives, good infrastructure, banking, and general policies in place and is rated as the third-best country in Africa to invest into. Due to the location in Africa, moderate climate and positive investor environment, many multinational companies have their African head office in Kenya. Refer to chapter 6 on Kenya country assessment

The report is concluded with specific recommendations to ASTA and its members to facilitate further growth opportunities in vegetable and flower seed production in Kenya.

As a general conclusion, there is an opportunity to stimulate vegetable seed production in Kenya / EAC, but significant investments in infrastructure, knowledge, and production research are required to conclude such a project successfully. Kenya is one of the African countries with the best seed laws, regulatory systems, and general infrastructure to develop into a future seed production area but will need some knowledge and skills transfer to do that. It will be necessary to partner with the private industry to do production research, skill development, and transfer, establish appropriate

infrastructure for the future, and bring a promising opportunity to light. Universities are also supporting agriculture and can assist with some research projects.

EMEA Agri BV is a team of experts that were employed in various roles in the Seed industry in Africa and Europe. The team leader was Lomo van Rensburg, who recently retired as director of one biggest private Seed companies in Africa. Lomo started this group in vegetable seed production in South Africa, which he later expanded into in regional seed company in Southern and Eastern Africa with breeding, production, and distribution in most countries in Southern and Eastern Africa. John Makoni was active for more than 25 years in Zimbabwe, Mozambique, and Malawi in the seed and agrochemical environment. He recently disinvested from various seed companies in the region and is currently busy with his P.hD in African smallholder farmer behavior and development. Fritz Rupping was active for several years as Financial and Admin manager in seed companies in several African countries and has got vast experience in seed regulatory systems en investment environment. Chandelle Smuts was actively involved in seed companies for 12 years. She then jointly establish a training academy in South Africa for agricultural post-graduate students, industry employees, and small scale farmers

The company gives advisory services to several government institutions and private enterprises on regulatory structure and affairs, marketing channels, and feasibility of seed and related affairs in Africa.

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Abbreviations

ASDS	- Agriculture Sector Development Strategy
AFA	- Agriculture and Food Authority
CABI	- Centre for Agriculture and Bioscience International
CIP	- Centro International de la Papa (International Potato Centre)
COMESA	- Common Market for Eastern and Southern Africa
COPE	- Centre of Phytosanitary Excellence
CPM	- The Commission on Phytosanitary Measures
CSS	- Corporate Social Sustainability
DUS	- Distinctness, Uniformity, and Stability
EAC	- East African Community
EAC- SPS	- East African Community – Sanitary and Phytosanitary Protocol
EALA	- East African Legislative Assembly
ECS	- Electronic Certification System
EPPO	- European and Mediterranean Plant Protection Organization EU - European Union
EU-SMAP	- European Union – Standards and Market Access Programme
FPEAK	- Fresh Produce Exporters Association of Kenya
GAP	- Good Agricultural Practices
GSM SMS	- Gas Chromatography-Mass Spectrometry
GDP	- Gross Domestic Product
HCD	- Horticultural Crops Directorate
ICS	- Import Certification System; also known as the PIQRS (Plant Import and Quarantine Regulatory System)
IITA	- The International Institute of Tropical Agriculture
ISO	- International Organization for Standardization
ISTA	- International Seed Testing Association
IPM	- Integrated Pest Management
IPPC	- International Plant Protection Convention
ISPMs	- International Standards for Phytosanitary Measures
JKIA	- Jomo Kenyatta International Airport
KALRO	- Kenya Agricultural and Livestock Research Organization KENAS - Kenya National Accreditation Service
KNSWS	- Kenya National Single Window System
KENTRADE	- Kenya Trade Network Agency
KFC	- Kenya Flower Council

LC-MSMS - Liquid Chromatography-Mass Spectrometry

MNLD - Maize Lethal Necrosis Disease

MOU - Memorandum of Understanding

MRLs - Maximum Residue Levels

MTP - Medium Term Plan

NPPO - National Plant Protection Organization

NPRMP - National Pesticide Residue Monitoring Plan

NPTC - National Performance Trials Committee

NPTs - National Performance Trials

NVRC - National Variety Release Committee

OECD - Organization for Economic Co-operation and Development OSD - Other Seed Determinants

PBR - Plant Breeders Rights

PCPB - Pest Control Products Board

PIP - Plant Import Permit

PWD - Person(s) with Disabilities

QMS - Quality Management Systems

SANAS - South African National Accreditation System

SASHA - Sweetpotato Action for Security and Health in Africa SMAP - Standards and Market Access Programme

UNECE - United Nations Economic Commission for Europe

UNIDO - United Nations Industrial Development Organization

USAID - United States Agency for International Development

USDA - United States Department of Agriculture

UPOV - The International Union for the Protection of New Varieties of Plants

WTO - World Trade Organization

WTO-SPS - World Trade Organization - Sanitary and Phytosanitary Agreement

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CHAPTER 1

Seed Regulatory Overview

Chapter 1: Seed regulatory overview

1.1. Intellectual Property recognition, laws, and application

The Seed market consists of two distinct segmentation, namely Formal and Informal seed sectors. These sectors have some conflicting practices where the formal segment vigorously implements a first world system in controlling the quality of seed, protecting IP, regulate production and distribution of seed. Systems are well developed, internet-based, and vigorously enforced. At the same time, the informal seed sector operates with farm-saved seed, no quality system, and degenerated genetics.

1.2. Informal seed Sector

This segment is consisting of mainly three sections; Farm saved seed, Community based seed production, and NGO Relief programs. The vegetable seed involved is minimal (some Indigenous vegetable varieties only) but are mainly historical practices in sweet potato, wheat, dry beans, OPV maize. Some good progression was made to formalize the Indigenous Vegetable seed production which in the past operated in this segment. General past practices to hold back seed from public types of wheat, beans, etc. is a practice that is addressed through several programs, but the widespread practical recognition of IP rights in this segment of the market is problematic. The leading suppliers of genetics in this segment are players like CYMMIT, KARO, Government, universities, etc.

1.3. Formal seed Sector

The formal seed sector is regulated by KEPHIS who controls seed import, seed production, seed quality, phytosanitary, and all regulatory affairs within the seed industry. Kenya officially became a member of the International Convention for the Protection of New Varieties of Plants (UPOV 1991 Convention). Kenya's PVP law is also based on this convention.

Kenya is also part of the OECD seed scheme. The crops that are covered is; Grasses and Legumes, Oil or fiber species, Cereals, Sorghum, and Maize. Beet and vegetable seed are however currently not included in the scheme and something that should be considered if the vegetable seed will be produced in future in Kenya.

Kenya is also a member of ISTA and KEPHIS runs an ISTA lab to test and control the quality of seed in the country. Several systems are run to control fake seed and ensure high-quality seed is sold. This creates issues with certain exports as an ISTA is required on export seed even if the customer is willing to accept the seed without ISTA.

1.4. The import process for seed production including regulatory requirements

For any imports, the company must register with the Kenyan Plant Health Inspectorate Service (KEPHIS). Any fresh and dry produce is regulated by this institution and issue a plant import permit for each consignment entering the country.

The company should also register as a seed merchant at KEPHIS who will then issue the entity with a certificate that will enable the body to trade. This certificate is valid for one calendar year. Failure to renew your registration will lead to the loss of the status as a seed merchant.

Before a new species/variety of seed can be imported for commercial use, the seed has to undergo National Performance Trials (NPT) as well as Distinctiveness Uniformity and Stability (DUS) testing. Once the variety has been cleared for import, the new seed variety is listed in the Kenya Gazette. The only vegetables that must undergo DUS testing are Climbing, and French beans and vegetable seeds, in general, are exempt from this testing. Any plant import permits (PIP) are issued by KEPHIS, allowing an entity to import plant material into Kenya adhering to the conditions on the PIP. The PIP is valid for six months. All importers are required to obtain an import declaration form (IDF) for any import. This form is processed online on the Trade Net System (KESWS). It is recommended to use a clearing agent for this step. The Kenya National Trade Net System (KESWS) online platform is used to process permits and declaration of goods. Traders are required to register with Kenya Trade Network Agency (KENTRADE) as an importer. The detailed process can be found in the attached Annexure C.

1.5. Restrictions of the movement of parental seed

After the successful importation and clearing of parent seed at any border post, the parent seed can move freely throughout the country. Kenya is the leading country in the region in terms of the development of seed law and regulations. Kenya is a major supplier of seed to Uganda, Tanzania, DRC, Ethiopia, Rwanda, Somalia, and Burundi. Harmonization of the seed laws with these countries is significant to assist trade and progress is made under COMESA. It is not only the sale of seed but also the harmonization of seed production that needs to receive a lot of attention in this matter. Currently, vegetable and flower seed production are not high on the agenda, and a regional approach would be very beneficial to all role players. Tanzania was historically a significant producer of vegetable seed for export, and Arusha was a historical hub. To optimize the potential future seed production, it would be most optimal if seed production regulations should be viewed in an East Africa context and not limited to a country. Kenya, as the most progressive, should take the lead in this action.

If parent material is permitted to enter the country under certain conditions, it should be kept and cultivated in a controlled environment as prescribed by KEPHIS. Different conditions can be imposed depending on the release conditions by KEPHIS.

1.6. Acceptance of any new breeding technology: Biotechnology and New Breeding techniques

Kenya has adopted a positive outlook towards biotechnology and is currently in the process of GMO event testing in a controlled environment for the possible approval for de-regulation by the government. It remains a highly political and even an emotional issue to allow the commercial release of GMO events in Kenya.

Kenya adopted a national biotechnology development policy to guide the creation and use of genetically modified organisms in 2006. The Kenya Biosafety Act 2009 includes clauses on labeling GMOs, distances that must be maintained between GM and conventional crops during cultivation, and import and export of the varieties. (AGABA, 2019). Currently, no food crops got a general release for GMO events.

In Kenya, genome editing techniques are currently regulated using a similar approach of GMOs, meaning that no guidelines specific to genome editing exist. Risk assessment follows the existing procedure for GMOs. It is worth noting that several research projects are currently ongoing using CRISPR technology. The Kenyatta University is developing new sorghum varieties with resistance to Striga under a project lead by Dr. Runo. Also, the Tropical Research Institute is using the technology in banana and yam research lead by Dr. Leena Tripathi. This is currently only research projects with no known commercial activity. (AFSTA 15 July 2019, Aghan Daniel)

It is also worth noting that Europe is the major trading partner for export of fresh vegetable and flowers for Kenya and that the government will most likely carefully follow the regulations on this subject as prescribed by their leading trading partner.

1.7. Field inspections, Phyto's, Testing requirements, Infrastructure of Government

KEPHIS is a well-run government institution with all the necessary documentation, testing capabilities, and structure. Most of the import/export procedure can be done online and are a modern system. All fresh and dry produce is regulated by KEPHIS, and traders must obtain a Phytosanitary certificate online.

Field inspections are currently done by KEPHIS only. To alleviate the pressure on the volume of work, it should be considered to allow partly private-sector inspections of fields. A proper system of accreditation should be developed. Some provisions to do this was provided in the legislation but not implemented yet. KEPHIS did issue a notice to seed companies to start this process in July 2019.

KEPHIS does have several accredited labs for most required testing, and due to the high demand from the fresh produce export industry, they are able to deliver prompt service.

1.8. Government/KEPHIS timelines

Government and KEPHIS have issued timelines on the issuing of the required documents to the public. In general, they can adhere to these timelines with some companies have occasional delays in the system.

Please see Annexure A and B for timelines on import and export.

1.9. Export regulations and process

An entity that wants to export seed is required by KEPHIS to register as a Seed Merchant. A registration certificate will be issued to the entity that is valid for one calendar year.

All seed for export must be tested by KEPHIS and should meet the minimum standards for seed.

The Kenya National Trade Net System (KESWS) online platform is used to process permits and declaration of goods. Traders are required to register with Kenya Trade Network Agency (KENTRADE) as an exporter.

A certificate of origin (COO) is categorized into preferential and non-preferential. A preferential certificate of origin is an export document issued by the Kenya Revenue Authority (KRA) for exports where trade agreements have been entered into with Kenya and other regions such as East African Community (EAC), Common Market for Eastern and Southern Africa (COMESA), European Union (EU), African Growth & Opportunity Act (AGOA) or Generalised System of Preferences (GSP). A non - preferential certificate of origin is an export document issued by the Kenya National Chamber of Commerce and Industry (KNCCI) that confirms the country of origin of goods being exported.

Register with Kenya National Chamber of Commerce and Industry (KNCCI)

Membership to the Kenya National Chamber of Commerce and Industry (KNCCI) is not mandatory but provides certain benefits, e.g., Lobby, Networking opportunities, etc.

The detailed process can be found in the attached Annexure B.

1.10. General overview: Regulations, ease to execute, General accepted practices worldwide

The Kenyan seed industry is highly regulated. The regulations are, in general, a rather over-regulation with several comments regarding conditions that prohibit trade in general. This includes OIC certificates on all seed for import and export, no private seed companies to do part of seed field inspections, extensive DUS, and yield improvement requirements to register a new variety, etc.

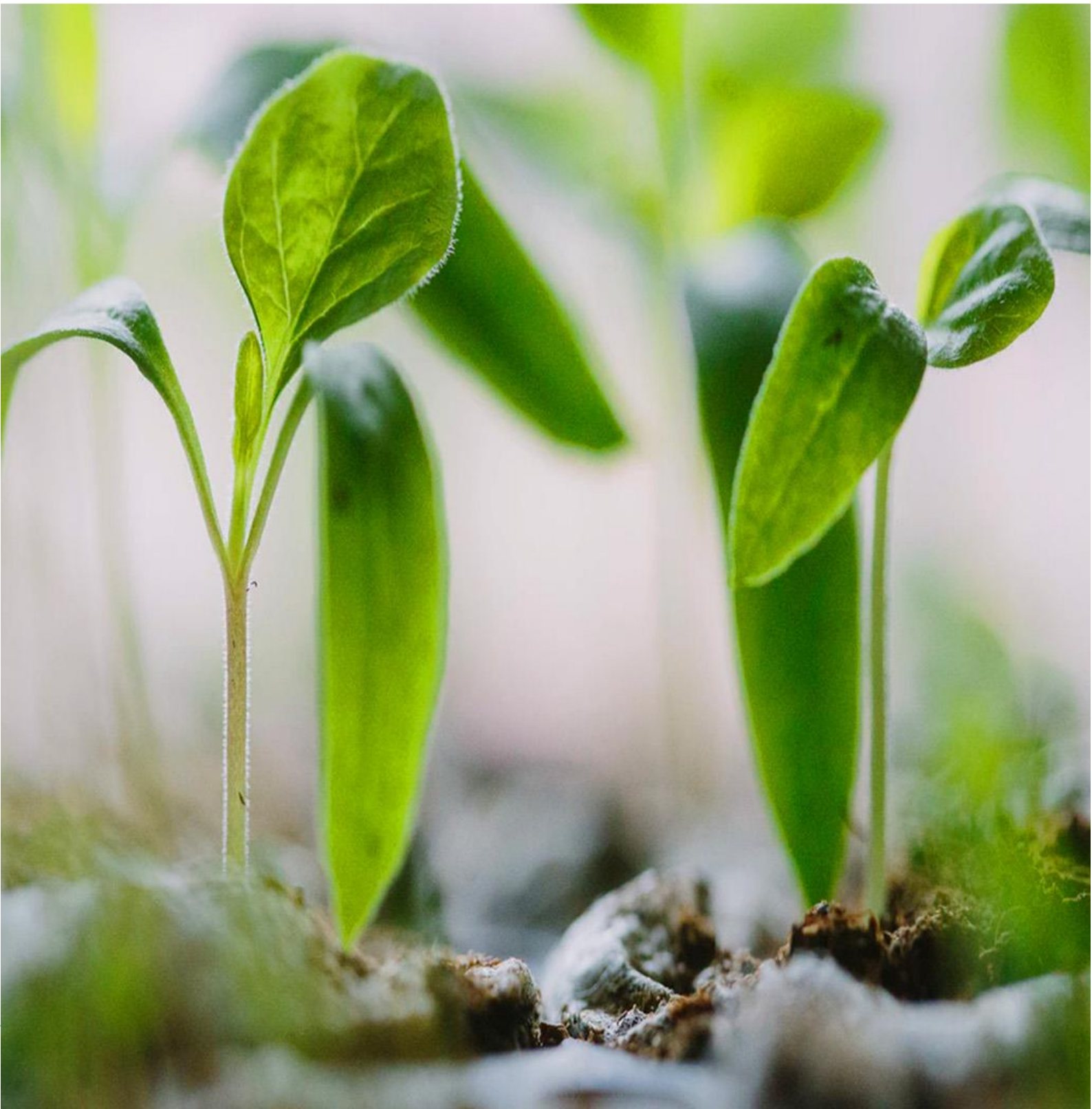
1.11. Assessment: Seed imports by / to USA seed companies and the ability to meet specifications

Importing vegetable seed from US companies are currently being done by several local and international seed companies and these companies are be able to meet the necessary phytosanitary and other import requirements as been required by KEPHIS. The following vegetable seed varieties are currently being imported from US companies: Watermelon, Cabbage, Onion, Squash, Carrots, Collards, Tomatoes, Beans, Peas, Peppers, Broccoli, etc.

Currently, no real quantities of vegetable seeds are exported from Kenya to the USA. In research on USDA website, no significant issues could be found to allow import accept a PIP required in some cases. It is advised to clear specific species in advance with ASDA – APHIS to avoid any problems.

CHAPTER 2

Seed Production Environment



Chapter 2: Seed Production Environment

2.1 Current overview of vegetable and flower seed production capacity

After consultation with various vegetable seed production role players in Kenya, the following conclusions were made:

1. Very limited vegetable and flower seed production is currently being done in Kenya.
2. The production is mainly limited to OPV of either African Indigenous Vegetables (African eggplant, Amaranthus, Nightshade, etc.) and public OPV (Collards, Eggplant, Tomato) which is mainly done by small scale farmers. Individual projects were launched to execute this with some success. See Appendix D
3. The limited hybrid tomato and beans were tried by some multinational seed companies. In general feedback, it seems that the success was limited or even a failure due to several reasons including genetic purity, the skill level of farmers, disease on seed, etc.
4. Limited flower seed was multiplied by some growers of export flowers in the past. It seems this was limited activity.
5. Historically French green bean seed was produced on a big scale in neighboring Tanzania. This activity was reduced due to change in weather patterns as most of the production was done under dryland conditions.
6. Some hybrid vegetable seeds were produced in a greenhouse and net houses in Arusha, Tanzania with some success.
7. Flower seed was produced on a commercial scale in Tanzania and Zimbabwe with export to mainly Dutch and American flower seed companies.

2.2 Assessment of the environmental conditions in Kenya

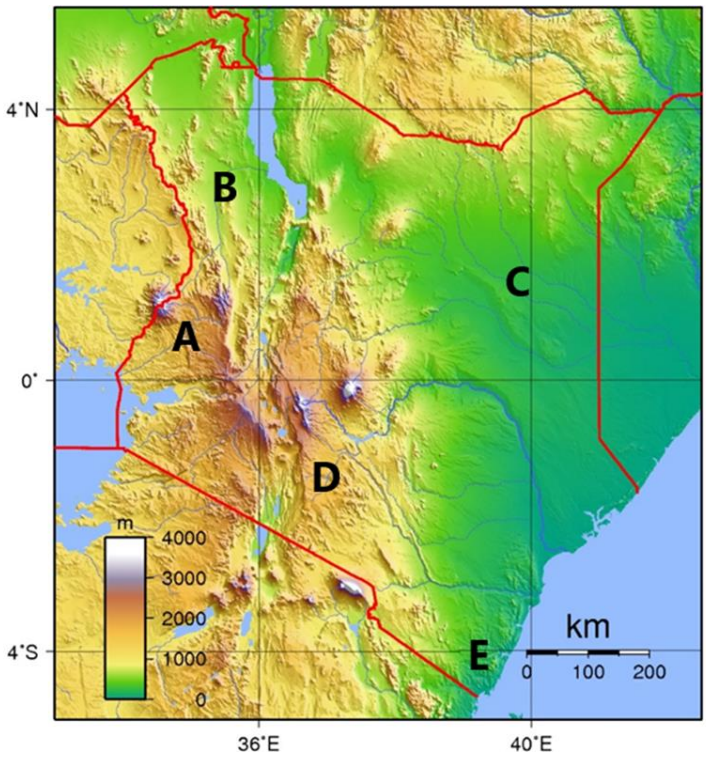
Kenya is located on the equator latitude between approximate 4 degrees South and 4 degrees North of the equator. Longitude is between 34 degrees East and 41 degrees East. The country borders the Indian Ocean on the East and by Somalia, Ethiopia, Sudan, Uganda, Tanzania on several borders. Elevation, therefore, varies between 0 and 5 199m (17 057 ft) above sea level.

The country is divided into several Bio Zones, and this assessment takes several critical towns in these regions to give an indication of the general environment in these regions.

In general, Kenya has two rainfall seasons. The long rains (March April May) and the short rains (October November). Agriculture was mainly developed around these seasons, and double cropping is the general practice due to the moderate climate.

Due to these practices, very little irrigation was developed and is one of the main constraining factors in agriculture in Kenya. The most significant portion of production originates from the high rainfall areas, and the remaining part of the country remains marginal in sustainable farming. Excluding production under protection, the high rainfall area is in general not most suited for vegetable seed production. This is caused by high disease pressure, rainfall during pollination, risk of seed-borne diseases, etc.

Semi-arid areas should be more suitable for seed production and are currently underdeveloped. Tanzania was historically able to produce vast quantities of French beans for seed (excess of 4 000 tons of seed per year). These productions were reduced and moved to China mainly due to the inconsistency of supply. This was caused primarily by dependence on rainfall for seed production and minimal access to irrigation.



Explanation of Markers: This refers to different cities later discussed in detail on usual weather patterns: A – Kitale, B – Lodwar, C – Wajir, D – Nairobi, E – Mombasa

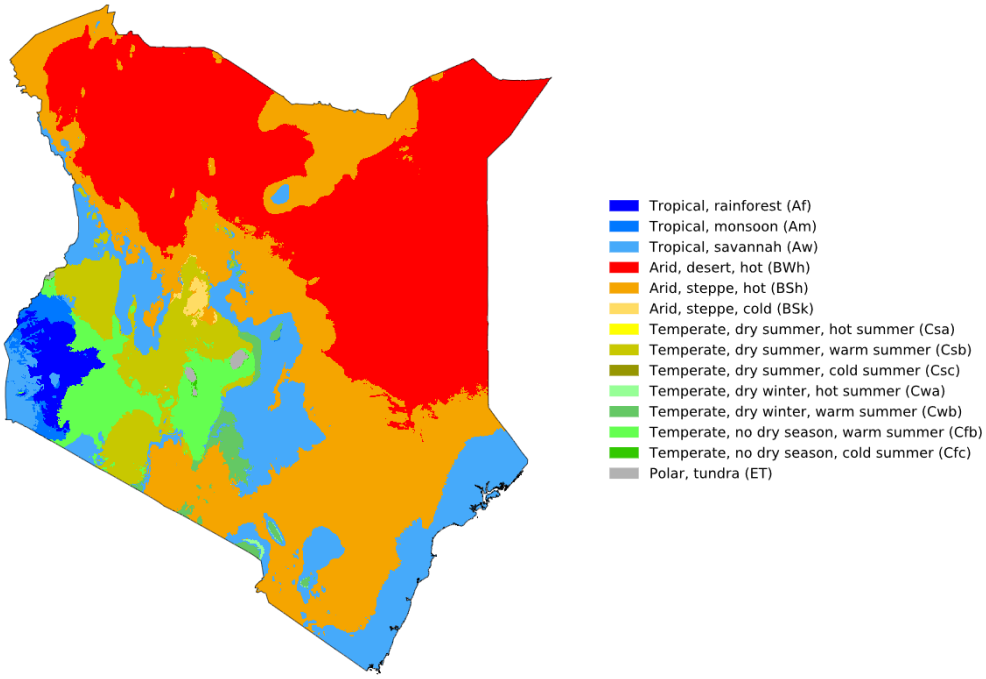
2.2.1 Latitude, Longitude, Altitude, Daylength, Seasons for production

The above map is explanatory regarding the latitude, longitude, and altitude of the country. It should be noted that Kenya is located on both sides of the equator with elevation from sea level to a highland area with a unique climate.

The diversity of the country brings a significant opportunity to the agricultural sector to produce various crops in different climatic biozones in Kenya.

- **Ecological biozones in Kenya and assessment of suitability for seed production**

Köppen-Geiger climate classification map for Kenya (1980–2016)



Source: Beck et al.: Present and future Köppen-Geiger climate classification maps at 1-km resolution, Scientific Data 5:180214, doi:10.1038/sdata.2018.214 (2018)

By Beck, H.E., Zimmermann, N. E., McVicar, T. R., Vergopolan, N., Berg, A., & Wood, E. F. - "Present and future Köppen-Geiger climate classification maps at 1-km resolution". Nature Scientific Data.

2.2.2 Weather and climate

Kenya's high rainfall areas constitute about 10 percent of Kenya's arable land and produce 70 percent of national commercial agricultural output. Farmers in semi-arid regions produce about 20 percent of the production while the arid areas account for the remaining ten percent of the production. Productivity remains relatively low due to poor agricultural practice by mainly smallholder farmers with minimum input into agricultural practices.

2.2.3 Seed Production environment

Vegetable seed production is classified into three categories, OPV open field production, Hybrid and professional OPV open field production, and Greenhouse production.

OPV open field is currently mainly being done by small scale farmers with little or no irrigation in predominately the fresh produce production area. Seed production trails should be planted under irrigation in more arid and temperate regions of Kenya to test the seed production adaptability. Several crops should be yielding well, for example Collards, eggplant, tomato, pepper, etc.

Hybrid and professional OPV open fields are currently very limited produced in Kenya. French beans are an example of a professional OPV, and production should be considered in a similar climate in Kenya than Arusha in Tanzania. Beans have been produced in this area with significant success, and if supplementary irrigation can be added, no real reason should exist not to produce the seed in Kenya. If a regional approach is taken, Tanzania has local expertise to produce bean and other vegetable seeds very successful. Eggplant, open field pepper and melon should also be able to be produced if supplementary irrigation is available in the region. Some successful trails were done with tropical hybrid onion varieties by Dutch companies in Kenya.

Greenhouse seed production should be able to be produced in the current areas of greenhouses; in most cases, the infrastructure does exist, but the skill level from the management and workers will be a significant concern. A regional approach with Tanzania will also be very positive in this field.

2.2.4 Western Part of Kenya: KITALE

Kitale is a well know agricultural town. Mount Elgon is to the west of Kitale with a height of 4321m. Kitale has the weather characteristic of a marine coast climate that is mild, that has warm summers, mild winter but has no dry season. Heavy rain occurs during winter that is dominated by cyclones.

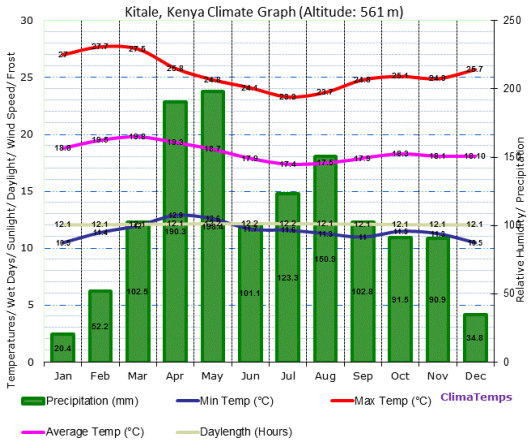


Table 1

Location: 35°0'E, 561 m (1840 ft).	1°1'N,
The Köppen-Geiger classification:	Cfb
Holdridge life zone system: moist forest biome	Subtropical
Mean temperature: degrees Celsius (65.1 degrees Fahrenheit)	18.4
Average Monthly temperature variation: (4.3°F)	2.4 °C

2.2.5 The north-western part of Kenya: LODWAR

Lodwar has a hot climate and has a subtropical desert and is primary industries are basket weaving and tourism.

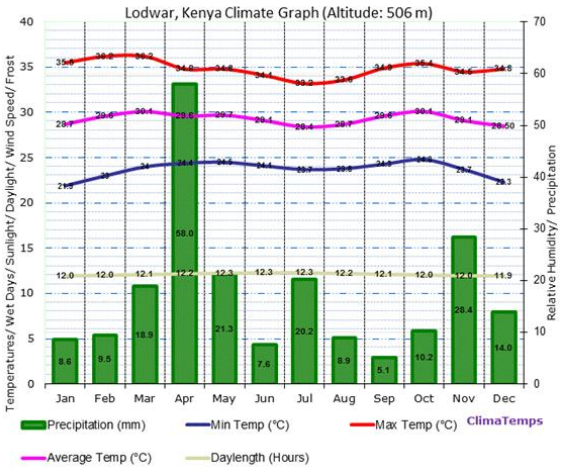


Table 2

Location: 3°7'N, 35°38'E, 506 m (1660 ft)

The Köppen-Geiger classification: BWh

Holdridge life zone system: Subtropical dry forest biome

Mean temperature: 29.3 degrees Celsius (84.7 degrees Fahrenheit)

Average Monthly temperature variation: 1.7 °C (3.1°F)

2.2.6 The north-eastern part of Kenya: WAJIR

Wajir has a hot semi-arid climate.

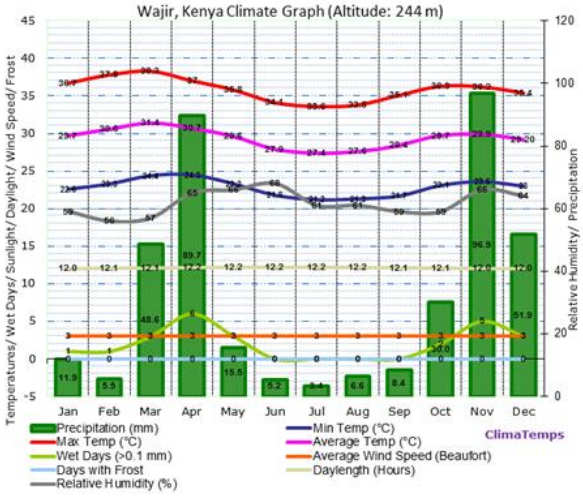


Table 3

Location:
1°44'N, 40°5'E, 244 m (800 ft)

The Köppen-Geiger classification: BSh

Holdridge life zone system:
Tropical thorn woodland biome

Mean temperature:
29.3 degrees Celsius (84.7 degrees Fahrenheit)

Average Monthly temperature variation: 4 °C (7.2°F)

2.2.7 South Western part of Kenya: NAIROBI

Nairobi is the capital city of Kenya and is also the largest. Its weather characteristic of a marine coast climate that is mild, that has warm summers, mild winter but has no dry season. Heavy rain occurs during winter that is dominated by cyclones.

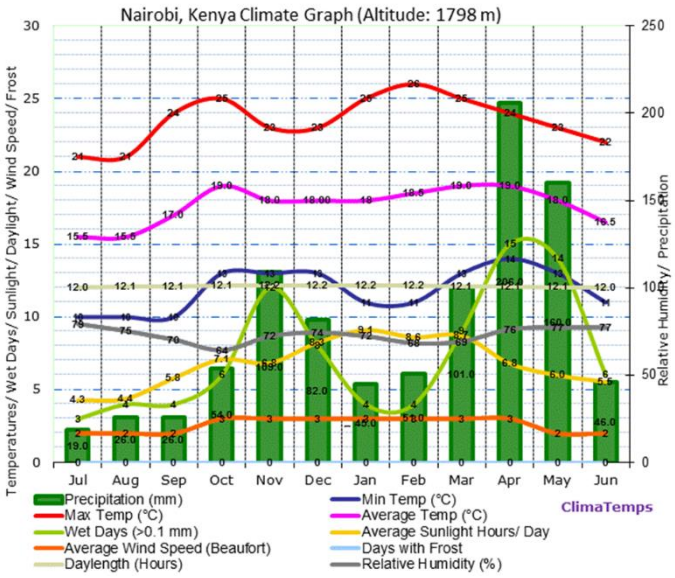


Table 4

Location: 1°18'S, 36°45'E, 1798 m (5899 ft)

The Köppen-Geiger classification: Cfb

Holdridge life zone system: Subtropical dry forest biome

Mean temperature: 17.7 degrees Celsius (63.8 degrees Fahrenheit)

Average Monthly temperature variation: 3.5 °C (6.3°F)

2.2.8 The coastal region of Kenya: MOMBASA

Mombasa has a dry season in the high-sun months and a wet season in the low-sun months.

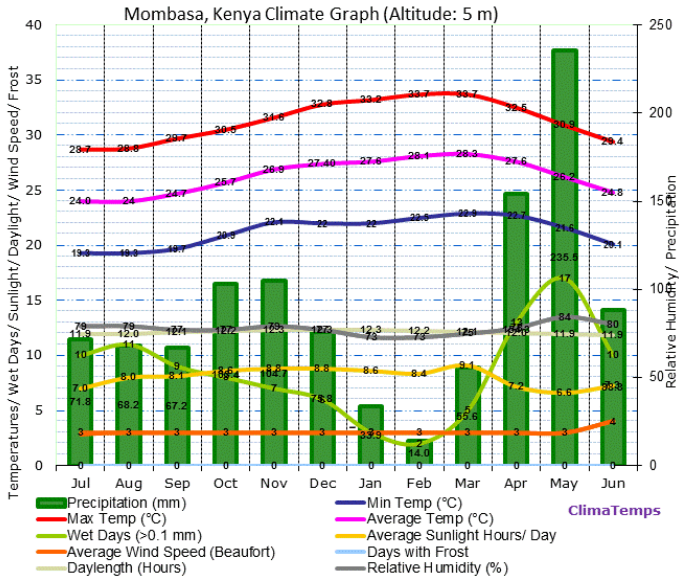


Table 5

Location: 4°0'S, 39°36'E, 5 m (18 ft)

The Köppen-Geiger classification: As

Mean temperature: 26.3 degrees Celsius (79.3 degrees Fahrenheit)

Average Monthly temperature variation: 4.3 °C (7.7°F)

2.3 Pollinators

Bees are used as the primary pollinators in Kenya. The industry is organized but still, lacks more commercial drive which can develop it into a significant contributor to agricultural output. Knowledge of the industry is lacking with government extension officers. Cutter bees and flies are currently not extensively used in the pollination of crops. In various consultations with industry players access to pollinators were not listed as a significant concern to them. The current industry role players and overview of the sector can be view on the below link.

http://www.nafis.go.ke/livestock/bee-keeping/

2.4 Infrastructure for seed production on farms

Some of the essential requirements on farms are assessed in a concise way below to give an overview of the conditions on farms.

2.4.1. Soil

There are five main types of soil in Kenya:

Loamy Soils: Loam soil is primarily a mixture of clay and sand soil. Loamy soil is majorly found in Western Kenya and parts of the Rift Valley. This is the primary vegetable production area.

Alluvial Soils: Alluvial soils are in most cases found deposited in the valleys and mouths of plentiful water sources, e.g., rivers such as Ewaso Nyiro, Sondu, Tana, etc. These soils are common in the southern parts of the Rift Valley.

Volcanic Soils: They are commonly found in highland areas that have previously been affected by volcanic activities. These soils are in East and West of the Rift Valley.

Black Cotton Soils: Black cotton soils are also referred to as clay soils. Black Cotton Soils are commonly found in Athi, Kapiti, Kano, Mwea, and Trans Mara.

Sandy soils: Sandy soils are commonly found in arid and semi-arid areas of northern and north-eastern Kenya, the coastal regions and some river valleys.

Soil quality is in general not well maintained by small scale farmers and in general little rotational practices are applied by them. Big Commercial farmers keep track of their agricultural practices and especially the exporters who need to adhere to the EURO GAP certification required for export of fresh produce.

2.4.2. Water

Kenya has got a diverse climate from tropical rain forest to semi-desert. Water supply is one of the critical issues in the country, and the proper management of these resources is one of the challenges of the country.

Professional growers in horticultural exports have created irrigation systems including Centre pivots, Overhead and drip irrigation.

Water sources are in general scarce, and it is estimated that 165 830 ha (409 600 ac) of irrigation is in use with a government plan to increase it to 969 302 ha (2 394 175 ac) in 2030. This is a very ambitious target and most probably not realistic, and according to the FAO, the total potential irrigation area is 353 000 ha. (871 910 ac)

http://www.fao.org/3/a-i5074e.pdf

Water sources are rain, rainfed dams and lakes, several rivers and underground sources like boreholes. The rain has become more erratic in recent years; this influences the availability of water into the irrigation schemes. Water restrictions for human consumption are also frequently in place to highlight the issue.

Currently, only about 20% of current fresh vegetable production is produced under irrigation, and one of the key reasons why production yields are under pressure. To create a sustainable vegetable and flower seed production industry, more permanent irrigation systems is required.

2.4.3. Fertilizer Systems

Commercial farmers use either liquid or water-soluble fertilization, foliar feeds, and a balance of biological or chemical solutions for their fertilization needs. Commercial growers use the most current crop solutions to optimize their yield. Most commercial growers have a complete irrigation system to use for fertigation. Some conventional NPK has limited use with commercial growers.

Small scale growers use either conventional NPK or in some limited cases no fertigation. Fertilizer is generally available and does not carry any subsidy from the government. Proper services exist in the country to do soil sampling, analysis, and advise growers on fertigation needs.

2.4.4. Registrations and availability of chemical products

The agrochemical market is heavily regulated and requires registrations for almost all agricultural use products. This process is a time-consuming process and is reported to take 3 – 4 years to register a new molecule. IP rights are respected, and all imports under a single registration are only allowed

from the original applicant of the registration. A new supplier will require new registration of the same molecule.

Role players consist of developers and marketers of IP molecules (BASF, Syngenta, Bayer, etc.) and generic product suppliers who are mainly importers and distributors of generic products. The second segment is the bulk of the market, but the fresh produce export market drives the IP products to allow traceability of their supply chain.

The generic segment is notorious for fake or sub-standard imports. Government support to pursue the perpetrators but suppliers should be verified before use by seed producers.

The market also has a robust biological segment due to fresh product export requirements. IPM are used by several export estates.

http://pcpb.go.ke/listofregproducts/List%20of%20Registered%20Products%20%20Version%2012018.pdf

Although this is a pervasive list, many active components are repeated several times on the list due to the import and registration requirements. Due to the process, certain limited application agrochemicals, mainly used in vegetable seed production, might be difficult to import into Kenya.

2.4.5. Availability of greenhouses, net houses, irrigation and dryland fields for seed production

In discussions with small scale and commercial growers, growers do have capacity and interest to engage in a new activity of vegetable seed production. The general concern is the infrastructure, working capital need, and skillset required for management and workers to grow seed successfully. Farmers are therefore more concerned in obtaining correct production advise and training for management and farm workers to grow the seed successfully.

Dryland Seed production for vegetables is, in my opinion, not a real option, although some commodity flower seed and commodity vegetable seed is a possibility, preferably with supplemental irrigation.

2.5. Availability of suitable nurseries for seedling growing (If applicable)

Several nurseries of different standards are in operation in Kenya. This is from commercial seedling growers who supply to farmers custom seedlings or commercial seedlings grown for farmers to small communal nurseries growing seedlings in a rural environment to provide smallholder farmers. Several nurseries are in operation in the South Western region with new major nurseries in construction. Israeli management and infrastructure are popular with local operators and input requirements. Some of the significant commercial growers established their own nurseries on the farm to supply to their individual needs.

To be able to grow seedlings for seed production should be possible although some training will be required to ensure proper seedling growing, ensuring the integrity of seed trays, etc. Commercial seedling growers were interested in engaging in such a process and were willing to consider the required practices to adhere to vegetable seed production protocol.

2.6. Warehousing for drying, cleaning, and warehousing in the seed production chain.

Facilities to receive the umble, fruit or seed set after harvest in general not available in Kenya. That is barring a small-scale grower that will dry and trash by hand. Some investment will be required to establish such facilities for commercial seed production.

Commercial seed companies do have the ability to receive the pre-cleaned vegetable seed, clean the seed on a gravity table, and treat the seed with registered seed treatment products. Basic facilities were observed at Simlaw and East Africa Seeds, but the further investment will be required to handle small seed lots. It was also noted that although there are 144 registered vegetable seed companies, none could be identified as a genuinely focused Vegetable and Flower Seed Production Company. List of Registered Seed companies Appendix C.

In comparing to other countries with successful vegetable and flower seed production areas, the absence of a major contract seed production company seems to be a significant shortcoming. Countries like Chile, China, South Africa, and the USA all have very active contract seed production companies that stimulate the seed production environment with various growers. In consultation with different seed production companies, they have shown interest in investigating the establishment of a dedicated seed production unit in Kenya. South African companies Klein Karoo Seed Production and JW Seed has shown interest in such an expansion. Kenyan Seed company East Africa also shown interest in getting involved in contract vegetable seed production and were willing to invest if demonstrated as an excellent opportunity. Some support with training and infrastructure might be required to make it feasible for these entities.

2.7. Seed cleaning facilities

Seed cleaning can be divided into several segments

Informal sector: Fundamental seed cleaning and cleaning by hand. Some community seed cleaning exists but is in general not able to meet requirements of formal sector

Formal sector - Agronomic crops. Good infrastructure exists with major investments from Kenya Seed Company, Monsanto, Syngenta, Western seed, etc.

Formal Sector – Horticultural crops. Investments are mainly by private companies like Simlaw, East Africa Seeds, etc. Facilities are basic but adequate to clean OPV vegetable seeds currently being produced. Multinational companies, e.g., Syngenta, made some investment in research and some cleaning in Kenya.

Training capacity for cleaning seed professionals was established by the University of Nairobi and several role players, including private and public institutions, do training inhouse. Although seed cleaning is mainly focused on agronomical crops, vegetable seed cleaning is also touched.

https://agra.org/news/state-of-the-art-seed-management-facilities-open-at-the-university-of-nairobi-kenya/

2.8. Seed treatment infrastructure and registrations

Seed treatment equipment is in use in most seed companies. Almost all seed is being sold as treated (95% and above). Most vegetable and flower seeds are imported and are, in most cases treated already. OPV and repacked seed are treated in Country in general with batch treaters with more prominent companies and slurry treaters with smaller companies.

Seed treatment registrations are available on the KEPHIS website

2.9. Ability to obtain germination, purity and pathology certificates (OIC, etc.)

KEPHIS is an ISTA member and is running an outstanding laboratory service. They can issue an OIC and are a well-recognized institute across the world. Several pathology labs with local universities and international service providers are in operation. Although some complaints were raised by local role-players on the timeline of delivery, it does not seem to be a significant problem. The currently registered laboratories in Kenya can be found below.

https://www.nema.go.ke/images/Docs/GazettedLabslist.pdf

2.10. Virus and bacterial pressure and race/strength identification

Several multinational agricultural input suppliers are present with resources, either local or international, to assist local laboratories in helping to identify any specific new deceases. KEPHIS, together with several local universities, can identify most diseases in their own laboratories. International role players like SGS have local labs and can deliver a proper service to the agricultural industry.

https://www.nema.go.ke/images/Docs/GazettedLabslist.pdf

2.11. General infrastructure and support structure

Roads: Main roads are reasonable but are in general overloaded with traffic. Trucks are notorious on roads, and traffic is not moving smoothly. Nairobi has got one of the worst traffic congestions in Africa. Corruption amongst traffic cops is prevalent. Road quality once you are off the main road is in general terrible. Quality of the road surface, slippery roads, and potholes, especially during the rainy season are major obstacles. General conditions of vehicles in rural areas are creating transport headaches and inefficiencies.

Train and public transport are used by most people in the country. Train service is minimal, and busses and a minibus taxi are the most popular. It is in general overloaded but relatively cheap and covers most of the country. General deliveries are done by local transport companies but due to the rural nature of the area, are limited to town and big farms.

Harbors: Mombasa is the largest port in East Africa and is the gateway to other regional markets.

Air transport: Kenya has got four major airports and is well serviced by several airlines to Europe, the Middle East and now the USA direct. Freight airplanes fly daily to Europe and UK with functional freight capacity on the airports.

2.12. Reliability of electricity

Kenya has got an outstanding and cost-effective electricity supply, with about 70% generated from green sources (Hydro and Geo Terminal). The country is considering exporting some excess energy into the region. The government is looking at sources like solar to expand the generating capacity. The extension of the grid into the rural areas is one of the government's key objectives and one of the challenges to help to expand rural development. A significant portion of rural farmers are still using kerosene for lighting in their homes, but electricity is in general available in the rural towns and direct surrounding areas.

2.13. The infrastructure of the country to handle imports and exports

Kenya has an excellent infrastructure for exports mainly driven by the fresh exports of flowers and vegetables to Europe. Airports have very good warehousing and clearing services to export products in an efficient way. Presence at the airport of custom and clearinghouses ease import and export by airfreight.

Mombasa is the deep regional seaport that imports not only for Kenya but also the region, e.g., Rwanda, Uganda, etc. The port has good facilities but is known for creating issues to delay import or export. This issue is usually handled by a good clearing agent. Some cases of corruption were reported by certain role players.

The government is well experienced in import and export transactions, and KEPHIS is efficient in Phyto and import systems. Certain role players did comment that KEPHIS are overregulating and would sometimes retest seed even if an ISTA is accompanying the shipment.

2.14. Income expectations from farmers for possible seed productions

Small scale farmers: In an experience that was collected with the introduction of AIV seed production, farmers were pleased in earning $4 500 / ha (app $1 820 / ac) from AIV seed production while their historical earnings were app $1 500 / ha ($610 / ac). The general reaction of farmers was that they compare their nett income from seed production with nett income from fresh vegetable production. They like the idea of having a fixed price for their produce when they plant. Close supervision is also a requirement to guide the growers in the process.

Commercial growers are interested in looking at vegetable seed production as they are under price competition from growers from Ethiopia on fresh produce due to transport subsidies from their government on export to Europe. Although the basic agronomic skills are present with these growers, no real seed production experience are present. These growers will look at seed production as a diversifying leg of their business to de-risk their vulnerability on the pricing of fresh products. They require a full feasibility study and training program to allow them to consider and commit.

2.15. **Investment requirements to establish a successful seed production area**

The first and general comment regarding vegetable seed production is that although the skill to produce the fresh product is a requirement to produce seed, it does not mean that the area suitable to produce the fresh product is also ideal for seed production. This assumption is a historical mistake in Kenya.

The first decision to make is, therefore, to decide on the production area for the crop. Kenya is a short-day environment, and species suspectable to daylength should be selected according to that requirement. Currently, items like eggplant, pepper, tomato, melon could be considered in a greenhouse, and open field seed production, Tropical onion, carrot, collards, and tropical vegetables could be tested for open field seed production. Flower seed production in the open field is an option on primarily commercial farms as a rotational crop.

Seed species needing vernalization should also be considered carefully as most areas have very mild night and winter temperatures. Artificial cold rooms are limited, but areas close to the mountains have colder winters and might be more suitable for these productions.

Access to a reliable water supply is critical and a possible investment/incentive to invest in drip irrigation by growers is a key to sustainable seed production. If seed production is an open field, the high rainfall areas should be avoided as the risk of seed-borne diseases increase substantially. In general, a dryer climate is better for seed production, but the water supply and irrigation system are a prerequisite.

Greenhouse seed production is, of course, less sensitive, but areas with enough sunlight and water should be considered. Access to farmworkers that have the ability and skill set to be trained to do the work in the greenhouse is essential.

Depending on the crop, the pre-cleaning equipment and infrastructure will need to be supplied /subsidized to the growers. Alternatively, a mobile pre-cleaning unit can be established to go around to growers to pre-clean the seed to be delivered to the seed companies.

A short summary of the situation would be that although the government and country do have the systems in place to facilitate successful vegetable and flower seed production, the balance of the supply chain is almost non-existent and will need to be established to be able to build a successful seed production country unit.

To stimulate a current contract seed production company from either USA, South Africa, Europe or East to establish a seed production unit in Kenya might be the easiest way to develop the supply chain on the farmer and support level. Vegetable seed production should also be considered on a EAC basis with Tanzania able to contribute in skill and infrastructure to such a venture.

Proper research on production technology is of crucial importance to assist companies in creating the correct protocol to do sustainable vegetable and flower seed production in Kenya.

CHAPTER 3

Human Skills Assessment

Chapter 3: Human Skills Assessment

To enable us to assess the whole value chain in the possible vegetable seed production, the skillset and experience of the Farmer, Extension officer, Input supplier, Seed company and Government is assessed

3.1. Farmers

Kenya's farming environment is made up of commercial and smallholder farmers. A smallholder farmer is defined as a farmer owning small-based plots of land on which they grow subsistence crops and one or two cash crops relying almost exclusively on family labor. They are mainly clustered around urban areas of Kenya. The literacy level is reported to be as low as 28% and is characterized by an aging demographic. The average age of these farmers is 60 years of age, as published by the Kenyan Ministry of Agriculture. The farmers do have the practical experience of growing vegetables but have limited ability to be open to new practices.

Although training and education remain a challenge to the small-scale farmer, the government is making a concerted effort to improve this situation. Younger people are better educated and contribute to the skill set of small farmers.

Commercial farmers can be described as a farmer; usually, an operator, farming for farm owners, making use of modernized farming systems, have access to greater portions of land and infrastructure. They are mainly clustered in peri-urban areas in Kenya and have higher literacy levels than smallholder farming communities. Most of the farmers have a university or college degree, are progressive in thinking and are very open to new ideas and practices. The average age of these farm operators is in their late 30's and farm owners in their late 40's, early 50's.

Therefore, commercial farmers have higher skill levels, required as a departure point to further academic and technical skills development needed for vegetable and flower seed productions. These skills are necessary for open field and greenhouse seed production practices. Farmworkers are generally well trained in production best practices and export systems like the EURO gap is maintained on the production sites.

3.2. Input suppliers and Extension officers

Input suppliers are described as any agriculture supplier of quality seed, fertilizer, chemicals, soil, insecticides, pesticides that are required for successful vegetable and flower seed production. Input suppliers have access to highly technical industry professionals. However, it has been found that the

highly specialized pool of talent has limitations with training and educating lower levels of literacy. For this reason, input suppliers mostly make use of agriculture extension officers to facilitate the necessary information to the target groups.

Agriculture extension officers are required to have a tertiary education qualification, with Mathematics, Physical Sciences as compulsory. They are further recommended to have studied, Life Sciences, Geography, Agricultural Sciences, and Information Technology. The formal minimum requirements to qualify for extension officer services are a Diploma in Agriculture or a BSC/ B (Agric) degree. Their planning and implementing skills need to be of the highest quality.

Agricultural extension officers are required to communicate to farmers about agricultural information, natural resources, animals, crops, on how best to utilize their land available. They furthermore are required to advise on constructing proper irrigation schemes, economic use, and storage of water, the combat of animal disease, and cost-saving farming practices.

The extension officer's main objective is to communicate in a way that is understood by the smallholder farmer. The information is transferred from the extension officer to the smallholder farmer in order to gain the maximum benefits from their planned productions.

Each agricultural extension officer is linked to one of the agricultural development centers throughout Kenya, which render agricultural services to farmers. These employers could be in the form of, and not limited to the Department of Agriculture, various industries and manufacturers of agricultural products (input suppliers) and farming co-operatives, pest control companies, agricultural corporations.

This form of education has been found to be successful; however, under constraints in having access to the necessary pool of agricultural graduate pool of talent.

3.3. Government and KEPHIS

In Kenya, the public sector is represented by the Ministry of Agriculture through the Direction of Extension, Research and Technical Training, universities, and research institutions around the country. These institutions provide extension services through various departments.

At the National level, Kenya's public extension (Ministry of Agriculture) comprises, an estimated, 5470 staff members. These staff members are managed by a team consisting of 910 senior staff members (MEAS report, 2011). The estimated staff of 5470 all possess a tertiary education degree. Most are formally trained to the level of an Agriculture diploma or Agriculture bachelor's degree. A Ph.D. is held by less than 0.3% and a Master of Science by less than 1% of the total employment. Furthermore,

the public extension boasts with more than 3000 subject matter specialists, all possessing a bachelor's degree, that provide support to field staff. 33% of these subject matter specialists are female. Females account for more than 32% of senior management employment. Two other groups have also been identified that have a vital role to play in the agriculture extension services NL: information, communication, and technology (ICT) support and in-service training staff.

KEPHIS (Kenya Plant Health Inspectorate Service) is responsible for all seed certification, phytosanitary services, and seed testing. Personnel is highly skilled, and each specialized in their department.

3.4. Horticultural Seed companies

Horticulture seed companies pursue highly qualified industry professionals. These individuals have several years of industry, academic and technical experience in the vegetable and flower production environments. This is a highly specialized profession, and these professionals are trained in specific horticultural seed varieties and product groups.

Horticulture seed companies employ or contract seed production specialists that have tertiary education, university degrees. These individuals are required to be qualified in BSc Plant production or Horticulture and ideally have completed the seed inspection qualification in collaboration with KEPHIS. Seed production is a highly specialized and regulated environment, and these individuals are highly sought after. A very limited pool of these individuals exsist.

Seed production specialists are responsible for contracting and supporting semi-commercial and commercial growers to multiply vegetable and flower stock seed to obtain high quality and yields of vegetable and flower seed. The seed productions require highly technical and, in practice training as it needs to adhere to the stringent local and international standards. This will be a key portion of the success for such a future project.

Most commercial seed production specialists are required to be seed inspectors as they perform a regulatory function on behalf of the Department of Agriculture. This is in a process to be recognized by KEPHIS. This enables the seed production specialist to certify various stages of crop growth.

The pool of talent for seed production specialists is small and due to the agriculture and horticulture professions being perceived as an unattractive industry to pursue, attract limited new entrants. There is a lack of transfer of knowledge from the specialized seed production specialists to the younger generations, simply because there is not enough enrolment and graduates into these specific study fields that can be trained and minimal access to these industry experts.

CHAPTER 4

Small Scale Farmer Seed Production

Chapter 4: Small scale farmer seed production

A rapid desktop comparison was made between Kenya and China 30 years ago in terms of vegetable and flower seed production environment.

In comparing the two countries in different time eras is a challenge of course but a few essential items are to note. Small scale farmers were farming most of the acres in both countries, using hand labour and little formal education. Seed production was stimulated in China with the deregulation of the seed industry. Due to the favorable labour costs and willing entrepreneurs, the seed industry developed quickly in China. Seed production was driven by small scale farmers who were mentored by new seed production companies that oversee the production of vegetable and flower seed in China. The growers started with OPV vegetable seed and quickly developed into hybrid seed production.

In my opinion, the key drivers that started this development in China the fact that irrigation was more readily available to the farmers and the stimulus the contract seed production companies provided to stimulate vegetable seed production in the area.

Other external factors that contributed were the increase in literacy, ideal climatic conditions, and the development of China in general. These items are also contributing to development in Kenya and I am of the opinion that Kenya seed production environment can be stimulated in a similar manner. Training and creation of a localized buy-in program from the total value chain will be key to success. A similar mentoring program that is used by the fresh production industry can also be considered to allow commercial growers to subcontract and mentor small scale growers.

Kenya does have a much better-developed seed law and regulations than what was applicable in China at the time. KEPHIS enforce the rules and regulations well and support the PVP on products in general

To learn from the business model in more detail from China can stimulate the contract seed production environment a lot in Kenya. A similar model to establish regional seed production entities, obtaining contracts to produce seed from third parties, contract small scale growers in a region to produce the seed under close supervision, clean the seed and export to the external company can develop into a similar industry than in China.

Comparative between Chinese production environment 30 years ago and Kenya today

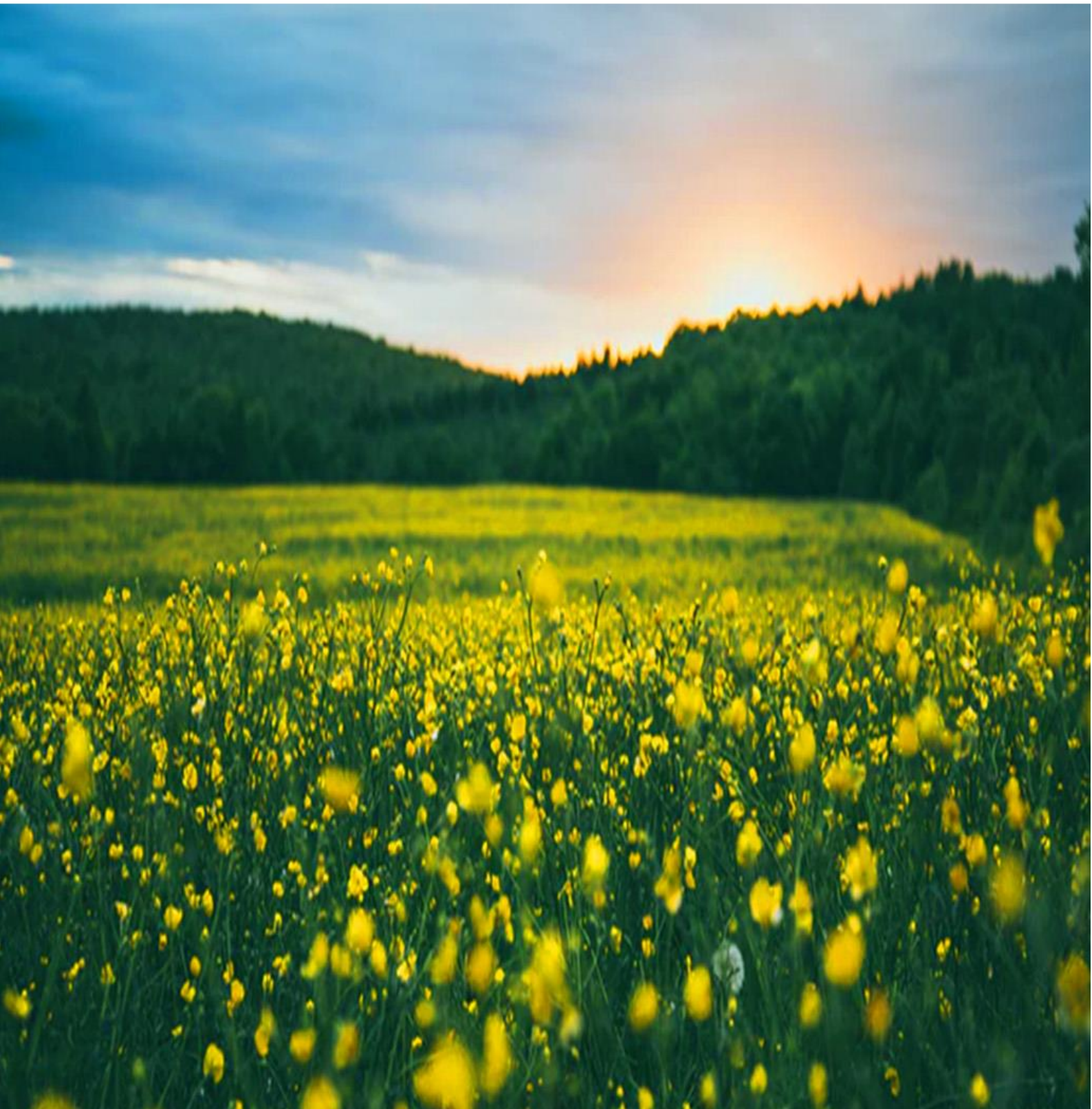
Items	China 30 years ago	Kenya
Farmers		
Size of farm	0.25 - 1 ha	0.25 - 2 ha
Family-run farm	yes	yes
Literacy	57%	28%
Mechanization	Hand Labour	Hand Labour
Cost of labor	Cheap	Cheap
Skill level	Practical no theory	Practical no theory
Farmer average age	Est 46	60
Government extension officers	Yes	Yes
Access to irrigation	Yes	Limited
Vegetable production	Yes	Yes
Communal Seed producers	Yes	Yes
Presence of input suppliers	Yes	Yes
Commercial growers		
Greenhouse	Limited	Limited
Big Farmers	Limited	Limited
Investment in Infrastructure	Yes	Yes
Seed Companies		
Government a significant player in the seed market	Yes	Yes
Government withdraw from seed market	Yes	Limited withdrawal
Contract seed production for third parties	Started	Very Limited
Seed production		
Communal seed production of Indigenous Vegetables	Yes	Yes
Limited Commercial seed production	Yes	Yes
Introduction of Vegetable seed Production Companies	Yes	No
Government		
UPOV 1991	No	Yes
OECD	No	Yes
ISTA	No	Yes
Recognition of PVP	No	Yes
Well established seed industry	No	Yes

Note: China did transform over last 30 years

Table 6

CHAPTER 5

Interaction with Seed Production Key Players



Chapter 5: Interaction with Seed Production Key Role Players

Various interactions with key role players during the period of the assignment were made. A lot of the feedback is incorporated in the report. This includes interactions with government, KEPHIS, AFSTA, STAK, and private seed companies. These role players are committed to delivering quality seed to the farmers in Kenya, currently focussed on production for corn, beans, etc. but have a clear interest to extend the activities to bigger scale vegetable and flower seed production in Kenya. All are aware of the limited success of the activity in Kenya up and till now. Tanzania had more success.

Several institutions and NGO's were very positive regarding further interaction if programs will be launched to stimulate additional seed production opportunities. It is also to be noted that most NGO's are focussed on the small-scale farmer and not to stimulate commercial activity in the market. Two models should be considered. One model can be a similar model to the fresh produce export industry where the commercial grower is the market opener and that they subcontract then certain activities to small scale growers. It is estimated that more than 30 000 small scale growers participate in export activities via more prominent commercial growers. This will require extensive investment in training and infrastructure to these commercial growers. A second model based on the Chinese model should be considered but again the investment in infrastructure, skill transfer and support structures are a pre-requisite for success.

Seed producers and community-based seed producers are operating in the formal and informal segments. Seed producers in the formal segment are registered on the KEPHIS system and monitored by the field inspectors. Seed producers do have a significant need for technical input and support. Yields of most crops in seed production are far below the industry norm and even compared to countries like Tanzania.

Financiers are very interested in the closed-loop system to create structured finance for growers. In talking to several banks, a proven business concept (vegetable and flower seed production), structured capital item finance and operational capital funding should be attractive if a guaranteed offtake agreement for the product exists. It is essential that the farmer does have access to sufficient water and irrigation to make sure risks are mitigated for the financier. Once a proven seed production concept is established, banks should be able to fund these activities to existing farmers.

Although several research activities were undertaken in the past on vegetable research, these activities were scaled down due to limited success and interest from students. Nairobi University does have a seed cleaning training academy. These universities can be approached for further research on seed production in Kenya. They are open to discuss these projects, but no clear commitment was received.

CHAPTER 6

Macro; Political; Economic Overview

Chapter 6: Macro; Political; Economic overview

6.1 Government Structure

The country of Kenya is a presidential representative democratic republic where the president is head of government as well as the head of state. It has an independent judiciary, and the legislative power is entrusted in the government in a two-house system, the National Assembly and the Senate.

A new constitution for Kenya was passed in 2010 and created 47 counties from the previous eight regions. This was in general positive for agriculture as the counties are more focussed on the local activity for its constituents. It is estimated that more than 70% of rural businesses are linked to agriculture.

Each county can elect a single member of the Senate. The government also deploys commissioners at each county to represent them. The chief executive of the county consists of a county governor and deputy governor. Kenyan law also requires a governor to have a university degree.

6.1.1. Political Stability

President Uhuru Kenyatta was sworn in for the second term (five years) on 28 November 2017 after the presidential elections were nullified on September 2017. (The World Bank In Kenya, n.d.). March 2018 a compromise deal between Raila Odinga (opposition presidential candidate) and the president reduced tensions that were fumed during the 2017 elections. The election saw abusive police operations that included the beating of people, raping of the woman and ending with the death of 100 opposition protesters in opposition strongholds. (2018, n.d.)

The United States continues with a travel warning for Kenya due to the threat of terrorism and crime. (Advisory, n.d.) Kenya Government and El-Shabab (Jihadist fundamentalist group) are involved in military operations in Kenya and neighbouring Somalia where El-Shabab is operational. Recent attacks on prominent locations in Nairobi by El-Shabab are highlighting these tensions. Kenya is historically and currently a stable and safe environment.

6.1.2. Corruption

Despite the reforms that the government has put in place, bribery is still an extensive problem. The use of "agents" to facilitate business presents a challenge to companies, especially to new companies that want to enter the Kenyan market. (Profile, 2015)

Kenya was ranked 145 out of 176 countries by Transparency International in 2016 on the corruption index. Despite reforms, the backlogs are still significant in cases where corrupt dealings, especially where corrupt dealings in land purchases, is involved. The passing of the new Bribery act in 2016 heightens penalties and mitigates some of the risks by putting in place some bribery prevention procedures.

6.1.3. Foreign Trade

Kenya has moved up 21 places in the World Bank's 'Ease of Doing Business Index.' This makes Kenya the third most improved economy in 2017. Part of the reforms that the government has introduced is removing barriers to starting a business, registering property and access to utilities.

The EY Attractiveness Program Africa 2018 report place Kenya as the third most attractive African Nation to invest in. It must also be noted that China is taking a massive interest in investing in Kenya and are a prominent supplier of various products to Kenya. Kenya's main export products are Tea, Coffee, and Horticultural products, which are mainly exported to Europe. Kenya's biggest trading partners are its neighbors, Uganda and Rwanda. Agriculture is the most significant contributor to the Kenyan economy and is core to its development strategy. (Guide)

Kenya currently the 98th largest trade partner of the US and currently runs a trade deficit of $279 million in 2018. (Representative, n.d.) Kenya is part of the East African Community (EAC) customs union that includes the Republics of Burundi, Kenya, Rwanda, South Sudan, the United Republic of Tanzania, and the Republic of Uganda, with its headquarters in Arusha, Tanzania. The combined population is 145 million.

Kenya is also a member of the Common Market for Eastern and Southern Africa (COMESA) that consists of 16 countries. Exports and imports within member countries enjoy preferential tariff rates. The EAC Member States have signed a Protocol to establish a joint Customs Union. (Guide) Kenya has signed bilateral trade agreements with the following countries: Argentina, Bangladesh, Nigeria, Bulgaria, China, Comoros, Congo (DRC), Djibouti, Egypt, Hungary, India, Iraq, Lesotho, Liberia,

Netherlands, Pakistan, Poland, Romania, Russia, Rwanda, Somalia, South Korea, Swaziland, Tanzania, Thailand, Zambia, and Zimbabwe. (Guide)Additional agreements that are currently under negotiation with the following other countries: Belarus, Czech Republic, Ethiopia, Eritrea, Iran, Kazakhstan, Mauritius, Mozambique, and South Africa.

6.1.4. Tax policies

Kenya's taxation system consists of value-added tax, income tax, customs and excise duties, capital gains tax, withholding tax, transfer pricing rules, etc. Customs duty is levied at an average of 25% based on the International Harmonized system. Imports into Kenya are subject to a standard VAT rate of 16%. General corporate tax is 30% for resident companies, 37,5% for non-resident companies, an approximate 20% for small business entities (2018). (Guide) There is no double tax treaty between Kenya and the United States.

The Kenyan revenue authority also provides for various tax incentives, allowances and exceptions for businesses and farming operations. Foreign investment above $100 000(multiple criteria) qualifies for specific tax incentives.

Examples of tax incentives (according to Tax authorities at this moment) include accelerated Investment deduction, e.g., investment in any buildings or machinery for manufacturing can claim 100% of the cost. If the capital expenditure exceeds sh.200million and the investment is outside Nairobi, the allowance is 150% of the cost. Farming cost deductions include any capital expenses for farm construction that are 100% deductible.

Special Economic Zones exist, and capital expenditure on buildings and machinery for use in a Special Economic Zone shall be entitled to Investment deduction equal to one hundred percent of the capital expenditure.

6.2. Economic Factors:

6.2.1. Economic growth and other factors

Kenya is known as the financial, logistics hub, and commercial hub of East Africa but half of the population lives under the poverty line. (Aid, n.d.)

Kenya's GDP growth rate is predicted to rise from 4.9% in 2017 to 6% in 2020, according to the World Bank's 18th Kenya Economic Update. (Bank T. W., 2018). Improved business confidence, macroeconomic stability, and the recovery of the agricultural industry, together with the strengthening in the global economy and tourism, is a contributing factor behind this growth. The risk to this growth is a weak global growth and the instability in the oil price. (Bank A. D., n.d.). The GDP growth rate can be compared to other EAC countries below.

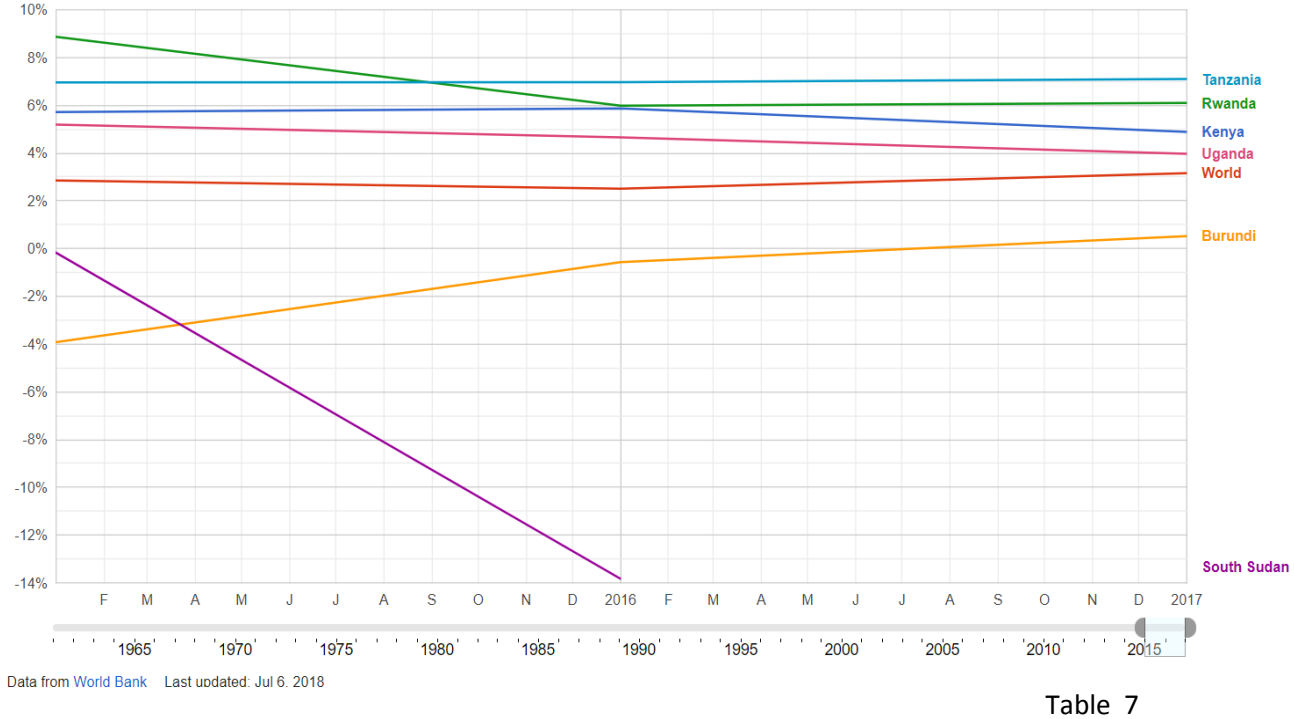


Table 7

Price competition in Kenya is weak with the price sensitivity of consumers that is high. These factors stifle new start-ups but also create opportunities. The fact that ownership of land is an issue that reduces the borrowing capabilities of families and businesses. (Kenya, n.d.)

6.2.2. Exchange rate

The Kenyan Shilling is the currency of Kenya. The currency code for Shillings is KES, and the currency symbol is KSh. (XE, n.d.) The Kenyan Shilling has remained relatively stable for the past five years and has averaged between 100 and 103 KSh against the US Dollar for the past few years.

Fitch Solutions has a forecast of 111.5 KSh to the US Dollar by the end of 2020.

Table 8

1.2.3. Inflation rate

The Kenyan government is applying continuous fiscal consolidation by decreasing government

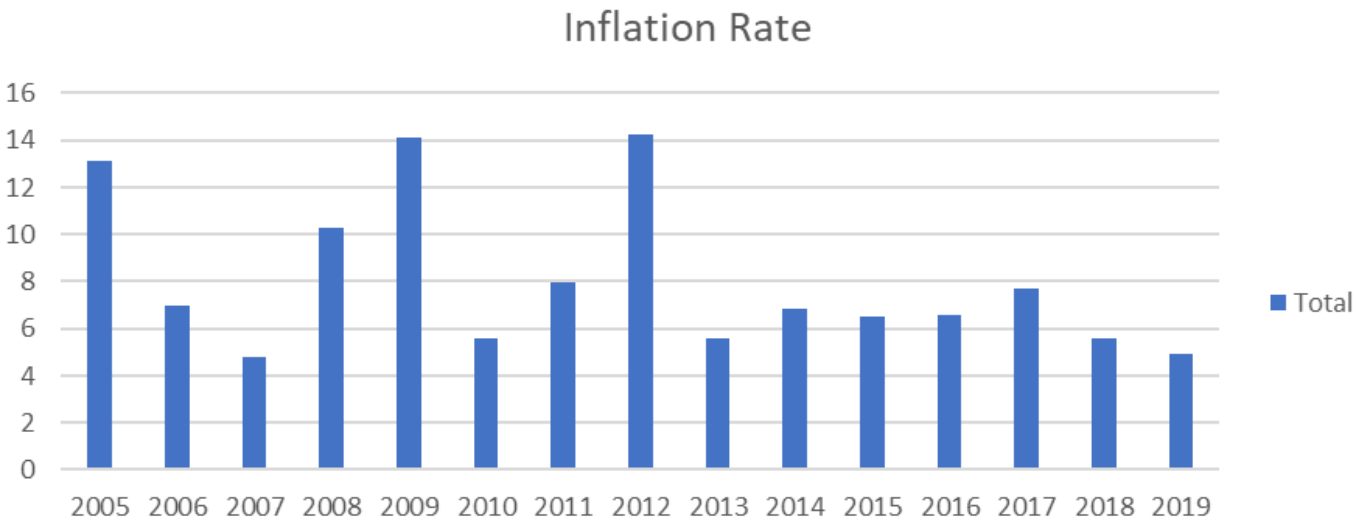


Table 9 Source: Central Bank of Kenya

5.4% in 2020 due to this policy. (Bank A. D., n.d.) Inflation is expected to remain within the target range in the foreseeable future, mainly due to expectations of lower food prices following favorable weather conditions. (Tradingeconomics, 2019)

6.2.4. Interest rate

It was decided by the Monetary Policy Committee to keep the bank rate at 9% due to the inflation rate ranging between 2.5% and 7.5%. It is forecasted that the bank rate will remain stable with possible downward pressure in 2020 if the inflation rate is managed within the target range. (Economics)

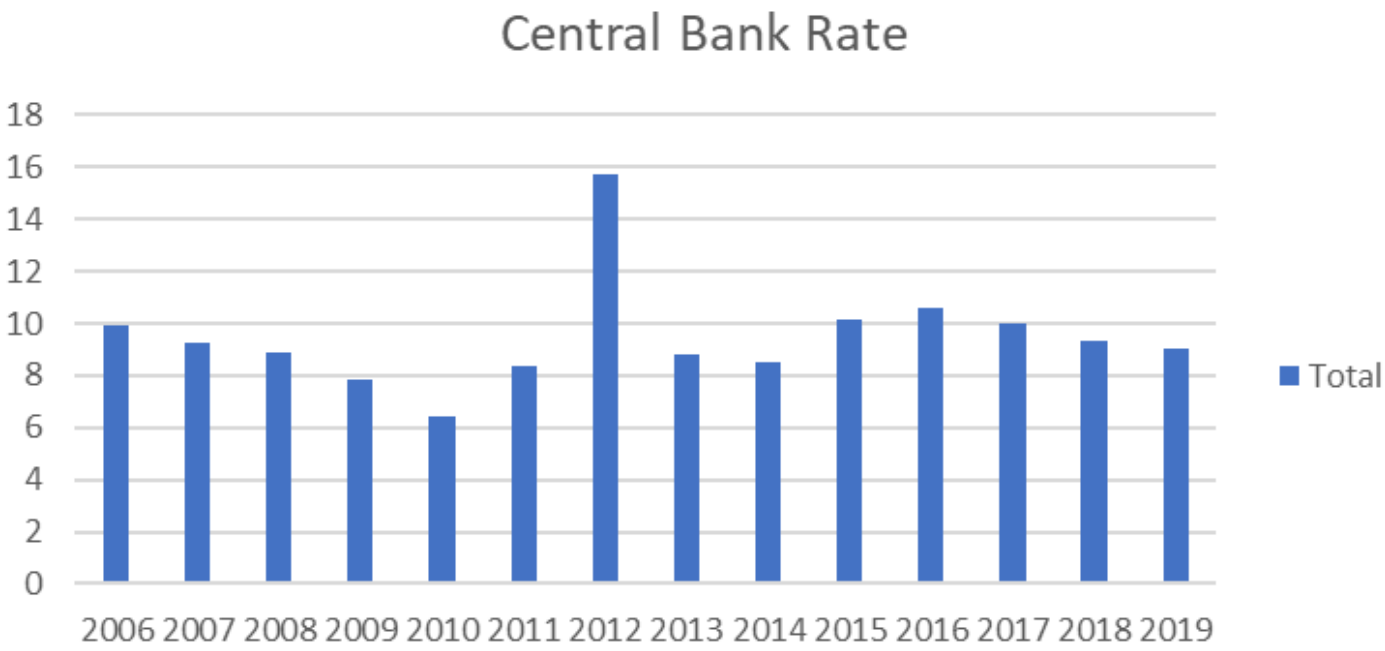
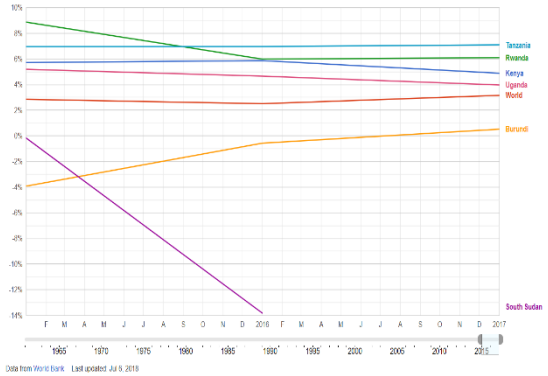


Table 10: Source: Central Bank of Kenya

6.2.5 Unemployment rate and income inequality

The country's per capita GDP was $1,553 in 2016, but unemployment and poverty remain high. (Export)

With the introduction of Kenya's Big Four (B4) economic plan, introduced in 2017, the focus has been



fixed on manufacturing, affordable housing, universal health coverage, and food and nutrition security. The Big Four plan will focus on structural transformation, entrenched social and economic challenges, and increase economic growth to at least 7%. By implementing the B4 strategy, Kenya hopes to reduce poverty rapidly and create decent jobs. (Bank A. D., n.d.) The population in extreme poverty (living on less than $1.90 a day) declined from 46% in 2006 to 36% in 2016. But the trajectory is inadequate to eradicate extreme poverty by 2030. (Group, n.d.) This is made worse by high unemployment that is prevalent among young people

6.2.6 Foreign investment

Kenya is ideally based on being the main logistical channel to the EAC. There are also multiple international companies whose regional headquarters is based in Nairobi. As the Indian Ocean is Kenya's border to the east, it has access to the most crucial shipping lanes. The Port of Mombasa is the most important deep-water port in the region. Kenya also has four international airports based throughout the country. The Kenyan government is continuously improving its regulatory framework to attract foreign investment and to increase its attractiveness investors. There is little to no discrimination against foreign investment companies as they are granted access to finances, research, export promotions programs and also has no bias against goods produced locally or imported. (Guide)

6.3. Social Factors:

6.3.1 Population growth

The current population of Kenya is 52,319,133 as of Monday, August 5, 2019, based on the latest United Nations estimates.

6.3.2 Business customs

Kenya's political and business culture differs in many ways from the west, but the US and Kenya have enjoyed a stable relationship in going back a long way. Kenyan businessmen are sophisticated, informal, and open. You are more than welcome to address someone on first name bases, and friendship and trust are highly valued. (Guide) A forty-hour week is a norm for businesses and office hours range from 8:00 AM to 5:00 PM, with a typical lunch hour from 1 to 2. Retail stores are typically open from 9:00 AM to 6:00 PM, and there are several supermarkets that are open throughout the day.

The following are the official statutory holidays when most commercial offices are closed:

New Year's Day, January 1	Good Friday, April 18
Easter Monday, April 21	Labor Day, May 1
Madaraka Day, June 2	Id-Ul-Fitr, July 28*
Mashujaa Day, October 20	Jamhuri Day, December 12
Christmas Day, December 25	Boxing Day, December 26

6.3.3. Workforce

Its urban areas, particularly Nairobi, are noted for their large number of well-educated English-speaking and multi-lingual professionals, and for their strong entrepreneurial tradition. (Kenya, n.d.)

6.4 Technology:

6.4.1 Level of Innovation and Internet access

Kenya is according to internetworldstats.com, the country in Africa with the highest internet penetration rate at 89.8% of the population. Several programs are run via the Internet base and but the country as one of the most accessible in Africa. Internet connection is only limited in isolated rural areas, and the country as got access to fiber fix line technology. The internet remains slow in rural areas but is accessible.

https://www.internetworldstats.com/stats1.htm

6.4.2. Technological awareness

Kenya was the front runner and is still currently leading the world of mobile money transfer. Kenya was part of the development of the M-PESA payment system. This system uses a mobile phone as a wallet and has changed the way people spend money, save, etc. There are about 17 million users of M-PESA in Kenya. (Economist, n.d.)

6.4.3. Foreign exchange control

Kenya currently does not have any exchange control laws and has moved to a fully market-determined exchange rate system. This has led to a short-term capital inflow. (Guide)

There is no restriction on residents and non-residents to buy or sell foreign exchange up the $10,000. Any amount above this limit should be accompanied by relevant paper words. Exporters may keep the proceeds in foreign currency accounts with a bank or sell the proceeds to obtain local currency. The is also no limit on any out of country borrowings. It must, however, be stated that royalty agreements, management fees, and the like is subject to approval. (Guide)

The Anti-Money Laundering Bill came into effect in 2010 and has been praised as a significant win against the fight against the money laundering activities that have been prevalent in Kenya. (Guide)

6.4.4 Antitrust laws

The competition act of 2010 was promulgated in August 2011. The act created the Competition Authority of Kenya (CAK). All mergers and acquisitions required the approval of the CAK with a pre-scribed fee based on turnover.

6.4.5 Employment laws

The minister is reviewing the current labour laws to ensure that it's in line with the new 2010 constitution. The Kenyan labor laws are in line with internationally agreed standards. The Labor Relations Act of 2007 enables workers to join a union and to strike subject to certain conditions. The act also provides for equal pay for equal work, and the government has established a minimum wage by occupation and location. The government has also implemented programs to eliminate forced and child labor. (Guide)

A work permit is required for all foreign workers, and international companies have complained that the permit process is slow, and the approval process is riddled with corruption and bribes must be used to speed up the process. (Guide)

After receiving an investment certificate from KenInvest, an Investment company becomes eligible for the three entry permits for management, technical staff, shareholders, or partners. (Guide)

6.4.6 Legal regime

The Kenyan legal system is based on British law. The Kenyan regulatory system is transparent, for the most part, and any proposed regulations are published and open to public input and deliberation before passed as law. Many international law firms are represented, and standards are ethical (Guide)

6.4.7 Expropriation and compensation

The Land Acquisition Act of 2010 governs the process of acquiring land. The new constitution also protects land rights and only allows expropriation where there are safety concerns and any eminent domain cases. This expropriation cases typically go hand in hand with market-related compensation.

6.4.8 Ease of creating a new company

Registering and business in Kenya are accessible and fully digitized. This creates transparency and minimizes the chance of corrupt behavior. (Guide)

Conclusion

Kenya has made significant political, structural, and economic reforms that have primarily driven sustained economic growth, social development, and political gains over the past decade. However, its key development challenges still include poverty, inequality, climate change, and the vulnerability of the economy to internal and external shocks.

KEY RECOMMENDATIONS

Key Recommendations

The following recommendations are made to consider and interact with various role-players

Regulatory influence

1. Create a separate set of requirements for the import of parent seed/seed for reproduction to differentiate from commercial seed. Currently, it is required that an OIC is supplied and adhere to the minimum germination requirement asset for commercial seed. This is not feasible and practical as parent seed is not always adhering to the same quality specs as commercial seed. This will restrict the movement of parent seed and limit seed for multiplication in Kenya.
2. Small seed lots used for research or basic seed increase need to be handled as a separate class of import to differentiate from commercial seed and adhere to the international movement of parent seed regulations.
3. Handle seed derived from New Breeding Techniques in terms of norms set by ISF as non-GMO and allow future multiplication and sales of these varieties in Kenya as no GMO varieties.
4. Consider the limited import of chemicals selects used for vegetable seed production.
5. Currently, vegetable seed production is not included in the OECD scheme (only maize, Oilseed and forage seed included). Include vegetable seed as an OECD certified crop.
6. It is noted that seed law allows the accreditation of private seed inspectors and that KEPHIS recently issued a statement to invite seed inspectors to accredit with KEPHIS. KEPHIS is recommended for this action, and quick implementation is requested.
7. Kenya has the most progressive and advanced seed system in East Africa. KEPHIS and the Government of Kenya are requested to take the lead in the region to implement a harmonized seed system in the region. Recognition is given for the vital role in the progress made via COMESA to implement the COMESA harmonized seed systems. Vegetable and flower seed production should also be aligned throughout the region to utilize resources to the maximum..
8. Create a vegetable and flower seed working group between government, private formal seed sector, and seed growers to discuss industry issues, seed distance isolations, diseases recognized and controlled mechanisms, general production issues, etc.

Government influence

1. Include Vegetable and flower contract seed production in Kenya as part of the key growth opportunities in the Kenya 2030 growth plan for agriculture.
2. Give tax and investment incentives to companies investing in contract seed production, training of seed production advisors and investing in local seed cleaning and treatment facilities which will stimulate contract seed production.
3. Include training of seed production advisors in the key agricultural training program for Kenya.
4. Train current extension officers to advise seed growers on good production practices.
5. Promote the seed industry as a career alternative for postgraduate students. Create courses to specialize in vegetable and flower seed production.
6. Stimulate and promote M.SC and P. HD students to write their thesis on vegetable and flower seed production improvement for Kenya conditions.

Private Sector

1. Invite and entice vegetable and flower seed production companies to invest in Kenya to stimulate contract seed production.
2. Stimulate and engage key role players to use seed production experts to make trails for seed production in various parts of the country to gain more data.
3. Create and invest in training of vegetable seed growers, farmworkers, management, government extension officers, and input suppliers on the skill to do successful vegetable seed production.
4. Engage with financiers to create a closed-loop financing structure to allow seed growers to invest in seed production infrastructure and operational expenses.
5. Campaign commercial vegetable growers and new commercial growers to test, invest, and promote vegetable seed production as a commercial activity.
6. Search for international investment incentive programs to stimulate commercial vegetable and flower seed production companies to invest in Kenya.
7. A regional approach to include Tanzania as a seed production destination will make commercial sense.

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ANNEXURES

Annexure A Detailed Import process

Annexure B Detailed Export process

Annexure C List of Registered Seed Companies

Annexure D Improving access to quality seed in Africa