D.2.1 SWOT Analysis

for

Targeted Countries

MILESTONE 2

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Part I.

SWOT ANALYSIS OF MEDICINAL AND AROMATIC PLANT PRODUCTION, IN KENYA, MAURITIUS AND SOUTH AFRICA

A. Kenya- Medicinal and Aromatic Plant Production

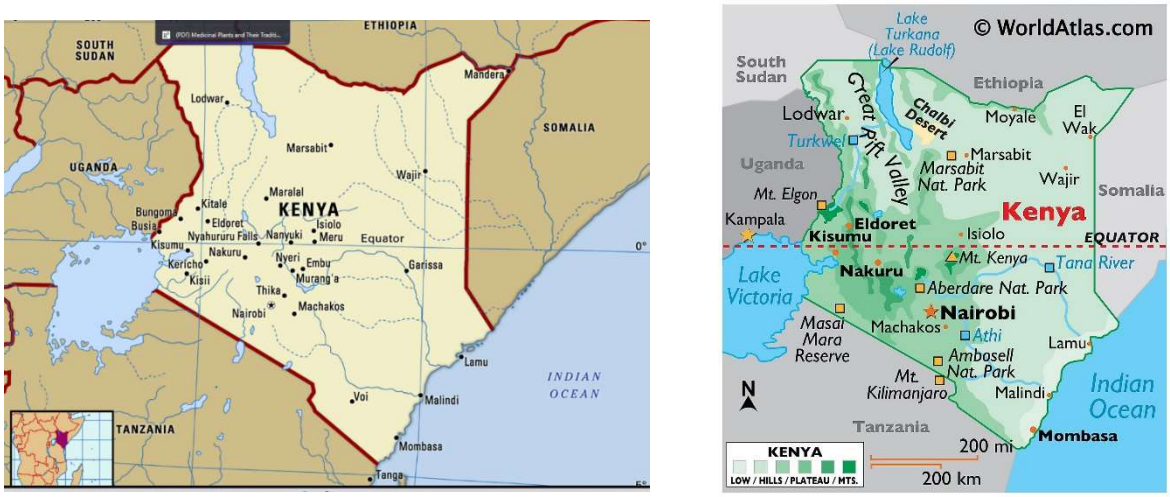

Figure 1 – Maps of Kenya

1. Main country data for Kenya:

Area: 569 140 km^2

Population: The total population of Kenya is approximately 47.6 million inhabitants. The population is expected to grow from 2018 to 2028 by ca. 9%.

Human Capital Index: The Human Capital Index (HCI) database provides data at the country level for each component of the Human Capital Index. This index measures the knowledge, skills, and health that people accumulate over their lives.

Demographics: Kenya has a diverse population with various ethnic groups. The country is known for its cultural richness and diversity.

Economy: Kenya has a growing economy and is considered one of the economic powerhouses in East Africa. The country's economy is driven by sectors such as agriculture, manufacturing, services, and tourism.

Agricultural Land: Kenya has a significant amount of agricultural land. In 2018, agricultural land accounted for 48.1% of the country's total land area.

Arable Land: The arable land in Kenya is estimated to be 9.8% of the total land area.

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Permanent Crops: The percentage of land dedicated to permanent crops in Kenya is 0.9%.

Permanent Pasture: Kenya has a significant amount of permanent pasture, which accounts for 37.4% of the country's land area.

Forest: Forests cover approximately 6.1% of Kenya's land area.

2. Climate of Kenya

The climate of Kenya is generally sunny, dry, and temperate throughout most of the year, despite being situated directly on the equator. However, **there are variations in climate across different regions of the country.**

Temperature: Kenya experiences average daytime temperatures ranging between 20°C/68°F and 28°C/82°F. The highlands, such as the central region, tend to have cooler temperatures compared to the coastal and lowland areas.

Rainfall: Kenya has two rainy seasons. The long rainy season occurs from March to May, while the short rainy season takes place from October to December. The amount of rainfall varies across different regions, with the western and coastal areas receiving higher rainfall compared to the arid and semi-arid regions.

Dry Season: The relatively cool and dry season in Kenya occurs from late June to August. During this time, there is less rainfall, making it a popular period for wildlife safaris and outdoor activities.

Laikipia Plateau: Central Kenya's Laikipia Plateau is known for its unique climate. It is generally hot and rainy throughout the year, with the wettest region in the country. However, there is abundant sunshine year-round.

It is important to note that due to its diverse geography, the climate can vary within different parts of Kenya

3. Topography of Kenya

The topography of Kenya is characterized by diverse geographical features and landscapes.

Highland Zone: Kenya region, known as the highland zone, consists of rolling uplands with cool weather. This area is marked by scenic landscapes, including hills and valleys.

Rift Valley: One of the prominent features of Kenya's topography. It is a geological trench that runs through the country from north to south. The Rift Valley is known for its steep escarpments, volcanic mountains, and lakes.

Mountains: Kenya is home to several mountains, including Mount Kenya, which is the highest peak in the country and the second-highest in Africa. Mount Kenya is a glaciated mountain with snow-capped peaks. Other notable mountains in Kenya include Mount Elgon and the Aberdare Range.

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Coastal Plains: Along the eastern side of Kenya, there is a coastline on the Indian Ocean. The coastal region is characterized by broad plains and sandy beaches. It also contains swamps of East African mangroves.

Plateaus: Kenya has various plateaus, such as the Laikipia Plateau in central Kenya. These plateaus are elevated areas with relatively flat terrain.

Great Rift Valley: The Great Rift Valley is a significant geological feature that stretches across Kenya. It is known for its dramatic landscapes, including cliffs, gorges, and volcanic formations.

Lakes: Kenya is home to several lakes, including Lake Victoria, Lake Turkana, and Lake Nakuru. These lakes contribute to the country's diverse topography and provide habitats for a wide range of flora and fauna.

4. Agriculture in Kenya

The agriculture sector in Kenya plays a significant role in the country's economy. Its contribution to the Economy amounts to approximately 26 percent of Kenya's Gross Domestic Product (GDP). It is considered the backbone of the economy.

About 15-17 percent of Kenya's total land area of **580,367 km²,** has sufficient fertility and rainfall to support farming. The land is suitable for agricultural activities.

In Kenya, most crops are grown using intercropping methods, where one main crop (e.g., maize) is planted with a second crop (e.g., beans). This approach maximizes land utilization and crop diversity.

Kenya has two main **growing seasons**, which allow for the cultivation of various crops throughout the year.

Agricultural products such as tea, fresh flowers, fruits, vegetables, and coffee constitute a significant proportion of Kenya's exports. These products contribute to the country's foreign exchange earnings.

The agriculture sector in Kenya is large and complex, involving multiple stakeholders from the public, parastatal, non-governmental, and private sectors. These entities contribute to the development and growth of the agricultural industry.

Conservation Challenges: Like many countries, Kenya faces challenges in the conservation of its agricultural resources. Unsustainable practices, habitat destruction, and overharvesting pose threats to the availability of certain crops and medicinal plants.

Kenya’s vision 2030 partly aims at ensuring adequate health care for all, and the integration of traditional healthcare practices into the national healthcare system would present a more rapid alternative towards the realization of universal health coverage in Kenya (Odongo et al., 2022)**.**

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5. Major agricultural regions in Kenya:

Regarding possible MAP cultivation it can be a guiding principle / starting point, where the presently known agricultural production areas are located. These are the following:

Western Highlands is located around Lake Victoria and Mount Kenya and has a high or medium potential for farming.

Coast: The coastal region of Kenya is also known for its agricultural activities.

These regions have fertile land and favorable climatic conditions for agriculture. They contribute significantly to Kenya's agricultural sector.

The main food crops grown in Kenya include maize, wheat, rice, potatoes, green grams, and beans. Maize is the principal staple food of Kenya and is grown in 90 percent of the country.

6. Traditional Medicine in Kenya.

Herbalism is the most preferred form of traditional medicine and is highly lucrative in the international market with annual sales ranging from US dollar 5 billion in Western Europe to US dollar 14 billion in China. In Africa, herbal products are available in most markets in the urban centers and rural areas. Irrespective of the accessibility to modern medicines, various communities in Kenya (either deliberately or due to economic limitations) utilize medicinal plants for the management of microbial infections and other diseases; thus, various legislations are actively being formulated to regulate this practice. Presently, there are over 400 plant species used for the management of common diseases in East Africa documented in several ethnobotanical.

7. Influencing Factors of Medicinal and Aromatic Plant Production, in Kenya.

This is a topic that has been studied and documented. Here are some decisive, key points to consider when evaluating MAP production in Kenya:

7.1 Practice of traditional medicine:

The practice of Traditional Mediciene has come a long way from ancient times. However, not much has come in the way of development and utility of TM as a resource owing to several limitations. This communication will, therefore, look at the status (both past and present), and challenges of TM in Kenya, and will provide recommendations on how the practice can be safeguarded.

Medicinal plants germplasm, which are the major sources of ethnomedicine form an important part of forests and riverine vegetation in Kenya. These important plants include Warburgia, Rhas spp., Aspilia, Acacia, prunus, Molinga, Brascae, Aloe, and Terminalia.

7.2 Diversity of Medicinal Plants:

Kenya is known for its rich biodiversity, including a wide variety of medicinal plants. These plants have been traditionally used by different communities in Kenya for their healing properties.

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7.3 Conservation Challenges:

Medicinal plant resources in Kenya are facing challenges due to unsustainable practices, habitat destruction, and overharvesting. This has led to a decline in the availability of certain medicinal plants. 296 plant species from 80 families and 191 genera were identified.

7.4 Indigenous Knowledge:

Medicinal plants are vital sources of easily accessible remedy used in the countryside healthcare system. As an example, the Maasai community in Kenya has a deep understanding of medicinal plants and their uses. Research has been conducted to document the diversity and uses of medicinal plants among the Maasai.

8. Production of Medicinal and Aromatic Plans, Spices, in Kenya

The cultivation of wild medicinal plants is an important approach to safeguard the herbal industry in Kenya. Efforts are being made to promote the cultivation of medicinal plants to ensure a sustainable supply (Matthews & Jack, 2011).

8.1 Main cultivated medicinal plants

Based on the presently available, real-time information, here are some of the main cultivated medicinal plants in Kenya:

Toddalia asiatica: This plant has strong antimicrobial activities and is used for various medicinal purposes.

Hagenia abyssinica: Known for its medicinal properties, this plant is used in traditional medicine in Kenya.

Ocimum gratissimum: Also known as "African basil," this plant is used for its medicinal and culinary purposes.

Harrisonia abyssinica: This plant is used in traditional medicine for its therapeutic properties.

Senna didymobotrya: Commonly known as "popcorn cassia," this plant is used for its medicinal properties.

Catha edulis (Khat or qat) native to eastern and southeastern Africa. It contains the alkaloid cathinone, a stimulant which causes greater sociability, excitement, mild loss of appetite and mild euphoria.

8.2 Main cultivated spice plants

Based on the real-time information, here are some of the **main cultivated spice plants** in Kenya. Exports In 2022, Kenya exported $15.2M in Spices, making it the 32nd largest exporter of Spices in the world. At the same year, Spices was the 77th most exported product in Kenya.

Basil: Basil is a popular spice plant cultivated in Kenya. It is known for its aromatic leaves and is used in various cuisines for its distinct flavor.

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Cilantro/Coriander: Cilantro, also known as coriander, is another commonly cultivated spice plant in Kenya. Both the leaves and seeds of this plant are used in cooking for their unique taste.
Oregano: Oregano is a spice plant that is grown in Kenya. It is known for its strong flavor and is often used in Mediterranean and Italian cuisines.
Parsley: Parsley is a widely cultivated spice plant in Kenya. It is used as a garnish and flavoring agent in various dishes.
Bay Leaves: Bay leaves are grown in Kenya and are used as a spice in cooking. They add a subtle aroma and flavor to soups, stews, and sauces.

The cultivation of these spice plants contributes to the rich flavors and culinary traditions of the country.

8.3 Export / Import of MAP commodities

In 2022, Kenya was the number 66 economy in the world in terms of GDP (current US$), the number 115 in total exports, the number 80 in total imports, the number 148 economy in terms of GDP per capita (current US$) and the number 84 most complex economy according to the Economic Complexity Index (ECI) .

8.4 Spices Exports

In 2022, Kenya exported $15.2M in **Spices**, making it the 32nd largest exporter of **Spices** in the world. At the same year, Spices was the 77th most exported product in Kenya. The main destination of Spices exports from Kenya are: United Kingdom ($3.18M), Uganda ($2.61M), Netherlands ($1.76M), Denmark ($1.36M), and Rwanda ($1.35M).

In 2022, Kenya exported $42.3k in **Spice Seeds**, making it the 91st largest exporter of Spice Seeds in the world. At the same year, **Spice Seeds** was the 763rd most exported product in Kenya. The main destination of Spice Seeds exports from Kenya are: Uganda ($21.7k), Norway ($6.55k), South Sudan ($6.37k), Slovenia ($3.36k), and United Kingdom ($1.4k). https://oec.world/en/profile/bilateral-product/spice-seeds/reporter/ken

The fastest growing export markets for **Spice Seeds** of Kenya between 2021 and 2022 were Norway ($6.55k), South Sudan ($6.37k), and Slovenia ($2.12k).

8.5 Spices Imports

In 2022, Kenya imported $2.53M in Spices, becoming the 102nd largest importer of Spices in the world. At the same year, Spices was the 580th most imported product in Kenya. Kenya imports Spices primarily from: India ($717k), South Africa ($480k), Tanzania ($452k), United Arab Emirates ($380k), and China ($186k).

The fastest growing import markets in Spices for Kenya between 2021 and 2022 were India ($217k), China ($109k), and France ($44.5k).

In 2022, Kenya exported $15.2M in Spices. The main destinations of Kenya exports on Spices were United Kingdom ($3.18M), Uganda ($2.61M), Netherlands ($1.76M), Denmark ($1.36M), and Rwanda ($1.35M).

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In 2022, Kenya imported $2.53M in Spices, mainly from India ($717k), South Africa ($480k), Tanzania ($452k), United Arab Emirates ($380k), and China ($186k).

9. Agricultural Legislation in Kenya

- The Agriculture and Food Authority (AFA) Act, 2013: This legislation establishes the **Agriculture and Food Authority**, which is responsible for regulating and developing the agricultural sector in Kenya.
- **The Crops Act, 2013:** The Crops Act focuses on the regulation and promotion of crop production in Kenya. It covers various aspects such as crop quality, certification, marketing, and research.
- **Agriculture Act (Cap 318):** This act aims to promote and maintain stable agriculture in Kenya. It includes provisions for soil conservation, fertility preservation, and the stimulation of agricultural activities.

Kenya National Strategies and Policies in Support of the Agricultural Sector: In June 2008, Kenya adopted the **Kenya Vision 2030** as a blueprint for the country's development. This vision includes strategies and policies to support the agricultural sector.

10. SWOT ANALYSIS OF MEDICINAL AND AROMATIC PLANT PRODUCTION IN KENYA

Strength

- most crops are grown with intercropping which allows,
- availability of land and favorable climate to grow most MAPs throughout the year and on perennial bases
- Kenya has two growth season which allows for a better supply of MAPs

Weakness

- no single study has documented medicinal plants as a whole in the area
- the regulatory framework for the practice of traditional medicine in Kenya is still underway
- Limited cultivation: There is a lack of large-scale cultivation of medicinal and aromatic plants in Kenya. This limits the overall production and availability of these plants.
- Constraints to cultivation: Smallholder farmers face various constraints when it comes to cultivating medicinal plants. These constraints can include limited access to resources such as land, water, and capital, as well as a lack of knowledge and technical expertise.
- Conservation challenges: Weaknesses in the conservation of medicinal and aromatic plants in Kenya pose a threat to their sustainable production. The loss of biodiversity and habitat destruction can negatively impact the availability and quality of these plants.
- Limited integration into global value chains: Integrating endemic medicinal plants into global value chains is a challenge. This limits the market opportunities for Kenyan

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producers and hampers the growth of the industry. Lack of information on where to sell markets

- Lack of research and development: Insufficient research and development efforts focused on medicinal and aromatic plants in Kenya can hinder innovation, productivity, and the development of new varieties or products.
- Lack of education (**University of Nairobi – Faculty of Agriculture**: The University of Nairobi offers a Faculty of Agriculture that collaborates with ESSA (Eastern and Southern Africa) to organize various agricultural programs and initiatives. They have a department of Plant Science and other relevant departments. **Jomo Kenyatta University of Agriculture and Technology** (JKUAT): JKUAT is another prominent agricultural university in Kenya. **Kenyatta University – School of Agriculture & Enterprise Development**: Kenyatta University is known for its School of Agriculture & Enterprise Development. **Kenya School of Agriculture**: The Kenya School of Agriculture is an Agricultural Training College under the State Department of Crops Development and Research. They focus on agricultural training and capacity building.

It is important to note that the listed weaknesses can be used in order to promote the sustainable production and utilization of medicinal and aromatic plants in Kenya.

Opportunities

- A high plant diversity for the production of roots, bark, leaves, fruits, and flowers as medicinal resources.
- Commercialization: There is a growing interest in the commercialization of medicinal and aromatic plant products in Kenya. Efforts are being made to add value to raw plant materials and develop marketable products. This can contribute to economic growth and create business opportunities in the herbal medicine and natural products industry.
- Conservation and Use: The future of medicinal and aromatic plants in Kenya depends on resolving the conflicts between conservation and use. Finding a balance between preserving these plants and utilizing them sustainably is crucial.
- Enhanced conservation of the environment.
- Improved efficiency in operations and sustainability of the MSMEs;
- Improved quality and yield of products;
- Increased income for the local community;
- Livelihood Improvement: Medicinal and aromatic plants offer opportunities for improving livelihoods in Kenya. Projects have been initiated to develop medicinal products from plants found in specific regions, such as the Kakamega forest in western Kenya. These initiatives aim to create value-added products and generate income for local communities.
- Reduced reliance on forest resources by the community;
- Research and Development: There is ongoing research and development in Kenya focused on medicinal and aromatic plants. This includes studying their biodiversity, crop improvement, and sustainable agriculture practices. Researchers are exploring the potential of these plants for various applications, such as herbal medicine, cosmetics, and food additives.

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- Resource Management: There is a shift towards more resource-efficient and sustainable practices in the cultivation and management of medicinal and aromatic plants. This includes adopting techniques that minimize water usage, reduce chemical inputs, and promote biodiversity.
- The cultivation of wild medicinal plants is an important approach to safeguard the herbal industry.
- Therapeutic uses of the compiled plants provide basic information that can aid scientists to conduct additional research dedicated to conservation of species and pharmacological studies of species with the greatest significance.
- The enterprises in the final products category were more recent, were the fastest growing, and sourced raw materials mostly from farms through purchasing (Muriuki et al., 2012)

Threats

- Agricultural expansion (38.5%) was the main threat to important medicinal species.
- Climate change.
- Deforestation and loss of habitat (5.1%).
- Environmental degradation (7.7%).
- Firewood and Charcoal production (10.3%).
- Habitat destruction, and habitat change.
- Indiscriminate trade of plant resources.
- Medicinal plant resources in Kenya are diminishing at an alarming rate due to unsustainable harvesting practices and the destruction of plant habitats.
- Overgrazing (20.5%).
- Overharvesting (17.9%), overexploitation.
- Uncontrolled collecting methods.
- Unsustainable practices.

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B. Mauritius - Medicinal and Aromatic Plant Production

Figure 2 – Maps of Mauritius Island

1. Main country data for Mauritius

Area: The land area of Mauritius is approximately 2,040 square kilometers (788 square miles).

Population: Mauritius is an island state with a population of about 1.26 million people as of 2022.

Coastline: Mauritius has a total coastline of 177 kilometers (110.0 miles).

Demographics: Mauritius has transitioned from a country of high fertility and high mortality rates in the 1950s and mid-1960s to one with among the lowest population growth rates in the world.

Economy: Mauritius has a diverse and growing economy. The country is known for its strong financial services sector, tourism industry, and textile manufacturing.

Human Capital Index: The Human Capital Index (HCI) database provides data at the country level for Mauritius. This index measures the knowledge, skills, and health that people accumulate over their lives.

Agricultural Land: Arable land (hectares): According to the World Bank Data, the arable land in Mauritius was reported to be 75,000 hectares in 2021.

Arable land (% of land area): According to the World Bank collection of development indicators the arable land, as a percentage of the total land area, in Mauritius was reported to be 37.56% in 2021.

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2. Climate of Mauritius

The climate of Mauritius is characterized as a mild tropical maritime climate throughout the year. Here are some key points about the climate of Mauritius:

Seasons: Mauritius experiences two main seasons: a warm and humid summer from November to April, and a cooler and drier winter from May to October.

Temperature: The average temperature in Mauritius ranges from around 20°C (68°F) to 30°C (86°F) throughout the year.

Warmest Months: December, January, and February are considered the warmest months, with average temperatures of around 27-28°C (81-82°F).

Coolest Month: July is considered the coolest month, with average temperatures of around 20°C (68°F).

Rainfall: Mauritius receives rainfall throughout the year, but the wettest months are usually from January to March. The coastal regions tend to be warmer and less rainy, while the central plateau, which is at a higher elevation, has a cooler temperature and receives more rainfall.

Trade Winds: The trade winds play a significant role in the climate of Mauritius, providing a cooling breeze in certain parts of the island.

3. Topography of Mauritius

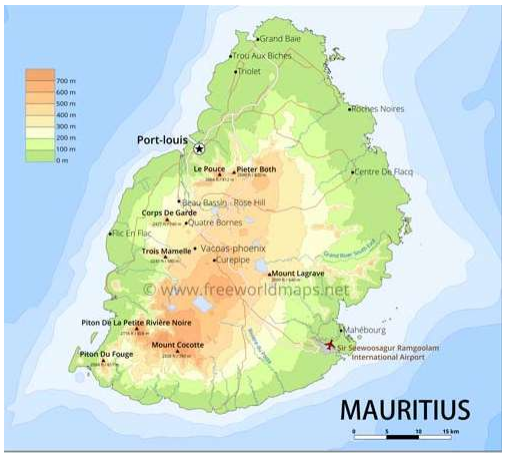

Figure 3 – Topographic map of Mauritius

The topography of Mauritius is characterized by a diverse landscape that includes plains, plateaus, mountains, and coastal areas. Some key points about the topography of Mauritius:

Central Plateau: The central part of Mauritius is dominated by a plateau that extends from north to south. This plateau is elevated and consists of rolling hills and valleys.

Mountains: The highest peak in Mauritius is called Piton de la Petite Rivière Noire, which stands at an elevation of 828 meters (2,717 feet) above sea level. Other notable mountains in Mauritius include Le Morne Brabant and Corps de Garde.

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Coastal Areas: Mauritius is almost entirely surrounded by coral reefs, which form beautiful lagoons along the coastline. The coastal areas are characterized by sandy beaches, rocky cliffs, and mangrove forests.

Plains: The northern part of Mauritius is predominantly flat and consists of fertile plains. This area is known for its agricultural activities, including sugarcane cultivation.

Rivers and Waterfalls: Mauritius has several rivers and waterfalls that add to its scenic beauty. Some notable rivers include the Grand River South East and the Black River. Tamarin Falls and Chamarel Falls are popular waterfalls in Mauritius.

Volcanic Origin: The island of Mauritius is of volcanic origin, and its topography reflects its volcanic history. The central plateau and mountains are remnants of ancient volcanic activity.

4. Agriculture in Mauritius

Agriculture in Mauritius plays a significant role in the country's economy and society.

Diversified Agriculture: Mauritius has a diversified agriculture sector that includes sugarcane, tea, fruits, vegetables, and livestock production.

Sugarcane Industry: Sugarcane has traditionally been a major crop in Mauritius. The country is known for its sugar production and exports.

Food Security: Agriculture in Mauritius contributes to the country's food security by producing a variety of crops for local consumption.

Export-Oriented: Apart from meeting local demand, Mauritius also exports agricultural products such as sugar, tea, and fruits to international markets.

Government Support: The Mauritian government provides support and incentives to farmers to enhance agricultural productivity and sustainability.

Challenges: Like many countries, Mauritius faces challenges in its agricultural sector, including limited arable land, climate change impacts, and the need for modernization and technological advancements.

Agro-Tourism: Agriculture in Mauritius also contributes to the tourism sector through agro-tourism initiatives that allow visitors to experience and learn about the country's agricultural practices.

5. Major Agricultural Regions in Mauritius

The major agricultural regions in Mauritius are as follows:

Plaines Wilhems: Plaines Wilhems is one of the main agricultural regions in Mauritius. It is located in the central part of the island and is known for its fertile plains. Sugarcane cultivation is a prominent agricultural activity in this region.

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Pamplemousses: Pamplemousses is another important agricultural region in Mauritius. It is situated in the northern part of the island and is known for its agricultural diversity. Apart from sugarcane, other crops such as fruits, vegetables, and flowers are grown in this region.

Rivière du Rempart: Rivière du Rempart is located in the northeastern part of Mauritius. This region is known for its agricultural activities, including the cultivation of sugarcane, fruits, and vegetables.

Flacq: Flacq is an agricultural region situated in the eastern part of Mauritius. It is known for its fertile soil and favorable climate for agriculture. Sugarcane, fruits, and vegetables are the main crops grown in this region.

Savanne: Savanne is a region located in the southern part of Mauritius. It is known for its agricultural activities, particularly sugarcane cultivation. The region also produces other crops such as fruits and vegetables.

6. Traditional Medicine in Mauritius

Traditional medicine in Mauritius is an important aspect of the country's cultural heritage and healthcare system. The Mauritian endemic flora has been used for medicinal purposes for nearly 300 years. Some key points about traditional medicine in Mauritius:

Endemic Plants: The unique flora of Mauritius includes various plants that are used in traditional medicine. 87 taxa of Mauritian endemic plants for their medicinal value. Endemic plants are either used as part of complex herbal formulations or singly, and are prescribed by herbalists (Rummun et al., 2018)

Ethnopharmacological Relevance: The traditional medicinal plants of Mauritius have been studied for their ethnopharmacological relevance. These plants have been recorded to be used as medicines for centuries and play a significant role in the healthcare practices of the Mauritian population.

Preparation Modes: Traditional therapies in Mauritius involve various preparation modes of herbal medicines. These include juice, decoction, infusion, crude form, paste, and soup. Indigenous communities in Mauritius have utilized these different modes of preparation for managing various health conditions.

It is important to note that traditional medicine in Mauritius is **a complex and diverse field, deeply rooted in the cultural traditions of the island**. The use of traditional remedies alongside modern healthcare practices reflects the rich heritage and beliefs of the Mauritian people.

The use of home herbal remedies appears to be widespread among Mauritians and is frequently the first form of treatment utilized for common ailments. The Indo-Mauritian herbalists I observed treat a wide variety of ailments and utilize approximately 150 plant species.

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7. Influencing Factors of Medicinal and Aromatic Plant Production, in Mauritius

Medicinal and aromatic plant production in Mauritius is an essential part of the country's agricultural sector. Some key aspects to consider in evaluating medicinal and aromatic plant production are the following:

7.1 Diversity of Plants

Mauritius is known for its rich biodiversity, which includes a variety of medicinal and aromatic plants. These plants are cultivated for their medicinal properties and aromatic compounds. Like most tropical oceanic islands, Mauritius has high levels of floral and faunal endemism and has suffered high extinction rates caused by a growing human population, habitat destruction and degradation.

To safeguard the remaining biodiversity, a terrestrial *Protected Area Network* has been established on the mainland, and associated offshore islets, comprising 20 formal state protected areas and covering a total area of 8,027ha.

7.2 Traditional Medicine

The use of medicinal plants in traditional medicine is prevalent in Mauritius. Local communities often rely on traditional remedies made from these plants for various health issues.

7.3 Commercial Cultivation

Some medicinal and aromatic plants are commercially cultivated in Mauritius to meet local demand as well as for export purposes. This helps boost the agricultural economy of the country. The list of species includes beyond eucalyptus, Cannabis indica, mainly spices (world renowned Mauritian vanilla, black pepper, nutmeg, cinnamon, and cardamom are also commercially cultivated in Mauritius).

Top 10 spices used in Mauritian cuisine include turmeric, coriander, curry leaves, garlic, ginger, mustard seeds, and star anise seeds.

7.4 Research and Development

There is ongoing research and development in Mauritius focused on the cultivation, processing, and utilization of medicinal and aromatic plants. This aims to promote sustainable practices and enhance the value of these plants. One of the aims was to explore the natural resources of MAPs: as such a survey has identified 461 plants with medicinal properties. Women's knowledge: traditional medicine and nature; Mauritius" is a publication that provides information on traditional medicine and nature in Mauritius

7.5 Government Initiatives

The government of Mauritius may have initiatives or programs to support the cultivation and sustainable use of medicinal and aromatic plants. These initiatives could include training programs, subsidies, or research grants. The local branch of the Mauritian Wildlife Foundation cultivates and preserves plants, including medicinal and aromatic plants.

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8. Production of Medicinal and Aromatic Plans, Spices, in Mauritius

Mauritius is a small island, where the production of medicinal and aromatic plants and spices is a dynamic sector with significant potential. With the right support and sustainable practices, it can continue to grow and contribute to the economy

8.1 Main Cultivated Medicinal Plants, in Mauritius

Based on the real-time information, here are the main cultivated medicinal plants in Mauritius:

Aloe vera: (*Aloe vera*) is a commonly cultivated medicinal plant in Mauritius. It is known for its soothing and healing properties and is used in various skincare and health products.

Ayapana: (*Ayapana triplinervis*) is another medicinal plant cultivated in Mauritius. It is used in traditional medicine for its antimicrobial and anti-inflammatory properties.

Baume du Perou: *(Myroxylon pereirae* Baume du Perou, also known as Peru Balsam, is a medicinal plant cultivated in Mauritius. It is used for its healing properties and is often used in topical ointments and creams.

Citronella: (*Cymbopogon nardus*) is a cultivated medicinal plant in Mauritius. It is known for its insect-repellent properties and is commonly used in candles, sprays, and lotions.

Wild Mint: (*Mentha longifolia*) or commonly called the wild mint is a plant that grows widely across Africa, Australia, the Mediterranean and Europe. Used in traditional medicine since ages, the main active ingredient in the wild mint is the essential oil component, menthol. Researchers have studied the wild mint extensively. As such, its biological effects and chemical compounds are well-known. Generally, all parts of the plant, from leaves to bark, have traditional medicinal uses. These include treating parasitic infections, curing gastrointestinal and respiratory problems, boosting the immune system, healing wounds and reducing fever.

Moringa *(Moringa oleifera9* or commonly called Brede Mouroum in Mauritius and even nicknamed the Miracle Tree by others is a fast-growing and drought-resistant tree. It originates from India and commonly grows in the tropics and sub-tropics. The Egyptians, Greeks and Romans used moringa ages ago for its health benefits. As it is, moringa can cure and heal some 300 diseases!

Neem (*Azadirachta indica*) Widely used in Ayurvedic, Chinese and Unani medicinal folklore, the. Neem (Azadirachta indica), also called lila de perse or lila perse in Mauritius, has various health benefits as it is a rich source of antioxidants.

Pissenli: pot marigold (*Calendula officinalis*) or Pissenli as it is called in Mauritius, grows extensively around the world, from the United States, Europe to Africa. The medicinal properties of the pot marigold exist in Ayurvedic and Unani traditional therapeutic systems.

Henna (*Lawsonia inermis*) or Mehendi is a small tree that is famous for its nail treating properties. Yet the plant has significant pharmacological properties. Henna is an important medicinal plant in Ayurvedic therapy. Almost all parts of the plant including the leaves, flowers, seeds, bark and roots are used in treatment.

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8.2 Main Cultivated Spices, in Mauritius

Tulsi (*Ocimum tenuiflorum*) is quite famous for its healing and therapeutic properties. Indians also call it the Queen of herbs, 'The Incomparable One' (Sanskrit meaning of Tulsi) and the Holy Basil. Generally, the plant grows in various parts of the tropics and has been used for thousands of years in Ayurvedic and Unani medicinal systems.

8.3 Export / Import of MAP Commodities

In 2022 Mauritius was the number 140 economy in the world in terms of total exports and the number 134 in total imports (Sources: https://oec.world/en/profile/country/mus).

The fastest growing export markets for **Spice Seeds** of Mauritius between 2021 and 2022 were France ($7.84k) and Madagascar ($4).

The fastest growing import markets in **Spice Seeds** for Mauritius between 2021 and 2022 were India ($391k), Bulgaria ($61.3k), and Singapore ($29.9k).

In 2022, Mauritius exported $292k in **Spices**, making it the 108th largest exporter of Spices in the world. The fastest growing export markets for Spices of Mauritius between 2021 and 2022 were United States ($3.98k), Switzerland ($2.05k), and Canada ($1.94k).

In 2022, Mauritius imported $2.52M in **Spices**, becoming the 103rd largest importer of Spices in the world. The fastest growing import markets in Spices for Mauritius between 2021 and 2022 were India ($180k), Pakistan ($117k), and United Arab Emirates ($41.4k).

9. Agricultural Legislation in Mauritius

The agricultural legislation in Mauritius encompasses laws and regulations that govern the agricultural sector, including MAPs, in the country. Some important points to consider are the following:

Mauritius Agricultural Marketing Act: The Mauritius Agricultural Marketing Act establishes the *Agricultural Marketing Board* as a body corporate. It defines the functions and powers of the board and regulates agricultural marketing activities. The act is also known as Act RL 3/549 of 23 December.

Declaration of Controlled Products: The Minister has the authority to declare any product of Mauritius or any imported product as a controlled product through regulations. This declaration allows for the regulation and control of specific agricultural products.

Mauritius Chamber of Agriculture: The oldest institution of the private sector in Mauritius that represents the agricultural community. It is a non-profit private association that was founded in 1853. The chamber plays a significant role in the agricultural sector.

Food and Agricultural Research and Extension Institute: The Food and Agricultural Research and Extension Institute (FAREI) is established under the Revised Laws of Mauritius.

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It is responsible for conducting research and providing extension services in the field of food and agriculture. The FAREI Act is Act 21 of 2013, dated 14 February 2014.

National Agricultural Products Regulatory Office Act: The National Agricultural Products Regulatory Office Act is another legislation related to agriculture in Mauritius. It provides for the establishment of the National Agricultural Products Regulatory Office and outlines its functions. This act is available in the Africa Legislation Commons collection.

10. SWOT ANALYSIS OF MEDICINAL AND AROMATIC PLANT PRODUCTION IN MAURITIUS

Strength

- Mauritius has two growth seasons (summer and winter season) which allows for a better supply of MAPs.
- Most crops are grown with intercropping.

Weakness

- No single study has documented medicinal plants as a whole in the area.
- The regulatory framework for the practice of traditional medicine in Mauritius is still underway.
- Limited cultivation: There is a lack of large-scale cultivation of medicinal and aromatic plants in Mauritius. This limits the overall production and availability of these plants.
- Constraints to cultivation: Smallholder farmers face various constraints when it comes to cultivating medicinal plants. These constraints can include limited access to resources such as land, water, and capital, as well as a lack of knowledge and technical expertise.
- Conservation challenges: Weaknesses in the conservation of medicinal and aromatic plants in Mauritius pose a threat to their sustainable production. The loss of biodiversity and habitat destruction can negatively impact the availability and quality of these plants.
- Limited integration into global value chains: Integrating endemic medicinal plants into global value chains is a challenge. This limits the market opportunities for producers and hampers the growth of the industry. Lack of information on where to sell markets
- Lack of research and development: Insufficient research and development efforts focused on medicinal and aromatic plants can hinder innovation, productivity, and the development of new varieties or products.
- Lack of education.
- It is important to address these weaknesses in order to promote the sustainable production and utilization of medicinal and aromatic plants.

Opportunities

- Commercialization: There is a growing interest in the commercialization of medicinal and aromatic plant products in Mauritius. Efforts are being made to add value to raw plant materials and develop marketable products. This can contribute to economic growth and create business opportunities in the herbal medicine and natural products industry.

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- Conservation and Use: The future of medicinal and aromatic plants in Mauritius depends on resolving the conflicts between conservation and use. Finding a balance between preserving these plants and utilizing them sustainably is crucial.
- Enhanced conservation of the environment.
- Improved efficiency in operations and sustainability of the MSMEs.
- Improved quality and yield of products.
- Increased income for the local community.
- Livelihood Improvement: Medicinal and aromatic plants offer opportunities for improving livelihoods in Mauritius. Projects have been initiated to develop medicinal products from plants found in specific regions. These initiatives aim to create value-added products and generate income for local communities.
- Reduced reliance on forest resources by the community;
- Research and Development: There is some research and development activity in Mauritius focused on medicinal and aromatic plants. This includes studying their biodiversity, crop improvement, and sustainable agriculture practices. Researchers are exploring the potential of these plants for various applications, such as herbal medicine, cosmetics, and food additives.
- Resource Management: There is a shift towards more resource-efficient and sustainable practices in the cultivation and management of medicinal and aromatic plants. This includes adopting techniques that minimize water usage, reduce chemical inputs, and promote biodiversity.
- The cultivation of wild medicinal plants is an important approach to safeguard the herbal industry.
- Therapeutic uses of the compiled plants provide basic information that can aid scientists to conduct additional research dedicated to conservation of species and pharmacological studies of species with the greatest significance. (a high plant diversity for the production of roots, bark, leaves, fruits, and flowers as medicinal resources).
- The enterprises in the final products category were more recent, were the fastest growing, and sourced raw materials mostly from farms through purchasing.

Threats

- Agricultural expansion (38.5%) was the main threat to important medicinal species.
- Climate change.
- Deforestation and loss of habitat (5.1%).
- Environmental degradation (7.7%).
- Firewood and Charcoal production (10.3%),
- Habitat destruction, and habitat change.
- Indiscriminate trade of plant resources.
- Medicinal plant resources in Kenya are diminishing at an alarming rate due to unsustainable harvesting practices and the destruction of plant habitats.
- Overgrazing (20.5%).
- Overharvesting (17.9%), overexploitation.

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- Uncontrolled collecting methods.
- Unsustainable practices.

C. South Africa – Medicinal and Aromatic Plant Production

Figure 3 – Topographic map of South Africa

1. Main Country Data

Area: South Africa covers an area of 1,221,037 square kilometers (471,445 square miles). It is the 24th-largest country in the world in terms of land area.

Population: The population of South Africa is approximately 59.89 million as of 2022. According to the latest United Nations data, the current population of South Africa is estimated to be 60,895,018 as of April 17, 2024. South Africa is the world's 23rd-most populous nation.

Demographics: Statistics South Africa's Census 2022 showed that the population of South Africa increased from 51.7 million in 2011 to more than 62 million in 2022, indicating population growth.
The population of South Africa is diverse, with people belonging to various ethnic groups. According to the 2022 estimates, the majority of the population is Black or African (81.4%), followed by White (8.8%), Coloured (8.4%), and Indian/Asian (2.4%).

Coastline: South Africa occupies the southern tip of Africa, and its coastline extends more than 2,850 kilometers (1,770 miles) from the desert border with Namibia to the border with Mozambique.

Economy: South Africa is one of the eight upper-middle-income countries in Africa. Agriculture is an important sector, with South Africa being a major producer of crops such as maize, wheat, citrus fruits, and wine.

Agricultural Land: The area of agricultural land in South Africa has varied over the years from 2000 to 2021, amounting to some 98,125 hectares.

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Arable land (% of land area): According to the real-time information, the arable land (% of land area) in South Africa was reported at 9.8921% in 2021, as per the World Bank collection of development indicators. This indicates that approximately 9.8921% of South Africa's total land area is considered arable land.

2. Climate of South Africa

South Africa is a relatively dry country, with an average annual rainfall of about 464 mm. The climate varies significantly across different parts of the country, offering a diverse range of weather conditions and landscapes.
Semi-Desert Regions: South Africa has semi-desert regions, particularly in the northwest. These areas receive very little rainfall and are characterized by arid conditions.

Coastal Subtropics: The coastal regions of South Africa have a warm subtropical climate. These areas enjoy mild winters and warm summers, with moderate rainfall throughout the year.

Hot Deserts: South Africa has hot desert regions, such as the Kalahari Desert, which experiences extremely high temperatures and very low rainfall.

Humid Highlands: The highland areas of South Africa have a humid climate, with cooler temperatures and higher rainfall compared to other regions. The Drakensberg Mountains are an example of this climate zone.

3. Topography of South Africa

The country can be divided into five main physiographic regions, each with a different climate and vegetation.
Southern African Central Plateau is edged by the Great Escarpment, which is a prominent feature of the country's topography.
Great Escarpment separates the plateau from the coastal areas and is characterized by steep cliffs and rugged terrain.
The plateau itself is a relatively flat and elevated region, with an average altitude of around 1,000 meters above sea level.
In the eastern part of the country, the ***Drakensberg Mountains*** form a dramatic escarpment and are known for their scenic beauty.
The highest point in South Africa is ***Mafadi***, which stands at 3,450 meters (11,320 feet) above sea level.
South Africa also has several important rivers, including the *Orange River, the Limpopo River, and the Vaal River*, which play a crucial role in the country's water resources and agriculture.
Additionally, there are several *lakes in South Africa*, with Lake Chrissie being the largest.

4. Agriculture in South Africa

The agricultural sector contributed around 10 percent to South Africa's total **export earnings** in FY2021 at a value of $12.0 billion. Citrus, wine, table grapes, corn, apples, pears, and wool accounted for the largest exports by value. South Africa also exports wool, nuts, sugar, mohair, and pears to name just a few products.

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South Africa imported $7.7 billion in agricultural and food products in FY2022, which is an increase of 5 percent from FY2021, mainly due to the normalization of economic activities after the COVID-19 lockdowns. The major products imported were palm oil ($656 million), wheat ($641 million), rice ($463 million), food mixtures ($448 million), sunflower seed ($262 million), and food preparations ($196 million), and cane sugar ($175 million).

The agriculture sector in South Africa is extremely diverse compared to other countries in the sub-Saharan African region.

This is mostly due to the country's climate that ranges from dry and arid in the Karoo, mediterranean in the west and sub-tropical on the east coast. It rains in the winter months in the Western and Eastern Cape and the summer months in the interior. The variety of farming products yielded from this climate include all major grains, oilseeds, deciduous and subtropical fruits, sugar, citrus, nuts, wine, flowers and most vegetables.

South Africa's biggest crop is grain which includes barley, maize, oats, sorghum, and wheat. These contribute more than 30% to total agricultural product. There are both the larger commercial (+/- 32000) and smaller subsistence farms. Quality and cost-effective machinery, as well as the newest AgriTech are all priorities for the farming communities who continue to battle against tough headwinds in the form of droughts, high input costs and electricity constraints.

There are many value-added services in the Agribusiness sector that take the form of slaughtering, processing, preserving, canning, bottling, drying, milling, refining and packaging. South African exports are known for their exceptional quality.

Compared to the rest of Africa, South Africa has by far the most modern, productive, and diverse agricultural economy. South Africa has a well-developed agricultural sector, which will stand the country in good stead in the face of continuing uncertainty both economically and in terms of the weather. There are many factors impacting on the industry – including credit ratings downgrade, land reform concerns, volatile exchange rate, ongoing weather concerns and rising input costs.

5. Major Agricultural Regions in South Africa

Western Cape Province: The Western Cape province is known for its commercial grain-growing areas. It is one of the key agricultural regions in South Africa.

Maize Quadrangle: The maize quadrangle, which includes the Northwest and Free State provinces, is another significant agricultural region in South Africa. It is primarily focused on maize production.

6. Traditional Medicine in South Africa

Traditional Medicine in South Africa is an important aspect of healthcare and cultural heritage. Some key points about Traditional Medicine in South Africa. Efforts to integrate traditional medicine with modern healthcare practices are aimed at provide comprehensive and culturally sensitive healthcare solutions.

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Traditional Medicine Practices: Traditional African medicine in South Africa encompasses a range of disciplines that involve indigenous herbalism and African spirituality. It includes practices based on beliefs and experiences indigenous to African cultures.

Medicinal Plants: South Africa is rich in biodiversity and has a wide variety of medicinal plants. Some of the most commonly traded medicinal plants include buchu (*Agathosma betulina*), bitter aloe (*Aloe ferrox)*, African wormwood (*Artemisia afra*), honeybush (*Cyclopia intermedia*), devil's claw (*Harpagophytum procumbens*), hoodia (*Hoodia gordonii*), etc. These plants have traditional uses for various health conditions.

Traditional Medicine and Modern Healthcare: It is estimated that around 72% of the Black African population in South Africa relies on traditional medicine for their healthcare needs, therefore traditional medicine should be recognized and integrated into modern healthcare systems.

Cultural Significance: Traditional medicine plays a significant role in the intersection of culture and science in South Africa. It is deeply rooted in the cultural heritage of the country and is an important part of the healing practices and beliefs of many communities.

7. Influencing Factors of Medicinal and Aromatic Plant Production, in South Africa

There are several influencing factors of medicinal plant production in South Africa. Specific influencing factors may vary depending on the type of medicinal plant and the region within South Africa. Local conditions and practices can have a significant impact on medicinal plant production. These factors can affect the successful cultivation and gathering of medicinal plants:

Biotic Factors: Biotic factors refer to living organisms that can influence medicinal plant production. These factors include:

Availability of suitable pollinators: Medicinal plants often rely on specific pollinators for reproduction. The presence or absence of these pollinators can affect plant fertility and seed production.

Pest and disease management: Pests and diseases can significantly impact the health and productivity of medicinal plants. Effective management strategies are necessary to control and prevent infestations.

Competition with other plant species: Medicinal plants may face competition from other plant species for resources such as sunlight, water, and nutrients. Managing competition is important for optimal plant growth.

Abiotic Factors: Main abiotic factors that usually influence medicinal plant production (Yields and quality of the product) from a South African focus include the followings:

***Climate and weather conditions*:** South Africa has diverse climatic regions, and different medicinal plants have specific climate requirements. Temperature, rainfall, and sunlight availability can affect plant growth and development.

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Soil quality and fertility: The composition and fertility of the soil play a crucial role in the growth of medicinal plants. Adequate nutrient levels, pH balance, and soil structure are important for optimal plant health.

Water availability: Sufficient water supply is essential for the growth and survival of medicinal plants. Water scarcity or improper irrigation practices can negatively impact plant production.

Socio-economic Factors: Socio-economic factors can also influence medicinal plant production in South Africa. These factors include:

Market demand and pricing: The demand for medicinal plants and their products can affect cultivation practices. Market prices and economic incentives can influence the decision to cultivate specific plant species.

Traditional knowledge and cultural practices: Traditional knowledge and cultural practices play a significant role in medicinal plant production. Indigenous communities and their traditional practices contribute to the conservation and sustainable use of medicinal plants.

7.1 Diversity of Plants

South Africa is home to a wide variety of endemic medicinal plants (e.g.: Roibos, Buchu, Sutherlandia, Pelargonium, Aloe ferox, etc.) thanks to its diverse climates and rich biodiversity. Sustainable harvesting and conservation efforts are essential to protect these valuable resources and ensure they continue to benefit both local communities and the wider world.

7.2 Traditional Medicine

Traditional medicine in South Africa is an integral part of the healthcare system, deeply rooted in the cultural heritage and spiritual beliefs of its people. With proper regulation, sustainable practices, and integration with modern medicine, traditional medicine continues to play a vital role in the health and well-being of South African communities.

7.3 Commercial Cultivation

The cultivation of medicinal, aromatic, and spice plants in South Africa offers significant opportunities for economic growth, rural development, and biodiversity conservation. By leveraging the country's diverse climates and rich biodiversity, along with sustainable practices and supportive policies, South Africa can continue to expand its production and meet the growing global demand for natural products.

7.4 Research and Development

Research and development (R&D) in the production of medicinal and aromatic plants (MAPs) in South Africa is crucial for optimizing cultivation practices, ensuring sustainable use, enhancing the economic potential, and conserving biodiversity. Some of the key aspects are the following: Cultivation techniques, Genetic improvement, Post-harvest processing, Sustainability and Conservation, Knowledge Integration, Market and Economic Studies.

7.5 Government Initiatives

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The South African government's initiatives to support medicinal and aromatic plant and spice production are comprehensive. They encompass research, sustainable practices, economic development, and regulatory frameworks. These efforts aim to harness the country's rich biodiversity for economic growth and ensure the conservation of natural resources and the equitable sharing of benefits with local communities. By fostering innovation, providing financial support, and promoting sustainable practices, the government plays a crucial role in the development of this promising sector.

8. Production of Medicinal and Aromatic Plants

South Africa has an abundant heritage of valuable indigenous plants with recognized medicinal value. There are various medicinal plants, not native to South Africa but fully naturalized in certain localities, which might well repay systematic cultivation. *[Source: Medicinal and Aromatic plants in South Africa]*

South Africa also produces significant volumes of non-indigenous medicinal and aromatic plants. Eucalyptus essential oils and tea tree essential oils as well as Tagete oil are produced and exported from South Africa. Together with citrus oils, these make up the bulk of 400 tons of exported oils from South Africa to mainly USA, Germany, Netherlands, France and UK. South Africa also produces moringa leaves in dried form and pressed oil seeds for the export market

Cultivation of Medicinal Plants by Smallholder Farmers: In South Africa, there are three main reasons for the lack of cultivation of medicinal plant species. These reasons include the lack of institutional support. Efforts have been made to promote the cultivation of medicinal plants by smallholder farmers to conserve indigenous plant species, support sustainable practices, and empower local communities.

Medicinal plants of South Africa: Aloe ferox is one of the medicinal plants distributed throughout the Western Cape, Eastern Cape, southern KwaZulu-Natal, and the southeastern part of the Free State in South Africa. [Source: Medicinal plants of South Africa]

8.1 Main Cultivated Medicinal Plants, in South Africa

Main Indigenous Cultivated Medicinal Plants in South Africa:

African Ginger: It is one of the most commonly utilized medicinal plants in South Africa. It has various traditional uses and is known for its medicinal properties. This plant is currently listed in the Red Data book of South African plants. It is distributed in the tropical and subtropical areas and successfully propagated by tissue culture.

Aloe Ferox: This medicinal plant is distributed throughout the Western Cape, Eastern Cape, southern KwaZulu-Natal, and the southeastern part of the Free State in South Africa.

Devil's Claw: Devil's Claw is another medicinal plant that is cultivated in South Africa. It has been traditionally used for its anti-inflammatory properties.

***Sceletium tortuosum*:** This plant is currently cultivated for applications used for depression and anxiety as well as insomnia.

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Artemisia afra: It is well known and used as a tea, and stuffed fresh into the nostrils and ears for infection. It is also cultivated for essential oil distillation and is a popular ingredient in gin.

Rooibos: It is not only used for beverages and health products but also used as neutraceuticals and in a wide range of cosmetics.

Buchu: it is used in dried form and steam distilled for applications as an anti-diuretic and infused into mixtures for pain, water retention and bladder problems.

8.2 Main Cultivated Spices in South Africa

Cardamom (*Elettaria cardamomum),* Chilli (*Capsicum sp.),* Coriander (*Coriandrum sativum*), Cumin (*Cuminum cyminum)*, Ginger (*Zingiber officinale*), Kan Kan Kan (*Afzelia africana* Sm. ex Pers.), etc.

8.3 Export / Import of MAP Commodities

Exporting and importing medicinal plants and spices from South Africa can be a lucrative business opportunity, but it requires careful planning, compliance with regulations, and attention to quality and sustainability. Main considerations are the following:

Research and Compliance: Understand the legal requirements and regulations for exporting and importing medicinal plants and spices both in South Africa and in the destination country. This includes permits, licenses, and regulations related to the specific plants or spices you intend to trade. All indigenous plants in South Africa requires a Bioprospecting permit for processing and trading.

Identify Products: Determine which medicinal plants and spices are in demand in the target market. Conduct market research to understand pricing, quality standards, and potential competitors.

Quality Control: Ensure that the products meet quality standards set by international regulations. This involves proper harvesting, processing, and packaging to maintain the quality and freshness of the products.

Certifications: Obtain any necessary certifications such as organic certification or Good Agricultural Practices (GAP) certification to assure buyers of the quality and safety of your products.

Export Documentation: Prepare all required export documentation including invoices, packing lists, certificates of origin, and phytosanitary certificates. These documents may vary depending on the destination country's regulations.

Logistics and Shipping: Arrange transportation and logistics for exporting the products. This includes choosing the appropriate mode of transportation (air, sea, or land) and finding reliable shipping partners or freight forwarders.

Market Entry: Develop marketing strategies to enter the target market successfully. This may include participating in trade fairs, engaging with potential buyers through online platforms, or partnering with distributors or agents in the target market.

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Import Procedures: If you're importing medicinal plants and spices into South Africa, familiarize yourself with the import procedures e.g. phytosanitary certificate and clearance and regulations. This includes customs clearance, inspection procedures, and any import duties or taxes.

Partnerships and Networks: Build relationships with suppliers, buyers, and relevant stakeholders in the industry. Networking can help you stay updated on market trends, find new business opportunities, and navigate any challenges in the export-import process.

Sustainability and Ethics: Consider the sustainability and ethical sourcing of medicinal plants and spices (GA©P). Ensure that your business practices support environmental conservation and FairTrade principles.

9. Agricultural Legislation

It is widely acknowledged that agriculture, or more properly agribusiness, is the key to transforming African economies.

Agricultural Laws Rationalization Act 72 of 1998: This act was enacted to provide for the rationalization of certain laws relating to agricultural affairs that remained in force in various areas of the national territory of South Africa.

Agricultural Research Act: This act establishes the Agricultural Research Council (ARC) and provides for its functions, powers, and duties. The ARC is responsible for conducting research and promoting the application of research results in the field of agriculture.

Agricultural Pests Act, 1983 (Act No. 36 of 1983): The purpose of this act and its subordinate legislations is to provide measures by which agricultural pests may be controlled and to regulate the importation, exportation, and movement of plants, plant products, and other articles that may carry agricultural pests.

Farmer's Assistance Amendment Act 16 of 1960: This act amends the Farmer's Assistance Act and provides for financial assistance to farmers in South Africa.

10. SWOT ANALYSIS OF MEDICINAL AND AROMATIC PLANT PRODUCTION IN SOUTH AFRICA

Strengths

- most crops are grown with intercropping which allows for environment friendly, sustainable production.
- several studies and publications have been done on medicinal plants in South Africa.

Weakness

- The regulatory framework for the practice of traditional medicine in South Africa is in place and seen as a trade barrier as it is over regulated in a way.
- Energy and manufacturing costs in South Africa is very high.

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- Limited cultivation: There is a lack of large-scale cultivation of medicinal and aromatic plants in South Africa. This limits the overall production and availability of these plants.
- Constraints to cultivation: Smallholder farmers face various constraints when it comes to cultivating medicinal plants. These constraints can include limited access to resources such as land, water, and capital, as well as a lack of knowledge and technical expertise.
- Limited integration into global value chains: Integrating endemic medicinal plants into global value chains is a challenge. This limits the market opportunities for South Africa producers and hampers the growth of the industry. Lack of information on where to sell markets
- Lack of research and development: Insufficient research and development efforts focused on medicinal and aromatic plants in South Africa can hinder innovation, productivity, and the development of new varieties or products.
- Lack of partnerships for research and development is concerning education.
- It is important to address these weaknesses in order to promote the sustainable production and utilization of medicinal and aromatic plants
- Limited cultivation.
- Constraints to cultivation: Smallholder farmers face various constraints when it comes to cultivating medicinal plants. These constraints can include limited access to resources such as land, water, and capital, as well as a lack of knowledge and technical expertise.
- Conservation challenges: Weaknesses in the conservation of medicinal and aromatic plants in South Africa pose a threat to their sustainable production. The loss of biodiversity and habitat destruction can negatively impact the availability and quality of these plants.
- Limited integration into global value chains: Integrating endemic medicinal plants into global value chains is a challenge. This limits the market opportunities for South Africa producers and hampers the growth of the industry. Lack of information on where to sell markets.
- Lack of funding for research and development: Insufficient research and development efforts focused on medicinal and aromatic plants in South Africa can hinder innovation, productivity, and the development of new varieties or products.
- It is important to address these weaknesses in order to promote the sustainable production and utilization of medicinal and aromatic plants.

Opportunities

- Commercialization: There is a growing interest in the commercialization of medicinal and aromatic plant products in South Africa. Efforts are being made to add value to raw plant materials and develop marketable products. This can contribute to economic growth and create business opportunities in the herbal medicine and natural products industry.
- Conservation and Use: The future of medicinal and aromatic plants in South Africa depends on resolving the conflicts between conservation and use. Finding a balance between preserving these plants and utilizing them sustainably is crucial.

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- Enhanced conservation of the environment.
- Improved efficiency in operations and sustainability of the MSMEs;
- Improved quality and yield of products;
- Increased income for the local community;
- Livelihood Improvement: Medicinal and aromatic plants offer opportunities for improving livelihoods in South Africa. Numerous projects have been initiated to develop medicinal products from plants found in specific regions, such as the Northern Cape, Eastern Cape, Western Cape, Mpumalanga, Limpopo, Free State and KwaZulu Natal. These initiatives aim to create value-added products and generate income for local communities.
- Reduced reliance on forest resources by the community;
- Research and Development: There is ongoing research and development in South Africa focused on medicinal and aromatic plants. This includes studying their biodiversity, crop improvement, and sustainable agriculture practices. Researchers are exploring the potential of these plants for various applications, such as herbal medicine, cosmetics, and food additives.
- Resource Management: There is a shift towards more resource-efficient and sustainable practices in the cultivation and management of medicinal and aromatic plants. This includes adopting techniques that minimize water usage, reduce chemical inputs, and promote biodiversity.
- The cultivation of wild medicinal plants is an important approach to safeguard the herbal industry.
- Therapeutic uses of the compiled plants provide basic information that can aid scientists to conduct additional research dedicated to conservation of species and pharmacological studies of species with the greatest significance. (a high plant diversity for the production of roots, bark, leaves, fruits, and flowers as medicinal resources).
- The enterprises in the final products category were more recent, were the fastest growing, and sourced raw materials mostly from farms through purchasing (Muriuki et al., 2012)
- Tractors - tractors occupy a significant part of agriculture machinery in terms of units sold and has steadily increased over the years.
- Nearly, unlimited opportunities offered by the recent spread of (partly) digitally based technology (Combine Harvesters, Drone Technology, Balers, Planters, Precision Agriculture Equipment and Technologies, Sprayers and Irrigation technology, Storage and soil Testing Equipment, *etc.*

Threats

- Droughts, high input costs and electricity constraints.
- Credit ratings downgrade, land reform concerns, volatile exchange rate as a result of political instability.
- Rising input costs.
- Agricultural expansion was the main threat to important medicinal species.
- Climate change and ongoing weather concerns.
- Mining and fractioning.

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- Deforestation and loss of habitat.
- Environmental degradation.
- Firewood and Charcoal production.
- Habitat destruction, and habitat change.
- Indiscriminate trade of plant resources,
- Medicinal plant resources in South Africa are diminishing at an alarming rate due to unsustainable harvesting practices and the destruction of plant habitats.
- Overgrazing.
- Overharvesting, overexploitation.
- Uncontrolled collecting methods.
- Unsustainable practices.

Part II.

ANALYSIS OF ENTREPRENEURIAL ACTIVITIES in MEDICINAL AND AROMATIC PLANT PRODUCTION, IN KENYA, MAURITIUS AND SOUTH AFRICA

A. Roles of Entrepreneurial Women in Agriculture

Kenya

Women play a crucial role in the agricultural sector of Kenya, Mauritius and South Africa. They contribute significantly to the country's food production and rural development. Their involvement is vital for the sector's success and for the overall well-being of their communities. Some characteristic aspects of women's role and potential in the agriculture of relevant countries is as follows:

a. Roles of Women in Kenyan Agriculture:

Food Production: Women are responsible for a significant portion of agricultural labor, particularly in small-scale farming. They grow a wide variety of crops, including staples such as maize, beans, and vegetables.

Animal Husbandry: Many women in rural Kenya are involved in raising livestock, such as poultry, goats, and cattle. This provides them with food for their families and income through the sale of animal products.

Household Management: Women play a key role in managing the household, including tasks such as cooking, cleaning, and caring for children. They also often manage household food supplies.

Market Participation: Women are active in selling their produce in local markets, contributing to local economies and supporting their families financially.

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Resource Management: Women often handle resources such as land and water for farming, although they may face challenges in accessing land ownership and credit.

b. Potential and Challenges:

Access to Resources: Although women are heavily involved in agriculture, they often lack access to critical resources such as land, credit, and extension services. Overcoming these barriers can empower women and improve productivity.

Education and Training: Providing women with access to education and training in agricultural best practices can increase productivity and sustainability in the sector.

Technological Advancements: Introducing women to modern farming techniques and technologies can help them improve crop yields and reduce labor-intensive tasks.

Financial Inclusion: Improving women's access to financial services, such as microloans and savings groups, can help them invest in their farms and businesses.

Leadership and Decision-Making: Encouraging women's participation in agricultural leadership and decision-making can lead to more inclusive and effective policies and practices.

Gender Equality: Addressing issues of gender inequality in land ownership, labor rights, and education can help women reach their full potential in the agricultural sector.

Value Addition: Empowering women with the skills and resources to process and add value to their agricultural products can increase their incomes and enhance food security.

By recognizing and addressing the challenges women face in the agricultural sector, Kenya is expected to unlock the full potential of women farmers and support sustainable agricultural development. Empowering women can lead to greater productivity, economic growth, and improved food security for the country.

Mauritius

Women play a vital role in the agricultural sector of Mauritius, contributing significantly to the country's overall agricultural output and rural development. Agriculture in Mauritius has evolved over time from a focus on sugarcane to a more diversified system including fruits, vegetables, livestock, and also Medicinal and Aromatic Plants. Women maintain their important role in the sector. Some characteristic aspects of the role and potential of women in agriculture in Mauritius are as follows:

a. Roles of Women in Mauritian Agriculture:

Food Production: Women are actively involved in the cultivation of various crops such as vegetables, fruits, and spices, as well as in livestock farming.

Market Participation: Women play a significant role in selling agricultural produce in local markets and other retail settings, supporting the local economy.

Household Management: Similar to other countries, women in Mauritius often manage household tasks in addition to their agricultural work, including food preparation and childcare.

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Farm Management: Many women manage family farms, handling tasks such as planting, harvesting, and taking care of livestock.

Entrepreneurship: Women are increasingly engaging in agribusiness ventures, such as food processing, value addition, and direct-to-consumer sales.

b. Potential and Challenges

Access to Resources: Women's access to land ownership, credit, and other resources can be limited by cultural norms and legal barriers. Removing these barriers can empower women and enhance their productivity.

Education and Training: Providing women with education and training in modern agricultural practices can boost productivity and sustainability in the sector.

Technological Adoption: Introducing women farmers to new agricultural technologies and practices can improve efficiency and yields.

Financial Inclusion: Increasing women's access to financial services such as credit and insurance can help them invest in their farms and grow their businesses.

Leadership and Decision-Making: Encouraging women's participation in agricultural leadership and decision-making can lead to more equitable and effective policies.

Supportive Policies: Government policies that support women's involvement in agriculture, such as providing training and resources specifically for women farmers, can help them thrive.

Gender Equality: Addressing gender-based inequalities in land ownership, education, and employment can enable women to reach their full potential in the sector.

By addressing the challenges women face in agriculture and supporting their efforts, Mauritius can enhance the productivity and sustainability of its agricultural sector. Empowering women farmers can contribute to food security, economic growth, and rural development in the country.

South Africa

Women play a significant role in South Africa's agricultural sector, contributing to the country's food production, rural development, and economic growth. Their involvement spans a variety of agricultural activities, including crop and livestock farming, agro-processing and marketing of Medicinal and Aromatic Plant produce. Some characteristic aspects of the role and potential of women in agriculture in South Africa are as follows:

a. Roles of Women in South African Agriculture

Farm Labor: Women make up the majority of the agricultural workforce, particularly in labor-intensive tasks such as planting, weeding, and harvesting.

Food Production: Women are involved in growing a range of crops, including staples such as maize and vegetables, as well as Medicinal and Aromatic Plants.

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Livestock Management: Many women are engaged in raising and caring for livestock, such as cattle, sheep, and poultry, which provide food and income for their families.

Market Participation: Women participate in selling produce in local markets, contributing to their household income and local economies.

Smallholder Farming: Women often manage smallholder farms, making key decisions on resource allocation, crop choices, and farm management.

Agro-processing: Women are involved in processing agricultural products, typically such as turning fruits into jams or drying, processing MAPs into herbal produce (crude drugs), cosmetics, etc., adding value to these products. Women are also involved in the technical processing and quality control of agricultural and natural ingredients.

b. Potential and Challenges

Access to Resources: Women may face challenges in accessing land, credit, and other resources necessary for agricultural success. Addressing these barriers can help improve their productivity.

Education and Training: Providing women with education and training in modern agricultural practices can help them improve yields and sustainability.

Technological Adoption: Introducing women to new agricultural technologies and modern techniques can help them manage farms more efficiently and increase productivity.

Financial Inclusion: Facilitating women's access to credit and financial services can enable them to invest in their farms and expand their businesses.

Leadership and Decision-Making: Supporting women's involvement in agricultural leadership and decision-making roles can lead to more inclusive and effective policies.

Gender Equality: Addressing issues of gender inequality in access to resources, employment, and wages can empower women and enhance their potential in agriculture.

Supportive Policies: Government policies that promote women's participation in agriculture, such as funding and training programs, can help women farmers thrive.

Recently, by recognizing the significant contributions of women in South African agriculture and addressing the challenges they face, the sector is becoming increasingly productive, sustainable, and inclusive. Empowering women farmers can lead to economic growth, food security, and improved rural livelihoods in South Africa.

B. Agricultural Vocational Education

Kenya

a. Agricultural Education in Kenya

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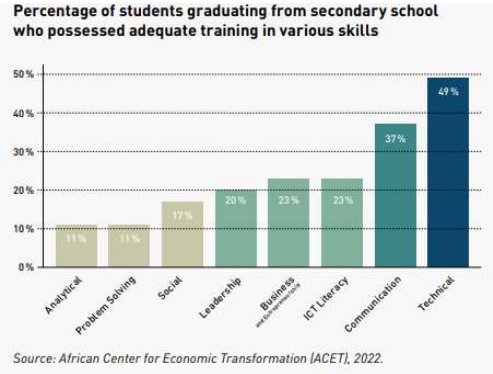
In Kenya, agricultural education plays a crucial role in equipping individuals with the knowledge and skills needed for a career in agriculture. Here are some key points about agricultural education in Kenya (*How Technical and Vocational Education Can Help Close Skills Gaps in Africa - ACET*, n.d.)



Bachelor of Science Agriculture, Education, and Extension: This program is offered by the University of Nairobi and provides a broad curriculum that offers many career opportunities in education and agriculture.

Agricultural Education and Extension (AGED): This course offers both full-time and part-time teaching options. It is a four-year program that covers various aspects of agricultural education and extension.

Agricultural Education and Community Development: This course requires a Kenya Certificate of Secondary Education (KCSE) mean grade D (Plus) or a Certificate in Fashion Design Level 4. It focuses on agricultural education and community development.

Bachelor of Science in Agricultural Education and Extension: Graduates from this program acquire leadership skills necessary to transform agricultural education and extension in Kenya and globally.

Bachelor of Science in Agricultural Education and Extension (with IT): This program combines agricultural education and extension with information technology, providing students with a comprehensive understanding of both fields.

These programs aim to develop professionals who can contribute to the growth and development of the agricultural sector in Kenya. They cover a wide range of topics, including agriculture fundamentals, farm animal anatomy, agricultural communication skills, and more.

b. Agriculture Vocational Education in Kenya:

In Kenya, there are several vocational education programs that focus on agriculture. These programs aim to equip individuals with practical skills and knowledge to meet the labor-market needs in the agricultural sector. Some key points about agriculture vocational education in Kenya:

Agriculture Technical Vocational Education and Training (ATVET):

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A national strategy for agricultural education is currently being developed in Kenya, with the support of GIZ's ATVET project. Through competency-based training along agricultural value chains, students are equipped with practical skills to meet labor-market needs. To date, over 6,000 students have been trained through ATVET programs.

Kenya School of Agriculture: The Kenya School of Agriculture is an Agricultural Training College under the State Department of Crops Development and Research (Ministry of Agriculture, Livestock, Fisheries, and Cooperatives). It offers various agricultural training programs to enhance capacity building in the agricultural sector.

Chuka Technical and Vocational College: Chuka Technical and Vocational College offers an opportunity to be part of the fastest-growing ventures in the world of agribusiness. They provide training in various aspects of agriculture, preparing students for careers in the agricultural industry.

Curriculum Review and Updates: To ensure that ATVET graduates and in-service agrifood sector officers meet the skill requirements of the agricultural sector, curricula are regularly reviewed and updated. This helps to align the education and training programs with the evolving needs of the industry.

c. Horticulture Vocational Education in Kenya

Horticulture vocational education in Kenya plays a crucial role in training individuals in various aspects of plant cultivation, including MAPs production and agribusiness related to horticultural products. Kenya's horticulture sector significantly contributes to the country's economy through exports of flowers, fruits, and vegetables.

Several institutions offer vocational training in horticulture across Kenya, including:

Kenya Agricultural and Livestock Research Organization (KALRO): KALRO provides technical training and research in various agricultural sectors, including horticulture.

Kenya Plant Health Inspectorate Service (KEPHIS): KEPHIS offers training programs focused on plant health, including aspects related to horticulture.

Kenya Forestry Research Institute (KEFRI): While primarily focused on forestry, KEFRI also offers training programs related to horticulture, especially in areas like agroforestry and landscaping.

Kenya Institute of Organic Farming (KIOF): KIOF provides vocational training in organic farming, which often includes horticultural practices.

Technical and Vocational Education and Training (TVET) institutions: Various TVET institutions across Kenya offer certificate and diploma programs in horticulture, providing practical skills and knowledge to students.

Universities: Some universities in Kenya offer degree programs in agriculture with specializations in horticulture.

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These institutions typically offer practical training alongside theoretical knowledge, preparing students for careers in horticulture, landscaping, agricultural extension services, and entrepreneurship in the horticulture sector.

The curriculum of these vocational education programs usually covers topics such as crop production, plant propagation, pest and disease management, soil science, irrigation techniques, post-harvest management, and agribusiness skills. Practical training often takes place in demonstration farms, research stations, and commercial horticultural enterprises.

The Kenyan government, in collaboration with international organizations and development partners, often supports initiatives aimed at improving vocational education in horticulture. This includes funding for infrastructure, curriculum development, and capacity building for instructors. These efforts are vital for ensuring that vocational education in horticulture remains relevant and responsive to the needs of the industry, thus contributing to the growth and sustainability of Kenya's horticulture sector.

Mauritius

a. Agricultural Education in Mauritius

The agricultural education in Mauritius is provided by various institutions and programs. Here is some information about agricultural education in Mauritius:

University of Mauritius - Faculty of Agriculture: The Faculty of Agriculture, originally founded as the School of Agriculture in 1914, plays a vital role in providing trained human resources for the public and private agricultural sectors in Mauritius. They offer undergraduate programs covering a wide range of fields including agriculture, food science and technology, biotechnology, and microbiology. For more information, you can visit the University of Mauritius - Faculty of Agriculture website.
Degrees in Agricultural Science: If you are interested in pursuing a degree in agricultural science in Mauritius, you can compare multiple degrees available for 2024. This will help you find the best fit for your educational goals. For more information, you can refer to the [1 Top Degrees in Agricultural Science in Mauritius for 2024

b. Agriculture Vocational Education in Mauritius

Agriculture vocational education in Mauritius is provided by various institutions and programs. Here is some information about agriculture vocational education in Mauritius:
Mauritius Institute of Training and Development: The Mauritius Institute of Training and Development is the main provider of Technical and Vocational Education and Training (TVET) in Mauritius. They offer vocational courses and programs in various fields, including agriculture. These programs aim to equip individuals with the necessary skills and knowledge to work in the agricultural sector.

Pre-Degree & Vocational Agriculture Sciences courses abroad: There are also opportunities to pursue pre-degree and vocational agriculture sciences courses abroad. IDP Mauritius offers 44

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such courses with a range of prices. These courses provide specialized training in agriculture and related fields.

Modernization of Vocational Education and Training in Agriculture: The modernization of vocational education and training in agriculture is an ongoing initiative in Mauritius. Through tailored initiatives, this project aims to equip rural communities, including youth, women, and vulnerable groups, with market-driven agricultural knowledge and skills.

c. Horticulture Vocational Courses in Mauritius

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South Africa

a. Agricultural Education in South Africa

Agricultural education in South Africa is diverse and dynamic, catering to the needs of a rapidly evolving agricultural sector. It encompasses formal academic programs, vocational training, research activities, and practical learning experiences, all aimed at building a skilled workforce and promoting innovation and sustainability in agriculture.

Agricultural education in South Africa is multifaceted, encompassing various institutions and programs aimed at equipping individuals with the knowledge and skills necessary for success in the agricultural sector. South Africa's agricultural industry is diverse, ranging from large-scale commercial farming to smallholder agriculture, agribusiness, and agricultural research.

Some key aspects of agricultural education in South Africa include:

Universities and Higher Education Institutions: Several universities in South Africa offer degree programs in agriculture and related fields. These programs cover a wide range of specializations, including agronomy, animal science, agricultural economics, agricultural engineering, and horticulture. Examples of institutions offering agricultural education include the University of Pretoria, Stellenbosch University, University of KwaZulu-Natal, University of Pretoria, Tshwane University of Technology, and University of the Free State.

Technical and Vocational Education and Training (TVET) Colleges: TVET colleges provide vocational training in agriculture and related disciplines. These institutions offer certificate and diploma programs focused on practical skills development, preparing students for careers as agricultural technicians, farm managers, or agricultural extension officers.

Agricultural Training Institutes: There are agricultural training institutes across South Africa that offer short courses, workshops, and practical training programs for farmers, agribusiness professionals, and agricultural workers. These institutes often collaborate with government agencies, industry organizations, and international partners to deliver training on topics such as sustainable farming practices, agribusiness management, and technology adoption.

Research Organizations: Research institutions like the Agricultural Research Council (ARC) play a significant role in advancing agricultural education and innovation in South Africa. They

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conduct research on various aspects of agriculture, develop new technologies and practices, and provide training and extension services to farmers and agricultural professionals.

Government Initiatives: The South African government, through the Department of Agriculture, Land Reform, and Rural Development, implements various initiatives to support agricultural education and training. This includes funding for education programs, scholarships, bursaries, and agricultural extension services aimed at improving productivity, sustainability, and inclusivity in the agricultural sector.

Private Sector Involvement: The private agricultural sector is also deeply involved in the training and development of Agricultural skills. Many private companies, agribusinesses, and agricultural associations in South Africa also contribute to agricultural education and training through sponsorship, mentorship programs, internships, and skills development initiatives.

b. Agriculture Vocational Education in South Africa

Agriculture vocational education plays a crucial role in building a skilled and diverse workforce that can drive innovation, productivity, and sustainability in South Africa's agricultural sector. By providing practical training and relevant skills, vocational programs contribute to the development of a vibrant and inclusive agricultural industry that supports livelihoods and economic growth across rural communities.

Technical and Vocational Education and Training (TVET) Colleges: TVET colleges offer a range of agriculture-related courses and programs, including certificates, diplomas, and occupational qualifications. These institutions provide hands-on training in areas such as crop production, livestock management, farm mechanization, irrigation techniques, and agribusiness management. Examples of TVET colleges offering agriculture programs include Elsenburg Agricultural Training Institute, Boland College, and Taletso TVET College.

Curriculum and Skills Development: Agriculture vocational education programs focus on equipping students with practical skills that are relevant to the needs of the agricultural industry. The curriculum often integrates classroom instruction with laboratory work, field practicals, and work-integrated learning opportunities on farms or agricultural enterprises. Students learn about crop and livestock production practices, agricultural machinery operation and maintenance, pest and disease management, soil conservation, and farm business management.

Industry Partnerships and Collaboration: Many agriculture vocational education programs collaborate closely with industry stakeholders, including commercial farmers, agribusinesses, agricultural associations, and government agencies. These partnerships help ensure that vocational training remains aligned with industry standards and practices. Industry partners may provide input into curriculum development, offer internship and apprenticeship opportunities, and participate in skills development initiatives.

Government Support: The South African government provides support for agriculture vocational education through various initiatives and funding mechanisms. The Department of Higher Education and Training (DHET) oversees the implementation of vocational education programs and allocates resources to TVET colleges. Additionally, government agencies such as

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the Department of Agriculture, Land Reform, and Rural Development may provide grants, subsidies, or scholarships to support students pursuing agriculture-related qualifications.

Entrepreneurship and Smallholder Development: Agriculture vocational education programs often include components focused on entrepreneurship and smallholder development. Students learn about the opportunities and challenges associated with starting and managing agricultural enterprises, including farm planning, budgeting, marketing, and access to finance. These skills are essential for empowering aspiring farmers and rural entrepreneurs to establish successful agricultural businesses.

c. Horticulture Vocational Education in South Africa

Horticulture vocational education in South Africa is a vital aspect of the country's agricultural education system. It focuses on the cultivation, management, and commercialization of horticultural crops and products. Horticulture encompasses a wide range of specialties, including fruit and vegetable production, ornamental plant cultivation, landscaping, and nursery management. Here are some key features of horticulture vocational education in South Africa:

Technical and Vocational Education and Training (TVET) Colleges: TVET colleges offer horticulture-related courses and programs at various levels, including certificates, diplomas, and occupational qualifications. These programs cover topics such as plant propagation, greenhouse management, irrigation techniques, pest and disease control, landscape design, and floriculture. Students receive hands-on training in horticultural practices through practical demonstrations, laboratory work, and fieldwork.

Specialized Horticultural Training Institutions: Some institutions in South Africa specialize in horticulture education and training, providing comprehensive programs tailored to the needs of the horticultural industry. These institutions may offer short courses, workshops, and specialized training in areas such as fruit production, viticulture, hydroponics, and arboriculture. Examples include the Cape Peninsula University of Technology's Department of Horticulture and the South African Nursery Association's training programs.

Industry Partnerships and Practical Experience: Horticulture vocational education programs often collaborate closely with industry stakeholders, including commercial growers, nurseries, landscaping companies, and research organizations. These partnerships provide students with opportunities for practical experience, internships, and work-integrated learning placements, allowing them to gain hands-on experience in real-world horticultural operations. Industry involvement also helps ensure that horticulture training remains relevant to current industry practices and trends.

Entrepreneurship and Business Skills: Horticulture vocational education programs incorporate elements of entrepreneurship and business management to prepare students for careers as horticultural entrepreneurs, farm managers, or nursery owners. Students learn about market analysis, business planning, budgeting, marketing strategies, and customer relations, equipping them with the skills needed to start and manage their own horticultural enterprises.

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Government Support and Funding: The South African government provides support for horticulture vocational education through various initiatives and funding mechanisms. The Department of Higher Education and Training (DHET) oversees the implementation of vocational education programs and allocates resources to TVET colleges and other training institutions. Additionally, government agencies such as the Department of Agriculture, Land Reform, and Rural Development may offer grants, subsidies, or scholarships to support students pursuing horticulture-related qualifications.

Part III.

SWOT ANALYSIS of VOCATIONAL EDUCATION

STRENGTHS OF HORTICULTURE VOCATIONAL COURSES

a. Strengths of horticulture vocational courses in Kenya:

Specialized Workforce: The current ATVETs (Agricultural Technical and Vocational Education and Training) and associated education institutions in Kenya have a general focus, but in view of the growing demand, the **specialized workforce in horticulture** can be regarded is still inadequate. By enrolling in horticulture vocational courses, individuals can acquire specialized knowledge and skills in the field of horticulture, making them valuable assets to the industry.

Fast-Growing Sub-Sector: Horticulture is one of the fastest-growing sub-sectors in Kenya. By pursuing vocational courses in horticulture, individuals can tap into the opportunities offered by this thriving industry. The demand for skilled horticulturists is increasing, and vocational training can help individuals meet this demand.

Practical Skills Development: Horticulture vocational courses in Kenya emphasize practical skills development. Students receive hands-on training in various aspects of horticulture, including plant propagation, crop management, pest and disease control, irrigation techniques, and post-harvest handling. This practical experience equips students with the necessary skills to excel in the field.

Industry-Relevant Curriculum: The curriculum of horticulture vocational courses in Kenya is designed to meet the needs of the industry. It covers a wide range of topics, including greenhouse management, floriculture, landscaping, nursery management, and sustainable horticulture practices. This ensures that students are equipped with the knowledge and skills required to succeed in the horticulture sector.

Job Opportunities: Horticulture vocational courses open up a range of job opportunities in Kenya. Graduates can find employment in various sectors, including commercial horticulture farms, research institutions, agribusinesses, landscaping companies, and government agencies. The skills acquired through vocational training make individuals highly employable in the horticulture industry.

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b. Strengths of Horticulture Vocational Courses in Mauritius:

Practical Skills Development: Horticulture vocational courses in Mauritius focus on developing practical skills in growing, improving, and commercializing flowers, fruits, vegetables, and plants for decorative purposes provide hands-on training and practical experience to equip individuals with the necessary skills to work in the horticulture industry.

Industry-Relevant Curriculum: The vocational courses in horticulture offered in Mauritius are designed to meet the needs of the industry. The curriculum is developed in consultation with industry experts and covers a wide range of topics, including plant propagation, pest and disease management, landscape design, and sustainable horticulture practices.

Opportunities for Specialization: Horticulture vocational courses in Mauritius offer opportunities for specialization in various areas of horticulture. Students can choose to focus on specific aspects such as floriculture, arboriculture, landscape gardening, or nursery management, depending on their interests and career goals.

Practical Exposure and Internships: These courses often provide practical exposure to real-world horticulture settings through field visits, internships, and industry collaborations. This allows students to apply their theoretical knowledge in practical settings and gain valuable hands-on experience.

Career Prospects*:* Horticulture is an important industry in Mauritius, and vocational courses in horticulture can lead to a wide range of career opportunities. Graduates can find employment in nurseries, landscaping companies, botanical gardens, agricultural research institutions, or even start their own horticulture businesses.

c. Strengths of horticulture vocational courses in South Africa:

South Africa has placed heavy emphasis on the acquisition of TVET skills relevant to the job market. The TVET system in South Africa is properly integrated with the labor market through the Work Integrated Learning program, which allows students the opportunity to intern with industries to gain hands-on, relevant experience.

TVET students in South Africa receive specialized training in entrepreneurship, and those without the means to fund their training, including persons with disabilities, receive financial supports from the government to do so. Regular assessments on the current and future skills needed by the job market are also conducted by the South African government to ensure TVET students are well prepared to bridge current and future skills gaps (*How Technical and Vocational Education Can Help Close Skills Gaps in Africa - ACET*, n.d.)

Service to Nut Farmers and Companies: Horticulture vocational courses in South Africa provide valuable training and knowledge to support the nut farming industry. This specialization helps individuals develop the skills necessary to contribute to the growth and success of nut farming businesses.

Ornamental Horticulture: Ornamental horticulture is an important component of horticulture that is often overlooked in South Africa. Horticulture vocational courses address this by

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providing education and training in ornamental horticulture, which includes the cultivation and management of flowers, plants, and decorative vegetation.

Industry-Relevant Curriculum: The vocational courses in horticulture offered in South Africa are designed to meet the current and future needs of the industry. The curriculum is developed in consultation with industry experts and covers a wide range of topics, including plant propagation, pest and disease management, landscape design, and sustainable horticulture practices.

Practical Skills Development: Horticulture vocational courses emphasize practical skills development. Students receive hands-on training in various aspects of horticulture, such as plant care, soil management, irrigation techniques, and harvesting methods. This practical experience equips students with the necessary skills to excel in the field.

Career Opportunities: Graduates of horticulture vocational courses in South Africa have a range of career opportunities. They can find employment in nurseries, landscaping companies, botanical gardens, agricultural research institutions, or even start their own horticulture businesses. The demand for skilled horticulturists is expected to grow, providing ample job prospects in the industry.

WEAKNESS OF HORTICULTURE VOCATIONAL EDUCATION

It is important to note that although generally these weaknesses are similar in all three project countries, still they exhibit a substantial country specific, individual variability. They can vary and may be influenced by various factors, as vocational education institutions and policymakers regularly address these weaknesses by implementing measures to improve market access, enhance practical training, and strengthen governance mechanisms in the horticulture sector.

a. Weakness of Horticulture Vocation Education in Kenya

Limited access to markets: One of the weaknesses of horticulture vocational education in Kenya is the limited access to markets. This means that graduates may face challenges in finding suitable employment opportunities or establishing their own businesses due to a lack of market connections and networks.

Low labor productivity: Another weakness is the low labor productivity in the horticulture industry. This could be attributed mainly to availability of inadequate tools, infrastructure in vocational education programs. It is important for vocational education institutions to focus on enhancing the practical skills of students to improve their productivity in the field.

Weak governance of contracts: Weak governance of contracts is another challenge faced in horticulture vocational education in Kenya. This refers to weak or proper enforcement strategies in contractual agreements between horticulture businesses and vocational education graduates. It can lead to exploitative practices and unfair treatment of workers.

It is important to note that these weaknesses can vary and may be influenced by various factors, as vocational education institutions and policymakers regularly address these weaknesses by implementing measures to improve market access, enhance practical training, and strengthen governance mechanisms in the horticulture sector.

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b. Weakness Of Horticulture Vocational Education in Mauritius

Limited availability of programs: One weakness is the limited availability of horticulture vocational education programs in Mauritius. This means that there may be a lack of opportunities for individuals interested in pursuing a career in horticulture to receive specialized vocational training.

Insufficient practical training: Another weakness is the potential lack of emphasis on practical training in horticulture vocational education. Practical training is crucial for students to develop hands-on skills and experience in the field. Without sufficient practical training, graduates may face challenges when entering the job market.

Outdated curriculum: Horticulture is a dynamic field that constantly evolves with new techniques, technologies, and industry practices. A weakness of vocational education in horticulture could be an outdated curriculum that does not adequately address the latest advancements in the industry. This may result in graduates lacking the necessary knowledge and skills required by employers.

Limited industry collaboration: Collaboration between vocational education institutions and the horticulture industry is essential for aligning the curriculum with industry needs. A weakness could be the limited collaboration between educational institutions and horticulture businesses, which may lead to a disconnect between the skills taught in the classroom and the skills demanded by employers.

Lack of career guidance and support: Another weakness could be the lack of comprehensive career guidance and support services for students pursuing horticulture vocational education. Adequate career guidance can help students make informed decisions about their career paths and provide them with the necessary resources to succeed in the industry.

c. Weakness of Horticulture Vocational Education in South Africa

Limited access to resources: One of the weaknesses is the limited access to resources, including funding, equipment, and infrastructure. This can hinder the quality of education and practical training provided to students in horticulture vocational programs.

Lack of industry collaboration: Another weakness is the limited collaboration between vocational education institutions and specific focus industries e.g., the horticulture industry in South Africa. This can result in a gap between the skills taught in the classroom and the skills demanded by employers. Close collaboration with industry stakeholders is crucial to ensure that the curriculum is aligned with industry needs.

Inadequate practical training: Practical training is essential for students to develop hands-on skills and experience in horticulture. However, a weakness in vocational education in South Africa may be the insufficient emphasis on practical training. This can affect the readiness of graduates to enter the job market and perform effectively in horticulture-related roles.

Outdated curriculum: Horticulture is a field that constantly evolves with new techniques, technologies, and industry practices. A weakness of vocational education in horticulture could

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be an outdated curriculum that does not adequately address the latest advancements in the industry. This may result in graduates lacking the necessary knowledge and skills required by employers. Aquaculture, Hydroponics and regenerative Agriculture, Organic Agriculture has not yet been included in the curricula. There is an increasing need in training with modern technology e.g. digital monitoring of crops, smart farming, precision farming. This is very attractive to the youth which is needed for the future.

Limited career guidance and support: Another weakness could be the lack of comprehensive career guidance and support services for students pursuing horticulture vocational education. Adequate career guidance can help students make informed decisions about their career paths and provide them with the necessary resources to succeed in the industry.

OPPORTUNITIES OF HORTICULTURE VOCATIONAL EDUCATION

a. Opportunities of Horticulture Vocational Education in Kenya

Economic opportunities: Horticulture is the fastest growing sub-sector in Kenya, offering numerous economic opportunities. By pursuing vocational education in horticulture, individuals can gain the skills and knowledge needed to tap into this thriving industry and contribute to its growth.

Joint learning sessions: There are opportunities for joint learning sessions in horticulture vocational education. These sessions provide a platform for collaboration and knowledge sharing among students, educators, and industry professionals. By participating in these sessions, students can expand their network and learn from experienced professionals in the field.

Agriculture Technical Vocational Education and Training (ATVET): Kenya has integrated Agriculture Technical Vocational Training into its National Agriculture Investment Plans (NAIPs) and national training strategies. This integration emphasizes the importance of vocational education in the agricultural sector, including horticulture.

Pre-Degree & Vocational Horticulture and Viticulture courses: There are various pre-degree and vocational courses available in horticulture and viticulture in Kenya. These courses provide specialized training in horticulture, equipping students with the necessary skills to succeed in the industry. The course prices range from KES 435,280 to KES 2,271,476.

EPIVOT Project: The EPIVOT Project is focused on vocational training and education in the horticulture value chains of Kenya. This project, which started in August 2019, aims to enhance vocational education opportunities in the horticulture sector. By participating in this project, individuals can access training programs and resources specifically tailored to the horticulture industry.

These opportunities highlight the potential for individuals interested in horticulture to pursue vocational education and contribute to the growth and development of the industry in Kenya.

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b. Opportunities of Horticulture Vocational Education in Mauritius

Horticulture and Viticulture courses: IDP Mauritius offers 18 pre-degree and vocational courses in horticulture and viticulture. These courses provide specialized training in the art and discipline of nurturing gardens. The course prices range from MUR 165,185 to MUR 862,006.

Workshop on Technical and Vocational Education and Training (TVET): Mauritius has launched a workshop focused on empowering green skills. This workshop emphasizes the importance of technical and vocational education and training in the country, including in the field of horticulture.

By pursuing vocational education in horticulture in Mauritius, individuals can gain knowledge and expertise in nurturing gardens, explore career opportunities in the horticulture industry, and contribute to the green skills development in the country.

c. Opportunities of Horticulture Vocational Education in South Africa

Vocational training for agriculture transformation: Vocational training in e.g. horticulture can transform agriculture into a high-tech industry, appealing to a new generation of farmers and agripreneurs. This presents an opportunity for individuals interested in special focused agriculture to gain the necessary skills and knowledge to contribute to the agricultural sector.

Technical Vocational Education & Training (TVET) in agriculture: South Africa has Technical Vocational Education and Training (TVET) colleges that offer programs in agriculture and related subjects. These programs provide a pathway for individuals to pursue vocational education in horticulture and other agricultural fields. For example, Motheo Technical and Vocational Education and Training (TVET) College is the first TVET College in South Africa to have established a major skills boost in agri-horticulture.

Promotion of sustainable and green economy: South Africa and its neighboring countries are developing strategies for vocational education that promote a sustainable and green economy. This indicates a growing emphasis on environmentally friendly practices in focus specialized agricultural sectors. By pursuing vocational education in this part of agriculture, individuals can contribute to the development of a sustainable and green economy.

THREATS TO HORTICULTURE VOCATIONAL EDUCATION

a. Threats to Horticulture Vocation Education in Kenya

Horticulture vocational education in Kenya faces several challenges, some of which are common to vocational education as a whole, while others are specific to the horticulture sector in the country. Here are some potential threats:

Limited Resources: Many vocational institutions in Kenya, including those focusing on horticulture, suffer from inadequate funding and resources. This shortage affects the quality of education and training provided.

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Outdated Curriculum: The curriculum might not always align with the current needs and trends of the horticulture industry. Updating curriculum to include modern techniques, technology, and sustainable practices is crucial.

Inadequate Qualified Instructors: There might be a shortage of skilled instructors with practical experience in horticulture. Without competent teachers, the quality of education suffers.

Insufficient Infrastructure: Some vocational institutions lack proper infrastructure such as well-equipped laboratories, demonstration farms, and modern teaching facilities. This affects hands-on learning opportunities.

Limited Industry Collaboration: Strong ties between educational institutions and the horticulture industry are essential for providing students with practical experience, internships, and job placements. Lack of collaboration can hinder students' transition into the workforce.

Perception and Awareness: There might be a lack of awareness about the potential of careers in horticulture, leading to fewer students opting for vocational education in this field. Changing perceptions about horticulture as a viable career option is necessary.

Market Demand Fluctuations: Inabilities to access markets and market fluctuations for horticultural products can impact the perceived value of vocational education in this sector. Ensuring students are equipped with diverse skills that are relevant even during market fluctuations is crucial.

Climate Change and Environmental Concerns: Climate change poses significant challenges to horticulture, affecting crop yields and production practices. Vocational education needs to incorporate training on climate-resilient farming techniques and environmental sustainability.

b. Threats To Horticulture Vocational Education in Mauritius

Horticulture vocational education in Mauritius may encounter several challenges similar to those faced in other countries, as well as some unique to the Mauritian context. Here are potential threats:

Limited Resources: Similar to Kenya, vocational institutions in Mauritius may face constraints in funding and resources, affecting the quality of education and training provided.

Outdated Curriculum: The curriculum may not always reflect the current needs and advancements in the horticulture industry. Updating the curriculum to incorporate modern techniques, technology, and sustainable practices is crucial.

Lack of Qualified Instructors: There might be a shortage of skilled instructors with practical experience in horticulture. Without competent teachers, the quality of education suffers.

Insufficient Infrastructure: Some vocational institutions in Mauritius may lack proper infrastructure, including laboratories, demonstration farms, and modern teaching facilities, which are essential for hands-on learning.

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Limited Industry Collaboration: Strong collaboration between educational institutions and the horticulture industry is vital for providing students with practical experience, internships, and job placements. Insufficient collaboration can hinder students' transition into the workforce.

Perception and Awareness: There might be a lack of awareness about the potential of careers in horticulture in Mauritius, leading to fewer students opting for vocational education in this field. Changing perceptions about horticulture as a viable career option is necessary.

Market Demand Fluctuations: Instabilities in market demand for horticultural products can impact the perceived value of vocational education in this sector. Ensuring students are equipped with diverse skills that are relevant even during market fluctuations is crucial.

Climate Change and Environmental Concerns: Mauritius, like many other places, is vulnerable to the effects of climate change, which can pose significant challenges to horticulture. Vocational education needs to incorporate training on climate-resilient farming techniques and environmental sustainability.

Addressing these threats requires coordinated efforts from government bodies, educational institutions, industry stakeholders, and other relevant parties to ensure that horticulture vocational education in Mauritius remains effective, up-to-date, and accessible to aspiring individuals.

c. Threats to Horticulture Vocational Education in South Africa

Horticulture and other specialized, focused, agricultural vocational education in South Africa face several challenges, reflective of broader issues in the education system and specific concerns within the horticulture sector. Here are some potential threats:

Limited Resources: Many vocational institutions in South Africa, including those focused on horticulture, suffer from inadequate funding and resources. This hampers their ability to offer quality education and training.

Outdated Curriculum: The curriculum may not always align with the evolving needs and advancements in the modern horticulture and other related industries. Updating the curriculum to include modern techniques, technology, and sustainable practices is crucial.

Lack of Qualified Instructors: There may be a shortage of skilled instructors with practical experience in horticulture. Without competent teachers, the quality of education suffers.

Insufficient Infrastructure: Some vocational institutions lack proper infrastructure, such as laboratories, demonstration farms, and modern teaching facilities. This affects hands-on learning opportunities.

Limited Industry Collaboration: Strong collaboration between educational institutions and the horticulture industry is essential for providing students with practical experience, internships, and job placements. Insufficient collaboration can hinder students' transition into the workforce.

Perception and Awareness: There might be a lack of awareness about the potential of careers in specialized, focused agriculture in South Africa, leading to fewer students opting for

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vocational education in this field. Changing perceptions about agriculture as a viable career option is necessary.

Market Demand Fluctuations: Instabilities in market demand for horticultural products can impact the perceived value of vocational education in this sector. Ensuring students are equipped with diverse skills that are relevant even during market fluctuations is crucial.

Climate Change and Environmental Concerns: South Africa, like many other places, is susceptible to the effects of climate change, which can pose significant challenges to horticulture. Vocational education needs to incorporate training on climate-resilient farming techniques and environmental sustainability.

By a concerted effort from government bodies, educational institutions, industry stakeholders, and other relevant parties South Africa continuously endeavors to ensure that general agriculture and vocational education remains effective, up-to-date, and accessible to aspiring individuals.

GENERAL CONCLUSIONS

As a general feature of the Targeted Countries, their unique and rich medicinal and aromatic plant diversity, the rich heritage of endemic and rare species can be regarded as a sound basis for professional development in the MAP sector.

Kenya

The structured TVET environment in Kenya presents an opportunity to improve women involvement in the cultivation of medicinal and aromatic herbs. On the production side it is mainly the inadequate availability and application of Tools, while – in general - Market development and marketing are seen to be the weakest link. Strategic interventions should revolve around training the women on entrepreneurship and linking them to sustainable markets.

Mauritius

Horticulture is an important industry also in Mauritius. Graduates can find employment in nurseries, landscaping companies, botanical gardens, agricultural research institutions, or even start their own horticulture businesses. It is expected that by farther improving/changing perceptions about horticulture, as a viable career option. It is expected that by farther improving/changing perceptions, horticulture will remain to be a viable career option. Thus, and by offering vocational courses can lead to a wide range of career opportunities changing the varied trends of awareness about the potential of careers in horticulture in Mauritius.

South Africa

Although many attempts have been made to address the reality of current challenges, the shortfall is obvious in the performance and continued lack of skills training. It is possible to

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change this situation as the desperate need to improve the situation is present at all levels. The willingness to participate in a workable project plan exists and will be supported by the government and welcomed by the wider agricultural community. Lessons have been learnt and can contribute to the success of this project. No real effort has ever been made to include specific women or medicinal and aromatic plants as part of the Agricultural and Vocational training programs in the past. There were some successes in the vegetable and viticulture as well as subtropical fruit training from which examples can be used to ensure this project excels.

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Enclosures:

Stakeholders Pilot Datasheets are available at: https://drive.google.com/drive/u/0/home

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