

THE REPUBLIC OF UGANDA

**MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION**



**NATIONAL BIOECONOMYPOLICY (NBP)**

**VERSION 1**

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**Ministry of Science, Technology and Innovation**

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# **GLOSSARY**

**Bioeconomy:** *The production, use and conservation of biological resources, including knowledge, science, technology and innovation related, to provide information, products, processes and services in all economic sectors, in order to move towards a sustainable economy*

**Bio-fuels** *Fuel produced from biomass either directly (e.g. wood) or indirectly through the fermentation of sugars (e.g. ethanol).*

**Biological resources**

**(Bio-resources)**: *Materials of biological origin and include organisms or parts thereof, populations, or any other biotic component of ecosystems that have actual or potential value or use to humanity. They represent the feedstock for the Bioeconomy*

**Biomass** *Plant or animal material encompasses, but is not limited to, agricultural crops and trees, including dedicated energy crops, food, feed and fibre crop residues; aquatic plants and animals, algae, fish bones and other fish residues; forestry and wood residues; agricultural waste, including animal manure; processing by-products and any other non-fossil organic material*.

**Bioproducts:** *All products made from biological resources, and includes food, feed, biofuels and bio-based products*

**Bioprospecting:** *The systematic search for biochemical and genetic information in nature to develop commercially valuable products for pharmaceutical, agricultural, cosmetic and other applications*

**Biosciences** *Life sciences dealing with the living organisms, their processes, their relationships to each other and the environment*

**GERD** *A measure of a country’s level of investment in research, innovation and product development(spending as a Percentage of GDP)*

**Living materials** *Resources composed of living cells or genetic ingredients*

**TAI** *A composite measure of the country’s capacity and capability to generate, transfer and diffuse technology for gainful society application.*

# **LIST OF ACRONYMS AND ABBREVIATIONS**

ABS: Access and Benefit Sharing

AfCFTA: African Continental Free Trade Area

AI: Artificial Intelligence

AIDS: Acquired Immune Deficiency Syndrome

BiSEA: Bioeconomy strategy for Eastern Africa

CBD: Convention on Biodiversity

CBOs: Community Based Organizations

CITES: Convention on the International Trade of Endangered Species

COMESA: Common Market for Eastern and Southern Africa

DFID: Department for International Development

EAC: East African Community

EASTECO: East African Science and Technology Commission

FBOs: Faith Based Organizations

GDP: Gross Domestic Product

GERD: Gross Expenditure on Research and Development

GHG: Green House Gas

GOU: Government of Uganda

HIV: Human Immunodeficiency Virus

ICT: Information and Communication Technology

IGADD: Inter-Governmental Authority on Drought and Development

IoT: Internet of Things

JICA: Japan International Cooperation Agency

KBBE: Knowledge-Based Bio-Economy

MAAIF: Ministry of Agriculture, Animal Industry and Fisheries.

MDAs: Ministries, Departments and Agencies.

M&E: Monitoring and Evaluation

MoSTI: Ministry of Science, Technology and Innovation.

MWE: Ministry of Water and Environment.

NARO: National Agricultural Research Organisation

NBP: National Bioeconomy Policy

NDP: National Development Plan

NEMA: National Environmental Management Authority

NGO: Non-Governmental Organisations

PBS: Program for Biosafety Systems

PTA: Preferential Trade Areas

R&D: Research and Development

RECs: Regional Economic Communities

SDG: Sustainable Development Goals

ST&I: Science, Technology and Innovation

STISA: Science, Technology and Innovation Strategy for Africa

TAI: Technology Achievements Index

USAID: United States Agency for International Development.

# **FOREWORD**

Bioeconomy is a new wave of economic development and a crucial element of circular economy that permits reuse and recycling of resources including waste. The crosscutting and multi-facetted nature of Bioeconomy offers a unique opportunity to comprehensively address inter-connected societal challenges such as: food and nutrition security; health; natural resource depletion; fossil resource dependence and climate change while achieving sustainable development. Bioeconomy can also serve as a nexus between indigenous knowledge and modern biomass processing technologies for producing bio-based products and adding value to bio-resources. It therefore plays a fundamental role in transiting from biological resource-based dependence to knowledge-based development for socio-economic transformation and shared prosperity. It thus has the potential to modernize and correct market failures in the traditional economic sectors that depend on biological resources in Uganda.

The development of the National Bioeconomy Policy (NBP) to guide Bioeconomy implementation addresses Vision 2040’s aspirations of having “a transformed Ugandan society from a peasant to a modern and prosperous country within 30 years”. It is also line with National Development Plan (NDP) III’s aim of increasing household incomes and improving the quality of life of Ugandans. Furthermore, it provides a framework for addressing the UN 2030 agenda and the SDGs, including poverty alleviation (SDG 1) improved food security and nutrition (SDGs 2 and 3), inclusive and sustainable economic growth (SDG 8), affordable energy for all (SDG 11), combatting climate change and its impacts (SDG 13) and functional ecosystems, clean environment and maintained biodiversity (SDG 15). It also addresses the aspirations of Agenda 2063 which is underpinned by its continental science and technology strategy, STISA 2024 and its priorities on eradication of hunger and ensuring food and nutritional security (priority 1), infrastructural development (priority 3), environmental protection and climate change (priority 4), and wealth creation (priority 6).

The development of the NBP is therefore timely in ensuring that the country takes advantage of the enormous opportunities it is endowed with. The policy objectives reflect countrywide consensus generated during highly interactive consultations and dialogues that were held with various stakeholders including Government Ministries, Departments and Agencies (MDAs); academia and research institutes; donors and investors; private sector actors; civil society organizations and umbrella associations; as well as individuals along the Bioeconomy value chain.

I thank everyone who contributed to the formulation of this policy and my Ministry is committed to sustaining the momentum and enthusiasm generated during its formulation process. Particular thanks go to the drafting team, members of the multi-sectoral and multi-institutional Taskforce for steering the process; consultants for technical assistance; and support received from our development partners, particularly the United States Government through USAID, the Program for Biosafety Systems (PBS), the East African Science and Technology Commission (EASTECO) and the Food and Agricultural Organization (FAO).

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**Minister for Science, Technology and InnovationPREAMBLE**

The growing global demand for food, feed and bio-based renewable materials, such as biofuels, is changing the conditions for bio-resource utilization worldwide. At the same time, modern biosciences are providing an increasingly powerful innovation engine for sustainable agricultural production, waste treatment, energy production and development of a diverse range of novel bio-products. The revolutionary advances in biosciences provide an increasingly powerful engine for innovations, which has led to the concept of a ‘Bio-economy’.

The Bioeconomy concept posits that scientific research and knowledge can be applied to biological resources and agricultural systems not only to produce food and feed, but also to an increasingly-wide range of agro-industrial and value-added products with potential applications in many sectors, including pharmaceuticals, chemicals, materials and energy. Some have called this phenomenon a ‘knowledge-based bio-economy’ (KBBE), i.e. the art and science of transforming biological resources into new, sustainable, eco-efficient and value-added products. In essence, it is the coming together of biology, chemistry, material sciences, genomics and information technology to better utilize natural resources in agriculture, health and industry. The development of a Bioeconomy is important for many reasons, including: (i) development of resource-efficient and productive agricultural systems able to adapt to climate change, (ii) decreased dependence on fossil fuel energy thereby decreasing emission of greenhouse gases, (iii) the possibility to revitalize rural communities, increasing the production base and the opportunities for local value addition, and (iv) increased possibilities to recycle energy and material flows for mitigation of environmental degradation.

Today, more than ever, Bioeconomy is the subject of focused attention from policymakers, corporate decision-makers, researchers in the social and biological sciences and the general public. With both short and long-term shifts in the world’s demand and supply of agricultural and industrial products, there is growing attention to the actual and potential role of bio-based innovations as a means of developing a resource-efficient and productive economy.

Bioeconomy offers Uganda the potential to modernise traditional economic sectors by generating new sustainable economic growth through enabling new technologies such as biotechnology and nanotechnology. On the contrary, efforts towards harnessing Bioeconomy largely focus on modest value addition in agriculture. Though the country is making some efforts towards advancing selected value chains such as banana, milk and meat, achieving bio-based agro-industrialization for job creation and shared prosperity is still an illusion. Healthcare and agricultural bioscience solutions have not progressed beyond research stage, yet these would lead to high returns in the country through commercialization for industrialization and job creation. Novel innovations like anti-tick vaccine, energy production from organic waste, biofuels from agricultural/food processing wastes/invasive plants/bio-energy crops, improved crop varieties and livestock breeds and medicinal plants might not benefit Ugandans.

The aim of the Bioeconomy Policy is to strengthen Biosciences innovation to ensure food security, enhance nutrition and improve health, as well as enable job creation through the expansion and intensification of sustainable production and processing. These interventions should be driven by strong commitment and market demand, and will require strong private-sector involvement.

The Ministry of Science, Technology and Innovation, as the lead agent of this policy, will continue to engage other stakeholders to promote cooperation, facilitate the policy’s broad implementation, and ensure synergy, alignment and better coordination of activities. It is crucial to note that the success of this policy hinges on the coordinated efforts and unanimous will of all stakeholders involved, and will require due conscientiousness, patience and robust investments in order to achieve its goals.

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**PERMANENT SECRETARY**

# **EXECUTIVE SUMMARY**

Bioeconomy is a key component in the global sustainable transition. It promotes the reuse and better use of secondary materials in order to deliver on environmental, social and economic gains. The key driver for Bioeconomy is the rapid population growth with resultant overexploitation of finite natural resources as well as the heavy reliance on non-renewable fossil-based resources. A vibrant Bioeconomy has the potential of reversing market failures and transforming several economic sectors. It therefore permits Uganda to achieve faster its aspiration of industrialization, job creation for shared prosperity and favourably compete with developed and rapidly growing countries. However, because of the unsustainable and underutilization of biological resources coupled with poor human capacity and inadequate investments, the country has repeatedly failed in its attempts of transforming society. The fragmented and ineffective frameworks to provide a broader strategic direction for the country to benefit from leveraged capacities and investments in other sectors have hindered sustainable utilization of the enormous biological resources.

Uganda needs a holistic policy focused on translating biosciences’ research and innovations into industrial and commercial enterprises, with greater participation of the private sector. The National Bioeconomy Policy is designed to contribute to the achievement of international, regional and national development frameworks such as the United Nations 2030 agenda for Sustainable Development; the Science and Technology Strategy for Africa; the East African Cooperation through its Science and Technology Commission; the Uganda Vision 2040 and National Development Plan III.

The goal of this policy is optimally utilise biological resources, their products and services for sustainable national development. This will be achieved through providing an enabling environment for harnessing bio-resources; promoting research; strengthening institutional and human capacity; leveraging new and emerging technologies; and awareness creation. The policy is therefore intended to provide a paradigm shift in the traditional development mechanism to knowledge-based economy fuelled by research. It will identify key value chains and strategic projects to fast-track them towards commercial development. It is hoped to have the greatest influence in agriculture, health, and industry by supporting the production of vaccines, biopharmaceutical and industrial enzymes among others. The policy is cognisant of crosscutting issues like climate change, gender and equity, environment, HIV/AIDS and will incorporate them in its implementation.

**1.0 INTRODUCTION**

## BACKGROUND

Bioeconomy is a knowledge-based development model that entails sustainable extraction, production, processing, distribution and consumption of goods and services from living materials. Bioeconomy is a new rapidly growing segment of the global economy identified as a key component in the global sustainability transition[[1]](#footnote-1). While at the beginning of this decade, there was not a single Bioeconomy strategy available in the world, dozens have now been developed and cross-fertilized across all continents and their number is steadily growing. Bioeconomy is a multi-sectoral and interdisciplinary approach enhancing a shift from the traditional to knowledge-based development mechanisms; fostering more efficient systems of production, consumption and processing. It promotes the reuse and better use of secondary materials in order to deliver on environmental, social and economic gains thus ensuring achievement of full life cycle of biological resources. The crosscutting nature of Bioeconomy therefore offers a unique opportunity to addressing in a comprehensive manner inter-connected societal challenges such as health, food security, waste management, unemployment, natural resource scarcity, fossil resource dependence and climate change, while achieving sustainable economic development.

Over the coming decades, the world will witness increased competition for limited and finite natural resources. A growing global population will need a safe and secure food supply. And climate change will have an impact on primary production systems, such as agriculture, forestry, fisheries and aquaculture. A 70 % increase of the world food supply is estimated to be required to feed the 9 billion global population by 2050. Economies in Europe are considering Bioeconomy as a key response to these challenges.

Global trade in bio-based products has been booming over the last decade. While bio-based products represented about 10% of total international trade in 2007, this figure reached 13% in 2014. The data available indicate that the turnover of bio-based products surpassed US$2,500 billion worldwide in 2014, of which the European Union has the largest share (about US$2,200 billion) while the United States’ bio-based industries (excluding food) represent around US$370 billion. Equivalent data about bio-based products from other nations are very scarce. Nevertheless, an increasing number of countries (currently about 50) are proposing to reinforce and strengthen the position of bio-based products in their economies.

The United States has a National Bioeconomy Blueprint that paves way for current and future Bioeconomy discourse while relying on the past policies and strategies. It is anchored on applications of genetic engineering, manipulations of biomolecules and DNA sequencing as a vehicle to drive sustainable development in health, agriculture and environment. This is in tandem with research and innovation and efficient use of bio resources. The Bioeconomy significantly contributes to the growth of the American economy through job creation and manufacturing of bio-based products. The data available indicates that the bio-based industry created an estimate 4.2 million jobs in 2014 and directly contributed $393 million to the economy through value addition.

The African continent is predominantly an agriculture-based industry without an advanced manufacturing sector. A number of Bioeconomy policies have emerged in the region with countries such as Mali, Namibia, Mozambique and Kenya among others working with regional organizations and international partners to promote Bioeconomy growth. On the forefront in such initiatives is South Africa which has developed a Bioeconomy strategy: The National Bioeconomy Strategy, 2013. The strategy has focuses on agriculture, health, industries and environmental innovation while incorporating indigenous knowledge system to conserve and maintain biodiversity. Coordination and cooperation between national and regional governments has seen increased investment from donors and development partners into Bioeconomy related activities and projects. This has been demonstrated by the Biomass Web project in Ethiopia, Ghana, Kenya and Nigeria, which aims to increase productivity and efficiency along the value chain including producing, processing and trading biomass an initiative of the German government and a Swedish International Development cooperation Agency (SIDA) initiative in eastern Africa to promote development of bio-innovations.

Eastern Africa has immense bio-resources and economic growth in the region could strategically tap into the advantages that come with investing in Bioeconomy. In 2017, the core biobased industries (agriculture, forestry and fishing) accounted for a regional average of 30.826% of the total GDP. Governments and policy makers are continually faced with the challenge of identifying ideal investments in science, technology and bioscience innovations that can best link smaller holders to market, value chains and agro-processing opportunities. Furthermore, as a region with agriculture as its mainstay, population growth increases demand for biomass and bio-based products, signalling a requirement for the development of diversified value-added products.

The National Bioeconomy Policy (NBP) seeks to transform the Ugandan economy into a knowledge-based economy, in which the production and dissemination of knowledge leads to economic benefits and enriches all fields of human endeavor. The Policy will promote the use of advanced knowledge of biosciences to develop new processes and products, the use of renewable biomass and efficient bioprocesses to support sustainable production, and the integration of biotechnology knowledge and applications across sectors. It encourages scientific research and innovation in biosciences and identifies barriers so as to improve cooperation between stakeholders. It thus provides an engine for the new economy based on bio-solutions (figure 1) that can be used to:

* manufacture high-value bio-products such as biopharmaceuticals and vaccines;
* improve agricultural production and productivity;
* address climate change and its associated effects;
* produce biofuels;
* properly manage industrial and municipal waste

 **1.2** POLICY CONTEXT

Figure 1: Bioeconomy integrates key sectors of the economy (Germany Bioeconomy council, 2016)

The development of the National Bioeconomy Policy is aligned to other policies in order to contribute to the achievement of higher nation objectives as highlighted in Vision 2040 and NDPIII as well as the agenda 2030, the Sustainable Development Gaols (SDGs) for example poverty alleviation (SDG 1) improved food security and nutrition (SDGs 2 and 3), inclusive and sustainable economic growth (SDG 8), affordable energy for all (SDG 11), combatting climate change and its impacts (SDG 13) and functional ecosystems, clean environment and maintained biodiversity (SDG 15).

This policy also addresses Africa’s aspirations of Agenda 2063 which is underpinned by the Science and Technology Strategy for Africa (STISA) 2024 and its priorities on eradication of hunger and ensuring food and nutritional security (priority 1), infrastructural development (priority 3), environmental protection and climate change (priority 4), and wealth creation (priority 6).

This Policy is also aligned to the East African Cooperation through its Science and Technology Commission (EASTECO) that recognizes the need for a strong Bioeconomy to build upon the strong foundation laid by Science, Technology and Innovation (ST&I) initiatives in the region.

The Policy linked to Uganda Vision 2040 aspirations that envisages a transformed Ugandan society from a peasant to a modern and prosperous country within 30 years. This transformation will be achieved, among others, through scientific research and innovation in order to harness the abundant opportunities around the country. It addresses the National Development Plan (NDP) III’s goal of increasing average household incomes and improving the quality of life of Ugandans. Furthermore, it is in agreement with the ST&I National Sector Development Plan (2019/20-2020/25) that strives to achieve broad development objectives of empowering society through innovation for sustainable development and further prioritizes promotion of environmentally sound technologies or “green technologies” based on efficient use, reuse and recycling of resources, ensuring completion of full life cycle of resources to propel Uganda into a middle income country by 2040.

The vast biological resources put the country ahead of others if they are properly harnessed. The current frameworks and approaches towards harnessing biological resources for Bioeconomy are however fragmented and permit limited value addition. New opportunities are arising for industries and agriculture in a Bioeconomy, but conflicting policies and strategies are limiting accelerated innovations for food security and sustainable utilization of land, water and biodiversity. The NBP has therefore been developed to provide long-term strategic direction for developing a Bioeconomy in order to modernize traditional economic sectors that rely on the good climate and vast biological resources in the country.

## SITUATION ANALYSIS

### 1.3.1 Strengths

1. **Unique Geographical location**

Uganda lies across the Equator and is naturally gifted with water, unique climate and arable land. It has unique and diverse biodiversity, partly due to its distinctive bio-geographical location. Its gross economic output attributed to biological resources from fisheries, forestry, tourism, agriculture and energy sectors is estimated to be in excess of USD 546.6M a year. Biodiversity support to economic output indirectly is worth at least USD 200M a year. Uganda therefore has potential to earn more from its biological resources if there is a conducive regulatory framework.

1. **Availability of world class training institutions and human capacity**

Uganda has a number of universities and technical institutions churning out several young and innovative scientists who can be trained to adapt to new technologies such as Artificial Intelligence, Biotechnology, Nanotechnology, Block chain, Internet of things and big data among others. These can lead to successfully implementation of Bioeconomy for socio-economic transformation. These training institutions continue to support development of additional knowledge and skills in conservation, bioprospecting, and biodiversity data management that are all critical to harnessing our Bioeconomy.

1. **Political goodwill**

Uganda has continuously enjoyed political goodwill that recognized the role of Science, Technology and Innovation in national development. As such, the Ministry of Science, Technology and Innovation was created to coordinate scientific research and the entire innovation system in the country. The Ministry aims at addressing the bottlenecks in order to harness the abundant opportunities around the country for industrialization, job creation and shared prosperity. In 2019, His Excellency, the president of Uganda established a national taskforce to guide the country on the 4th industrial revolution technologies which among others will guide the government on the adoption and promotion of new technologies. The third national development plan of Uganda (NDP III) focuses on enhancing value addition in key growth opportunities and strengthening the private sector capacity to drive growth and create jobs through industrialization. This demonstrates clear political will to use ST&I including Bioeconomy in attaining vision 2040.

1. **High population growth rate**

Uganda's population is on steady increase and it is projected to reach 75 million by 2040. With a growth rate of 3% per annum, Uganda has the third fastest growing population in the world. This is as a result of a high fertility rate (currently 5.4) and a declining mortality rate. On the other hand, according to the Uganda Vision 2040 aspirations of changing the country from predominantly low income to a competitive upper middle-income country within 30 years, the per capita income is expected to increase to USD 9,500. A larger and a more affluent population will increase demand for health services that improve the quality and length of life and demand for essential natural resources: food, animal feed, fibre for clothing and housing, clean water, and energy. This would provide a great opportunity for the country, however, many of the Uganda’s ecosystems that support human societies are already overexploited and unsustainable.

### 1.3.2 Opportunities

1. **Regional Economic blocks**

Uganda belongs to several Regional Economic Communities (RECs) to enable it transform faster into a modern and prosperous country. The RECs constitute the building blocks of the African Economic Community. These include the African Continental Free Trade Area (AfCFTA), East African Community (EAC), Common Market for Eastern and Southern Africa (COMESA), Inter-Governmental Authority on Drought and Development (IGADD) and Preferential Trade Areas (PTA). On account of its membership to RECs and central location in the Great Lakes region, Uganda has ready market and unrivaled potential to be the source of bio-products for Africa if more investment is targeted at processing. Currently, Uganda exports substantial surplus of agricultural products to South Sudan, Kenya, Tanzania, Burundi, Democratic Republic of Congo, Rwanda and some countries in the COMESA region. These exports are majorly in raw form, causing the country to lose a considerable amount of money and opportunities to employ its citizens.

1. **Presence of Development Partners**

There are a number of partners, both national and international, willing to support the country harness its vast bio-resources through efficient systems of production, consumption and processing while delivering on the country’s quest for industrialization, job creation and shared prosperity. The Government of Uganda is therefore delivering Vision 2040 and the NDP II goal of transforming Uganda into a middle-income country by 2040, through cooperation with the Development Partners. The key Development Partners in Uganda among others include World Bank, Department for International Development (DFID), African Development Bank, Japan International Cooperation Agency (JICA) and United States Agency for International Development (USAID).

### 1.3.3 Weaknesses

1. **Inadequate bio-resource documentation**

An accurate inventory of Uganda’s biological resources has not been undertaken. A good monitoring and evaluation framework is not yet available to help in planning for the proper use and management of the biological resources. The gross and net economic output attributed to biological resources from fisheries, forestry, tourism, agriculture and energy sectors, is always estimated.

1. **Inadequate collaboration among stakeholders**

There is inherent weak inter-agency and inadequate collaboration between academia (university), processing companies, government, research institutions, extension staff and producers. Each group of stakeholders works independently resulting into competition and duplication of efforts. This has hindered flow of knowledge, training, skills and innovations among stakeholders thus leading to the prevalent inefficiencies in harnessing biological resources in the country.

1. **Competing and conflicting uses of Biological resources**

There is increasing competition and disagreements over access to, and control and use of, biological resources in Uganda. These have emerged because different people having different uses for resources such as forests, water, pastures and land, or want to manage them differently. While the rural people, the landless and women are highly dependent on biological resources that provide them with choice and fall back in times of drought, unemployment or other times of stress, industrialists demand biological resources as raw materials to feed their industries. There have been isolated cases of attempts or successes to degazette protected areas for industrial development. In other cases, especially within the national parks, forest reserves and wetlands, pressures for concessions and leases have mounted too high to be easily sustained thus posing a potential danger to biological resources.

1. **Inadequate service delivery systems and limited investments**

Uganda is still characterized by low human and technological capacity, inadequate services delivery systems and physical infrastructure to support the harnessing of biological resources. This is attributed to the low investments by both the public and private sectors. Despite the favourable climatic conditions for production of bio-resources, the country still relies on outdated technologies like the hoe and seasonal rains to produce. This has led to low production and productivity, creating prevalent poverty traps. The limited investments have also led to poorly developed bio-resources’ value chains and limited value addition thus having a large number of people being involved in agriculture.

### Threats

### Climate change

Climate change, characterized by changing weather patterns is impacting on crop and livestock production, food security, infrastructure durability and is greatly hindering Uganda in realizing its full development potential. It is aggravated by anthropogenic activities like land clearance and deforestation for charcoal production. The effects of climate change manifest as frequent prolonged droughts coupled with unpredictable and harsh weather, unreliable rainfall patterns.

The scarce water supplies lead to reduced production of biological resources, genetic erosion and negatively impacting on livelihoods.

1. **Trade deficit**

Uganda has a systemic trade deficit as a result of the country’s dependence on fuel imports and by September 2019, it recorded a trade deficit of USD 314M. It still imports a lot of pharmaceuticals yet it has vast biodiversity. For example, Uganda imported pharmaceutical products worth USD 281M equivalent to 4.2% of total trade value while Food related imports amounted to 12.5% (Trading Economics, 2019). It is a net exporter of low value semi processed agricultural products such as coffee and cotton. Developing the Bioeconomy would lead to production of high-quality bio-products including bio-fuels resulting into import substitution and significantly reversing the balance of trade.

1. **Major pest and disease burdens**

The global outbreak of COVID-19 has exposed significant vulnerabilities in many countries as regards to preparedness, response, management and recovery from such threats. This affects bioeconomic interventions. Equally, it provides an opportunity for countries to harness their bioeconomic resources to timely respond to such challenges through bio-innovations such as medicines and vaccines. Pests like locusts have greatly affected biomass production in agriculture, forestry and rangelands. Through innovations such as development of bio-chemicals, pheromones to alter their ecology, their proliferation can be curtailed.

**1.4** PROBLEM STATEMENT

Several studies show that Biological Resources and Bio-innovations play a significant role in national development and can propel countries towards sustainable development. However, in Uganda there is unsustainable and underutilization of living materials, products and services. This has been brought about by a number of reasons such as: weak coordination among Bioeconomy stakeholders; lack of an enabling policy, legal and regulatory environment; limited political will; sub-optimal productivity of bio-based enterprises; low use of alternative sustainable bio-innovations as a result of low awareness; limited exposure; cultural barriers; negative mindset; negative impacts of climate change; and unfavorable market conditions. This has led to low levels of income generation with poverty levels standing at 21.4% (UBOS, 2020); low foreign exchange earnings; low levels of industrialization; increased unemployment levels; bio-resources’ depletion; loss of biodiversity; high post-harvest losses; over-dependence on imported bio-products; worsening impact of climate change; increased poverty levels; increased conflicts over use of bio-resources; increased food insecurity; environmental degradation; and increased pest and disease burden (in humans and agriculture).

## 1.5 POLICY JUSTIFICATION AND RATIONALE

A vibrant Bioeconomy has the potential of reversing market failures and transforming several economic sectors but requires public and private sector interest and sustained investments. Experiences from USA, India, Denmark, Sweden, Brazil and South Africa, show that an enabling framework on Bioeconomy can be an important catalyst to commercializing the multitudes of innovations in biosciences. Uganda needs a holistic policy focused on translating biosciences’ research innovations into industrial and commercial enterprises, with greater participation of the private sector. The lack of appreciation of the significance of Bioeconomy, as evidenced by fragmented regulatory frameworks and weak collaboration of stakeholders has provided a compelling case for urgent and appropriate policy intervention. The policy is therefore intended to provide a paradigm shift in the traditional development mechanisms to knowledge-based economy fuelled by research. It will identify key value chains, fast-track strategic projects towards commercial development and facilitate more efficient systems of production, consumption and processing to generate new sustainable economic growth through enabling new technologies such as biotechnology and nanotechnology. These will foster the reuse and better use of secondary materials to deliver on environmental, social and economic gains.

# **2.0 VISION, MISSION, GOALS, OBJECTIVES AND GUIDING PRINCIPLES**

## 2.1 VISION

A prosperous, sustainable and productive knowledge-based society.

## MISSION

To utilise safe scientific, innovative technologies and practices in harnessing biological resources for socio-economic development.

## GOAL

To optimally utilise biological resources, their products and services for sustainable national development.

## SPECIFIC OBJECTIVES

1. To provide for an enabling legal, regulatory and institutional framework for harnessing biological resources
2. To promote research, innovation and industry (Put in place requisite infrastructure)
3. To strengthen institutional and human capacity and cooperation for Bioeconomy
4. To Leverage new and emerging technologies in harnessing biological resources
5. To Promote awareness creation and transformative mind-set change for a sustainable Bioeconomy

## POLICY OUTCOMES

The Policy will promote the use of advanced knowledge of biosciences’ processes to develop new high-quality products and services for export, fetching the country high foreign exchange earnings. Through the integration of biotechnology knowledge and applications across sectors, the policy is hoped to spur industrialization with associated creation of jobs thus reducing unemployment levels. This will result into high levels of income with resultant reduction in poverty levels. The use of renewable biomass and efficient bioprocesses to support sustainable production will result into reduction of post-harvest losses and reduced dependence on imported bio-products. The policy will revolutionize the agricultural sector by supporting production of the major food, feed and industrial feedstock crops by increasing research into agronomic traits to improve yields and resistance to climate change impacts. This will lead to reduced pests and disease burden, reduced food insecurity with further reduction in poverty levels.

The policy will play a key role in the health sector by supporting the development of therapeutics, biopharmaceuticals, functional foods, nutraceuticals, diagnostics, pharmacogenetics to improve prescribing practices and some medical devices among others. This will lead to provision of quality health services, reduced disease burden with resultant improvement on the length and quality of life. The policy will also address biosafety and biosecurity concerns that may arise during the exploitation of bio-resources.

In Industry, the Policy will enhance the use of biotechnological processes to produce chemicals, plastics, enzymes and biofuels leading to reduction in imports of these products. In addition, the policy will support the application of bioremediation in cleaning up the polluted environment, leading to restoration ecology and reduced negative impacts of climate change. This will result into bio-resources’ sustainability, conservation of biodiversity and reduced conflicts over use of bio-resources.

## GUIDING PRINCIPLES

This policy development process took into consideration the global, continental, regional and national development frameworks. Namely the UN Climate Change COP held in Bonn in 2017, STISA 2024 and Vision 2040. The core guiding principles for successful implementation of the policy directives include among others;

1. **Transparency and Accountability**

This policy espouses principles of openness, accountability and honesty. It was developed through a consultative process with key stakeholders comprised of civil society, MDAs, private sector among others. The document was widely shared and made accessible to all stakeholders with a clear feedback mechanism. The policy will be implemented in such a way that information will be easily accessible and easy to understand. The policy provides for continuous awareness of the stakeholders on the role of Bioeconomy towards achieving national development goals

1. **Participation and Inclusiveness**

The policy addresses all Bioeconomy issues with participation of public, private and other non-state actors. This policy is guided by the principles of; “*Leave no one behind*” and *“Whole of government approach.”* Regardless of residence, socio economic status, affiliation, gender, race, age and others. This policy is cognizant of the roles and mandates of various MDAs, civil society organizations and private sect.

1. **Sustainability**

Sustainability is a key component of policy formulation and implementation. This policy addresses sustainable use of biological resources in key sectors including; health, environment, agriculture, energy, trade and industry and others. The principle of Sustainability ensures efficient, effective and optimal use of bio resources and services through development of new products or value addition. The policy facilities institutional frameworks which will support the development of local capacities and deliberate use of indigenous knowledge among others

1. **Equity and Fairness**

This policy put into consideration aspects of equity and fairness during its development and implementation process. This policy promotes equality in-terms of gender and demographic data on the national bio resources. The policy promotes equitable benefits sharing and opportunities for equal representation and decision-making processes in a non-discriminatory manner and co-existence.

1. **Resilience and Biodiversity**

The policy supports conservation of biodiversity through responsible use of bio resources to mitigate against and adapt to the impacts of climate Change. The policy supports interventions to combat pollution and emission of GHG by supporting adoption and use of renewable energy sources through knowledge-based utilization of bio resources

# **3.0 POLICY PRIORITY AREAS AND STRATEGIC INTERVENTIONS**

**OBJECTIVE 1:** To provide for an enabling legal and regulatory framework for harnessing biological resources

**Priority Area 1.1:** Develop and implement laws and regulations to remove barriers to sustainable use of bio-resources.

**Policy statement:** Government shall develop and implement laws and regulations for optimal and sustainable utilisation of bio-resources.

**Strategic interventions**

1. Develop a Bioeconomy research and development Act to spur bio-innovation and import substitution.
2. Develop a bio-innovations regulatory Act to strengthen regulatory mechanisms for bio-based products.
3. Develop and implement regulations for access and benefit sharing, intellectual property, biosecurity, bio-ethics in cooperation with relevant lead agencies.
4. Review and harmonize the existing policies, laws and regulations for Bioeconomy development.
5. Create policy incentives for promotion of emerging and catalytic bio-based industries such as nutraceuticals, banana industry, starch, bio-textile, bioplastics and biopharmaceuticals among others.
6. Develop and implement policies that will foster the consumption of locally produced bio-products.
7. Strengthen MoSTI as a lead institution in Bioeconomy development

**OBJECTIVE 2:** To promote biosciences research, innovation and industry for national transformation.

**Priority area 2.1:** Increasing investment in Biosciences R&D.

**Policy statement:** Government shall increase investment in R&D that will strengthen the platform for the Bioeconomy.

### Strategic interventions

1. Develop and expand essential infrastructure to enhance biosciences research and development.
2. Develop and promote mechanisms for the conservation of biological resources
3. **Support multi-disciplinary research to** promote the generation of new value chains and closed loops.
4. **Establish a bio-innovations research fund (20% of the innovation fund) to support public and private sector research and innovations**
5. **Provide incentives to industries/private sector to** invest in research and innovations that promote reuse and efficiency.
6. Support research, use and deployment of indigenous knowledge/technologies for producing bio-based products and services.
7. **Support bio-prospecting** by carrying out systematic search for and development of new bio-resources.

**Priority Area 2.2:** Increased resilience to negative impacts of climate change and natural disasters

**Policy statement:** Government shall strengthen its efforts to mitigate and adapt to Climate change and other natural disasters

**Strategic interventions**

1. Establish a climate science institute
2. Support research into solutions to emerging threats such as pests and disease outbreaks
3. Cleaner production (3Rs) program (Smart management of waste through reuse, reducing and recycling)
4. Development and use of alternative technologies
5. Develop and implement innovations, programs and projects to avert impacts of climate change

**Priority Area 2.3:** Facilitate the commercialization of bio-products and bio-innovations

**Policy statement:** Government shall ensure the creation and growth of new Bioeconomy markets and prioritize procurement of bio-based products where appropriate and cost-effective.

**Strategic interventions**

1. Enhance entrepreneurship at research institutions, communities and academia
2. Support creation of favourable taxation regimes to local bio-innovators
3. Explore and promote national, regional and international markets for locally generated bio-products and services
4. Harmonisation of international trade regimes in bio-based products

**OBJECTIVE 3: To strengthen institutional, human capacity and cooperation for Bioeconomy**

**Priority Area 3.1**: Coordination of stakeholders to increase efficiency in utilizing bio-resources

**Policy Statement:** Government shall support mechanisms for bringing together different players in the Bioeconomy to leverage their capabilities and competences

**Strategic interventions**

1. Create a National Bioeconomy Platform
2. Establish appropriate structures in respective MDAs and LGs to support and facilitate effective Bioeconomy implementation
3. Organize Annual Bioeconomy conference
4. Harmonize and strengthen linkages among Bioeconomy stakeholders
5. Mainstream efficient use of bio-resources in all MDAs and LGs

**Priority Area 3.2: Institutional and Human capacity building**

**Policy statement:** Government shall direct resources to develop specialized skills in Bioeconomy

**Strategic interventions**

1. **Develop *non-tax* incentives and training programs** for institutions to adapt training to meet the needs of the Bioeconomy workforce
2. Establish International exchange of programs on Bioeconomy
3. Development of requisite infrastructure for Bioeconomy (infrastructure) i.e. establishment Certification and accrediting of reference laboratories for quality assurance, diagnostics, training and research **(also add in infrastructure)**
4. **Awareness creation.** Sustained sensitization on Bioeconomy to influence Social attitudes and perspective towards the Bioeconomy.
5. Establishment of biosciences/Bioeconomy centres/Institutions for skills development
6. Piloting Bioeconomy projects**.** Bioeconomy projects will be identified, fast-tracked and piloted before spreading to the entire country.
7. Put in deliberate effort to procure and consume Bioeconomy products and services (Commercialization). *Procuring bio-based products and services used in government institutions will support markets, promote innovations and further create jobs and shared prosperity*.
8. Establish start-up credit to promote local innovators and encourage entrepreneurship
9. Create local industries i.e. cottage industries especially in rural areas where bio-resources are predominantly produced

**OBJECTIVE 4:** To Leverage new and emerging technologies in harnessing biological resources

**Priority Area 4.1:** Leverage new and emerging technologies

**Policy statement:** Government shall drive more innovation in bioproducts and services by funnelling funds toward growth initiatives that leverage new and emerging technologies.

**Strategic interventions**

1. Facilitate Commercialization of Biosciences innovations through Improvements to Business
2. Accelerate Technology Transfer through Knowledgeable Partners
3. Create Jobs in Rural Areas through Bio-based and Sustainable Product Procurement
4. Establish Biosciences Institute toprovide science-based solutions to reduce costs and time required to bring products to market.
5. Establish infrastructure to facilitate the 4th Industrial Revolution

**Priority Area 4.2:** Strengthening partnerships and collaborations

**Policy statement:** Government shall support development of strong partnerships and collaborations

**Strategic Interventions**

1. Establishing partnerships for innovations and food Security to address the root causes of hunger and poverty and forge long-term solutions to chronic food insecurity and under-nutrition.
2. Strengthen interactions between academia (the university), industry (private sector) and government, to foster economic and social development
3. Support joint planning and mutual consultation with partners

**OBJECTIVE 5:** To promote awareness creation and transformative mind-set change for a sustainable Bioeconomy

**Priority Area 5.1:** Mindset change

**Policy Statement:** Government shall identify and support efforts aimed at changing social attitudes and public opinion on Bioeconomy

**Strategic interventions**

1. Promote awareness creation and transformative mind-set change for a sustainable Bioeconomy.
2. Develop a Bioeconomy communication and outreach plan.
3. Campaign through branding, documentaries, mass media, social media, road shows and exhibitions. Development of key messages.
4. Engagement with value and belief system institutions (cultural, religious and education institutions).
5. **Social modelling:** Create champions and models.
6. Governance; Political mindset change and buy in and ownership.
7. Establish a national bio-innovation excellence award and grant.
8. Have a Bioeconomy resource and information systems, catalogue, databases and profiles.
9. Establish a Bioeconomy innovation platform

**4.0 CROSS-CUTTING ISSUES**

## 4.1 Climate change

Climate change is a major global challenge that requires global commitment and Uganda is a party to a number of conventions; namely SDGs particularly Goal 13, the Paris Agreement and Kyoto protocol under the United Nations Framework for Climate Change. This policy recognises that climate change affects sustainable use of bio resources. This policy aims to promote the use of green technologies and rally efforts towards mitigating against the impacts of climate change. This policy is also cognizant of the fact that unstainable utilisation of bio-resources may contribute to emission of GHGs and will route for technologies that reduce emissions and adapt to climate change by advocating for sustainable ways of utilising bioresources.

## 4.2 Environment

This policy acknowledges the integral role of the environment in achieving sustainable utilisation of bio-resources. It further recognises the key actors and frameworks in the environment sector including international bodies and treaties that have been ratified by Uganda namely; CBD, CITES among others. In implementing this policy, key actors both state and non-state will be engaged closely. This policy is in line with environmental management tenets at the global, regional and national levels.

## 4.3 Gender and Equity

This policy recognises the unique gender contributions and needs in the Bioeconomy space. Bioeconomy is gender neutral to the extent that women, youth, the marginalised and ethnic minorities among others can engage in economically productive enterprises leveraging bio-resources. This policy will identify and empower the special interest groups to maximise utility through capacity building, put in place infrastructure, markets and requisite resources. This policy further recognises the distinctiveness of the different regions and their contribution and will support sustainable utilisation of bio-resources tailored to the bio-resources potential in the specific regions of the country.

## 4.4 HIV/AIDS

The policy recognises the need for interventions that will create a conducive environment and platforms for society to manage HIV/AIDS appropriately, cognizant of the effects of the scourge. Mechanisms will be put in place to support programs directly working with persons living and /or affected by HIV/AIDS.

# **5.0 LINKAGES TO EXISTING POLICY AND LEGAL FRAMEWORKS**

This policy will be implemented within the framework of several existing laws ratified or enacted. The existing relevant legal, policy and regulatory documents reviewed include:

1. **Legislations**

## The Constitution of Uganda, 1995

Objective XI (ii) of the Constitution provides that the state shall “stimulate agricultural, industrial, technological and scientific development by adopting appropriate policies and enactment of enabling legislation”. Objective XIV (a) provides that the State shall endeavour to fulfil the fundamental rights of all Ugandans to social justice and economic development and shall, in particular, ensure that all developmental efforts are directed at ensuring the maximum social and cultural well-being of the people. The constitution does not however provide for integration/coordination of sectors to maximize interventions. There is also no constitutional right to standards in agriculture, industry or environment to ensure maximum social justice. The National Bioeconomy Policy is aimed at translating the high-level national obligations into strategies that maximize living material resources’ utilization.

**The Animal Diseases Act, 1918**

Provides for prevention of spread of livestock diseases and gives veterinary officers powers to impose quarantine measures, conduct vaccination and destruction of infected animals. It is obsolete and considers disease causing agents as dangerous and must be eradicated. It fails to recognize the value of harnessing disease causative agents in manufacture of vaccines for socio-economic benefits.

**The National Drug Policy and Act, 1993**

The object of this is to ensure availability of essential, efficacious and cost-effective drugs to the entire population of Uganda, as a means of providing satisfactory health care and safeguarding the appropriate use of drugs. These have no strong provisions for regulation of herbal medicine that sustains the well-being of about 80% of Ugandans (Anke & Male., 2002). They have also stifled the application of indigenous knowledge in commercial production of herbal medicines. The country thus imports most of its drugs and often experiences shortage. Furthermore, there are no provisions for promoting collaboration between National Drug Authority and other professional councils to deliver on Uganda’s aspirations of achieving the Sustainable Development Goal 3 of good health and well-being.

**The Forestry and Tree Planting Act, 2003**

The Act prohibits cutting, taking, working or removing forest produce in or from a forest reserve, village forest or open land without a license. It further prohibits clearing, using or occupying any land in a forest reserve save as permitted under the Act. It is however more concerned with the reservation of forests.

**The Biofuels Act, 2018**

The Act regulates the production, licensing of the production, storage and transportation of biofuels and the blending of biofuels with petroleum products. It determines the appropriate amount of biofuels to be blended in a petroleum product and also provides for the offences, penalties and related matters. It however stifles innovation in biofuels and does not support the development of biofuels as the only source of fuel.

**The National Environment Act, 2019**

This is the framework law for the management of environment and natural resources in Uganda. It provides for the National Environment Management Authority (NEMA) whose functions include coordinating, monitoring and harmonizing the integration of environmental issues in Uganda. NEMA is supposed to liaise with lead agencies in other departments and government ministries in the field of management of the environment. There is limited coordination with other sectors in regard to efforts in harnessing environment and biological materials.

1. **Strategies**

**The Uganda Vision 2040**

Uganda’s Vision is “a trans-formed Ugandan society from a peasant to a modern and prosperous country within 30 years”. The Vision targets related to this policy include; raising the technology achievement index to 0.5, increasing the per capita income to USD 9,500 and reducing population below the poverty line to 5%. The Vision promotes sectors working in silos and is silent on inter-sectoral synergies that are crucial in achievement of these aspirations. The National Bioeconomy Policy intends to contribute to achieving these targets by promoting research and innovation in living material resources, use of Indigenous Knowledge and establishing well-balanced Intellectual Property Rights Management Systems in order to achieve rapid, concerted and sustained changes in lifestyle and resource use that cuts across all sectors, levels of society and the economy. The Policy therefore provides for a paradigm shift in the traditional development mechanism to adopting more efficient systems of production, extraction, processing and consumption that include fostering the reuse and better use of secondary materials.

**The NDP III (2020/21 – 2024/25)**

The goal of the Plan is to increase household incomes and improve the quality of life of Ugandans. This is expected to be achieved through resource-led industrialization. Successful resource-led sustainable industrialization will enable value addition in key growth opportunities (agriculture, tourism and minerals), trigger structural change and eventual movement of labour from low-paid agriculture to relatively better paid industrial employment. This transition is hoped to stimulate increased incomes and demand for agricultural output, quality education and health services and hence improvement in the quality of life of Ugandans. The approach to service delivery will focus on achievement of results through a programmatic approach to planning and budgeting. This will ensure synergies between sectors in order to transform Uganda and deliver the aspirations of the people of Uganda, as articulated in Uganda Vision 2040. Bioeconomy aims at translating this high national goal into realistic results and transforming the Ugandan economy into a knowledge-based economy, in which the production and dissemination of knowledge leads to economic benefits and enrich all fields of human endeavour.

**The Biomass Energy Strategy, 2014**

This is intended to provide a balanced view of all the options available for managing the all-important biomass resource in the country. There is however no specific incentives for the growing of energy crops, for example no market has been provided for such enterprises. The creation of new non-food markets for agriculture (such as bioenergy) in synergy with existing food markets, and in combination with alternative income sources for farmers, can give rural areas a major boost.

**The ST&I National Sector Development Plan (2019/20-2024/25)**

The aim of this plan is to achieve broad development objectives of empowering society through innovation for sustainable development. It further prioritizes promotion of environmentally sound technologies or “green technologies” based on efficient use, reuse and recycling of resources, ensuring completion of full life cycle of resources to propel Uganda into a middle-income country by 2040.

There is still low level of effective coordination; actors are proceeding separately without a guiding national level vision framework. There are still limited incentives to technology transfer and actions to replicate and diffuse “green technologies”.

1. **Policies**

**The National Environment Management Policy, 1994**

The policy sets the overall goals and objectives for environment management in Uganda. The policy endeavours to integrate environmental concerns in all development activities and promote positive attitudes and behavioural change in natural resource use.

**The National Wetland policy, 1995**

The overall aim is to promote the conservation of Uganda’s wetlands in order to sustain their ecological and socio-economic functions for the present and future well-being of the people. This policy is however more concerned with the reservation of wetland without providing mechanisms for harnessing these resources for sustainable livelihoods.

**The National Water Policy, 1999**

The national water policy gives an integrated approach to manage Uganda’s water resources in ways that are sustainable and most beneficial to the people. The policy was developed based on the Water Action Plan of 1995 and the Water Statute of 1995 that provided for guidelines for protection and development of Uganda’s water resources and recommended for management structures. It regulates use of all water, whether public, private or ground water other than for “domestic use”. This curtails innovative use of water for economic benefit. It has also registered limited success as evidenced by a large number of water facilities established having broken down despite the creation of an elaborate management structure.

**The Energy Policy, 2002**

The Goal is to meet the energy needs of Uganda’s population for social and economic development in an environmentally sustainable manner. It also identifies biomass energy as a key component of the New and Renewable Energy sub sector. Despite this policy, inefficient production and use of biomass energy resulting in adverse effects on the environment and the health of biomass energy users, especially in rural households has been realized.

**The Animal Feeds Policy, 2005**

This policy aims at stimulating increased feed production, ensuring quality animal feeds on the market, reducing production costs and building capacity among private and public sector for the development of the animal feeds industry. It spells out strategies for increasing animal feeds’ production that include strengthening of research, availing credit to the industry and encouraging increased production of raw materials for feeds production. Other strategies also include encouraging transfer of appropriate technologies, encouraging formation of farmers’ and manufacturers’ associations and developing rural infrastructure to increase access to raw materials. The policy has remained quite ineffective with no law to implement it. The feed quality and quantity are still inconsistent. Furthermore, the policy does not address other societal challenges like climate change and natural resource depletion.

**The National Land Use Policy, 2006**

The policy aims to achieve coordination, sustainability and optimal land utilization for socio-economic development in Uganda. It is more concerned with issues of reducing land degradation, environmental management and conservation but falls short in providing incentives for promoting efficiency in land management.

**The Renewable Energy Policy, 2007**

This aims at increasing the use of modern renewable energy from the current 4% to 61% of the total energy consumption by the year 2017. There is limited stakeholder participation in the planning and implementation of renewable energy projects. This is evidenced by the consistent inefficient use of biomass and lack of replenishment. There is still indiscriminate cutting of trees and little use of more efficient technologies such as improved cook stoves and gasification. Other renewable energy sources have not been explored e.g. production and use of hydrogen. There is still limited utilization of waste to generate energy.

**The National Biotechnology and Biosafety Policy, 2008**

The policy aims at ensuring that Uganda benefits from safe application of modern biotechnology such as genetically modified organisms. It has however largely remained ineffective with no law to operationalize it. The vast biological resources have therefore remained underutilized with limited economic returns.

**The National Sugar Policy, 2010**

The aim of this policy is to institutionalize harmony among all the Sugar industry stakeholders in order to promote and sustain steady industrial growth and transform the sugar Sector to become competitive and modernized. It also aims at supporting diversification of sugarcane products (bagasse into power; molasses to sweets, animal feeds and fertilizers). The policy established cane growing zones to be within a radius of 25km from the mills and no new sugar mill can be licensed within 25km radius of an already existing mill. This locks out other potential players in the sugar industry, reduced competition and has led to farmer exploitation. There has been limited success in diversifying the sugar sector.

**The Second National Health Policy, 2010**

The aim of this policy is to attain a good standard of health for all people in Uganda in order to promote healthy and productive lives. It is cognizant of emerging health issues (problems) but does not provide mechanisms for ensuring that all Ugandans are healthy. It does not promote the use of indigenous knowledge that has sustained health services for a bigger fraction of Ugandans.

**The National Agricultural Policy, 2011**

The overall objective of the agricultural policy is to promote food, nutrition security and household incomes through coordinated interventions that focus on enhancing sustainable agricultural productivity and value addition, providing employment opportunities and promoting domestic and international trade. The policy however has no mechanism for more efficient systems of production, consumption and processing that foster the reuse and better use of secondary materials in order to deliver on environmental, social and economic gains. It does not also provide a broader strategic direction for the country to benefit from leveraged capacities and investments in other sectors. There is still inherentlack of effective value chains in agriculture with systemic low production and productivity, post-harvest handling and value addition to agricultural products.

**The Uganda Wildlife Policy, 2014**

The overall aim of the Uganda Wildlife Policy is to promote the long term conservation of the country’s wildlife and biodiversity in a cost effective manner which maximizes the benefits to the people of Uganda. It is however more concerned with the reservation of biodiversity areas but fail to present concrete incentives for people to conserve biodiversity in the course of their economic activity.

**Buy Uganda Build Uganda Policy, 2014**

The policy sets out to support the production, purchase, supply, and consumption of local goods and services. It prescribes targets 50% of local resources and raw materials to be utilized in production but does provide for strategies of achieving this. It has therefore remained ineffective and redundant.

**The National Fisheries and Aquaculture Policy, 2017**

The aim is to increase fisheries and aquaculture production to 1.7 million tonnes annually so as to contribute to food security, nutrition and economic growth. It recognizes the need for equitable benefits sharing opportunity for and any other vulnerable groups’ representation and decision-making processes in a non-discriminatory manner. A large number of stakeholders are however still locked out in decision- making processes with women playing insignificant roles.

**The National Population Policy, 2018**

The overall goal of this policy is to attain a quality, cohesive, productive and innovative population for social transformation and sustainable development. The Policy is more concerned with turning the abundant human resource into a force for social and economic transformation but does not recognize the value of the abundant bio-resources and local innovations in this transformation.

**The National Seed Policy 2018**

The aim to guide, promote, develop and regulate the seed sub-sector in order to ensure availability, accessibility and affordability of safe and high quality seed to all stakeholders for increased food and nutrition security, household income, wealth creation and higher export earnings. It puts a lot of emphasis on seed production of commercial value but ignores species of medicinal value.

**6.0 IMPLEMENTATION ARRANGEMENTS**

## 6.1 Institutional Mechanism

Bioeconomy is a multidisciplinary and multisectoral approach thus its implementation must reflect this. The policy is to provide a framework in which other policies and efforts towards harnessing bioresources are to be coordinated and harmonized. As a framework policy, it will provide links to other policies for integration and customization. Every sector will be an implementing unit of the policy. For purposes of successful implementation, creation of a Bioeconomy Panel of eminent persons is necessary. This will give informed opinion and guide on roles and responsibilities of each stakeholder in Bioeconomy.

The Regional Innovation-led Bioeconomy Strategy for Eastern Africa (BiSEA) in the offing, supported by EASTECO and the National Science, Technology and Innovation Policy under review will be critical in providing guidance on implementation mechanisms. Implementation of the policy will be vested into the main stakeholder; MoSTI, other MDAs and other stakeholders.

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| --- | --- | --- |
| **Objectives** | **Strategic intervention** | **Action/responsibilities** |
| To provide for an enabling legal, regulatory and institutional framework for harnessing biological resources | Develop a Bioeconomy research and development Act to spur bio-innovation and import substitution. | MoSTI, UNCST, Ministry of Justice and Constitutional Affairs |
| Develop a bio-innovations regulatory Act to strengthen regulatory mechanisms for bio-based products. | MoSTI, UNBS, Ministry of trade and industry, National drug authority, NEMA, MoICT, MWE, MAAIF, Ministry of Health, Ministry of Justice |
| Develop and implement regulations for access and benefit sharing, intellectual property, biosecurity and bio-ethics in cooperation with relevant lead agencies. | URSB, MoSTI, Ministry of Justice Ministry of security, NEMA, LGs |
| Review and harmonize the existing policies, laws and regulations for Bioeconomy development. | MoSTI will be the lead agency. It will work with MAAIF, MWE, Ministry of trade and industry, UNBS, Ministry of local government, LGs |
| Create policy incentives for promotion of emerging and catalytic bio-based industries such as nutraceuticals, banana industry, starch, bio-textile, bioplastics and biopharmaceuticals among others. | MFPED; MOSTI |
| Develop and implement policies that will foster the consumption of locally produced bio-products. | Ministry of trade and industry to lead, UNBS, NEMA, MOSTI, NARO, Universities, MAAIF |
| Strengthen MoSTI as a lead institution in Bioeconomy development | MoSTI, MoPS |
| To promote biosciences research, innovation and industry for national transformation | Develop and expand essential infrastructure to enhance biosciences research and development. | MoSTI, UIRI, UNCST, Universities, NARO |
| Develop and promote mechanisms for the conservation of biological resources | MOSTI, NEMA, Ministry of Energy, MWE, Ministry of wildlife and antiques, UWA, NFA |
| Support multi-disciplinary research to promote the generation of new value chains and closed loops. | MoSTI, Universities, UNCST, UIRI, NARO, BIRDC |
| Establish a bio-innovations research fund (20% of the innovation fund) to support public and private sector research and innovations | MoSTI, MoFPED, NPA |
| Provide incentives to industries/private sector to invest in research and innovations that promote reuse and efficiency. | MoSTI, Ministry of trade, NEMA, MWE, URA, MoFPED, Ministry of Energy |
| Support research, use and deployment of indigenous knowledge/technologies for producing bio-based products and services. | MoSTI, UNCST, NEMA, Ministry of wildlife, tourism and antiques, Universities, Private sector, Research Institutes |
| Promote environmentally friendly ways of extraction, use and recycling of bio-products and services (transfer to group 3) | MoSTI, UNCST, NEMA, MWE, Universities, UIRI |
| Development of alternative technologies | MoSTI, Universities, NARO, MAAIF, MWE, UIRI |
| Develop and implement innovations, programs and projects to avert impacts of climate change | MWE to lead, MoSTI, NARO, MAAIF, NEMA, Ministry of wildlife, tourism and antiques, UWA, NFA, Universities |
| Establish a climate science institute | MoSTI, MWE, MoFPED |
| Support research into solutions to emerging threats such as pests and disease outbreaks | MoSTI, OPM, MAAIF, Universities, NARO |
| Cleaner production (3Rs) program (Smart management of clean waste) | MoSTI, MWE, NEMA, UWA, NFA, Universities, KCCA, LGs, Ministry of local government |
| Enhance entrepreneurship at research institutions, communities and academia | MoSTI, UNCST, Universities, NARO, UIRI, LGs, CBOs & CBs |
| Support creation of favourable taxation regimes to local bio-innovators | MoSTI, MOFPED, URA, Ministry of trade and industry, ministry of local government, LGs |
| Explore and promote national, regional and international markets for locally generated bio-products and services | Ministry of trade and industries, MoFA, MoFPED |
| Harmonisation of international trade regimes in bio-based products | MoFA, Ministry of trade and industries, UNBS |
| Promote awareness creation and transformative mind-set change for a sustainable Bioeconomy | Develop a Bioeconomy communication and outreach plan | MoSTI, MoICT |
| Campaign through branding, documentaries, mass media, social media, Road shows and exhibitions. Development of key messages. Engagement with value and belief system institutions (cultural, religious and education institutions) Social modeling: Create champions and models Governance; Political mindset change and buy in and ownership. | MoSTI, MoICT |
| Exchange visits for knowledge transfer and best practices | MoSTI |
| Establish a national bio-innovation excellence award and grant  *Recognition of excellence. Reward; Have competitions and contests at various levels ( industry, educational institutions and the general public)* | MoSTI, MFPED |
| Promotion of Cleaner production technologies; Reduce, Reuse and recycle | MoSTI, MWE, NEMA, UNCST, UIRI |
| Have a Bioeconomy resource and information systems, catalogue, databases and profiles. | MoSTI, MoICT, Universities, UIRI, NARO, UNCST, |
| Establish a Bioeconomy innovation platform | MoSTI, UNCST, Universities, Research institutes such as NARO, UIRI, NEMA, MWE, MAAIF, Ministry of Wildlife, tourism and antiques, UWA, Development partners and Funding partners |
| To strengthen institutional, human capacity and cooperation for Bioeconomy | Create a National Bieconomy Platform | MoSTI, UNCST, Universities, Research institutes such as NARO, UIRI, NEMA, MWE, MAAIF, Ministry of Wildlife, tourism and antiques, UWA |
| Establish appropriate structures in respective MDAs and LGs to support and facilitate effective Bioeconomy implementation | MoSTI, MAAIF, MWE, Ministry of Tourism, wildlife and antiques, ministry of health, ministry of trade, ministry of energy and mineral development, LGs, Ministry of public service |
| Organize Annual Bioeconomy conference | MoSTI, UNCST, MoICT, Development partners, CSOs |
| Harmonize and strengthen linkages among Bioeconomy stakeholders | MoSTI |
| Mainstream efficient use of Bioresources in all MDAs and LGs | MoSTI, Ministry of public service MAAIF, MWE, Ministry of Tourism, wildlife and antiques, ministry of health, ministry of trade, ministry of energy and mineral development, LGs, |
| Develop non-tax incentives and training programs for institutions to adapt training to meet the needs of the Bioeconomy workforce. | MoSTI, MoFED, Ministry of Education, Ministry of Trade and Industry, UIRI, Universities, |
| Establish International exchange of programs on Bioeconomy | MoSTI, Ministry of Foreign Affairs, Ministry of Justice, Development partners, International collaborators |
| Development of requisite infrastructure for Bioeconomy (infrastructure) i.e. establishment Certification and accrediting of reference laboratories for quality assurance, diagnostics, training and research. | MoSTI, MOFPED, Ministry of works and transport, National planning authority, Private sector, MWE, MAAIF |
| Awareness creation. Sustained sensitization on Bioeconmy to influence Social attitudes and perspective towards the Bioeconomy. | MoSTI, MoICT, CSOs, LGs, Ministry of Gender |
| Establishment of biosciences/Bioeconomy centres/Institutions for skills development | MoSTI, MOFPED, Ministry of works and transport, National planning authority, Ministry of Education, Private sector |
| Piloting Bioeconomy projects. Bioeconomy projects will be identified, fast-tracked and piloted before spreading to the entire country. | MoSTI, Ministry of trade and industry, UIRI, UIA, NARO, UNCST, UNHRO |
| Put in deliberate effort to procure and consume Bioeconomy products and services (Commercialization). Procuring bio-based products and services used in government institutions will support markets, promote innovations and further create jobs and shared prosperity. | Ministry of trade and industry to lead, UNBS, NEMA, MOSTI, NARO, Universities, MAAIF, MoFPED, PPDA |
| Establish start-up credit to promote local innovators and encourage entrepreneurship | MoFPED, Private sector financing entities, Development partners, microfinance support center, operation wealth creation |
| Create local industries i.e. cottage industries especially in rural areas where bio-resources are predominantly produced | Ministry of trade and industry in the lead, MoFPED, Private sector financing entities, Development partners, microfinance support center, operation wealth creation |
|  | Support opportunities for the development of public- public and public-private partnerships. | MoSTI |
|  | Establish and implement Bilateral and multi-lateral bio-science protocols and agreements to support Bioeconomy | MoSTI, UNCST, UWA, NEMA, MWE, MAAIF |
|  | Harmonize international trade of bio-based products | Ministry of trade and industry in the lead, MoSTI |
|  | Foster collaborations for biosciences research to facilitate technology transfer | MoSTI, UNCST, NARO, Universities, UIRI, Development partners, |
|  | Develop, enhance and enforce Intellectual Property Rights regimes among partners | MoSTI, URSB, |
|  | Establish an interministerial Bioeconomy committee | OPM, MoSTI, MoFPED, Ministry of defence and security, MAAIF, Ministry of trade and industry, MWE, Ministry of wildlife, tourism and antiques, Ministry of health |
|  |  |  |

## 6.2 BIOECONOMY LEGISLATION

In order to implement this policy, a robust legal framework is required. The Policy will provide the basis for the development of legislation. This will require a review of and harmonization of existing legislation to establish a cohesive body of law for bio-resources maximisation. There will be a need to review and update sectoral laws and policies in conformity with the strategies and policy responses outlined in this Policy.

# **7.0 MONITORING AND EVALUATION FRAMEWORK**

Due to the interdisciplinary and cross-cutting nature of Bioeconomy, the monitoring and evaluation process will be participatory and shall require multi-sectoral and multi-faceted teams including the government, civil society, private sector, public and development partners. MoSTI will coordinate other stakeholders to ensure that the policy is successfully implemented. Government will undertake periodic reviews of performance on the National Bioeconomy policy assess emerging issues requiring policy interventions every five years and undertake a comprehensive review of the NBP at every ten years. The monitoring and evaluation of NBP will be undertaken as part of the already established Science, Technology and Innovation Monitoring and Evaluation (M&E) framework, which feeds into the National M&E policy coordination under the Office of the Prime Minister. Details of monitoring and evaluation of the NBP are provided in the sector Monitoring and Evaluation Framework.

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| **Objectives** | **Strategy** | **Outcome** | **INDICATOR** | **BASELINE**  What is the current value? | **TARGET**  (**Outputs**) What is the target value? | | **DATA SOURCE**  How will it be measured? | | **FREQUENCY**  How often will it be measured? | | | **COST** | | | **RESPONSIBLE**  Who will measure it? | | | **REPORTING**  Where will it be reported? | | |
| To provide for an enabling legal, regulatory and institutional framework for harnessing biological resources | Develop a Bioeconomy research and development Act to spur bio-innovation |  | Number of Acts developed to support Bioeconomy | 0 | 2 | | Parliamentary records | | Annual | |  | | | MoSTI | | | Annual performance report | | |
| Develop a bio-innovations regulatory Act to strengthen regulatory mechanisms for bio-based products. |  |  |  |  | |  | |  | |  | | |  | | |  | | |
| Develop and implement regulations for access and benefit sharing, intellectual property, biosecurity and bio-ethics in cooperation with relevant lead agencies. |  | Number of regulations developed and implemented | 0 | 5 | | MoSTI Reports, National Gazette | | Annual | |  | | | MoSTI | | | Annual performance report | | |
| Review and harmonize the existing policies, laws and regulations for Bioeconomy development. |  | Number of policies, laws and regulations reviewed | 0 | 10 | | Reports | | Annual | |  | | | MoSTI | | | Annual performance report | | |
| Create policy incentives for promotion of emerging and catalytic bio-based industries such as nutraceuticals, banana industry, starch, bio-textile, bioplastics and biopharmaceuticals among others. | | Number of incentives approved by cabinet | 0 |  | Cabinet reports | | Annual | |  | | | MoSTI | | | Annual performance report | | |
| Develop and implement policies that will foster the consumption of locally produced bio-products. | |  |  |  |  | |  | |  | | |  | | |  | | |
| Strengthen MoSTI as a lead institution in Bioeconomy development | |  |  |  |  | |  | |  | | |  | | |  | | |
| To promote biosciences research, innovation and industry for national transformation | Develop and expand essential infrastructure to enhance biosciences research and development. | |  |  |  |  | |  | |  | | |  | | |  | | |
| Develop and promote mechanisms for the conservation of biological resources | |  |  |  |  | |  | |  | | |  | | |  | | |
| Support multi-disciplinary research to promote the generation of new value chains and closed loops. | |  |  |  |  | |  | |  | | |  | | |  | | |
| Establish a bio-innovations research fund (20% of the innovation fund) to support public and private sector research and innovations | |  |  |  |  | |  | |  | | |  | | |  | | |
| Provide incentives to industries/private sector to invest in research and innovations that promote reuse and efficiency. | |  |  |  |  | |  | |  | | |  | | |  | | |
| Support research, use and deployment of indigenous knowledge/technologies for producing bio-based products and services. | |  |  |  |  | |  | |  | | |  | | |  | | |
| Promote environmentally friendly ways of extraction, use and recycling of bio-products and services (transfer to group 3) | |  |  |  |  | |  | |  | | |  | | |  | | |
| Development of alternative technologies | |  |  |  |  | |  | |  | | |  | | |  | | |
| Develop and implement innovations, programs and projects to avert impacts of climate change | |  |  |  |  | |  | |  | | |  | | |  | | |
| Establish a climate science institute | |  |  |  |  | |  | |  | | |  | | |  | | |
| Support research into solutions to emerging threats such as pests and disease outbreaks | |  |  |  |  | |  | |  | | |  | | |  | | |
| Cleaner production (3Rs) program (Smart management of clean waste) | |  |  |  |  | |  | |  | | |  | | |  | | |
| Enhance entrepreneurship at research institutions, communities and academia | |  |  |  |  | |  | |  | | |  | | |  | | |
| Support creation of favourable taxation regimes to local bio-innovators | |  |  |  |  | |  | |  | | |  | | |  | | |
| Explore and promote national, regional and international markets for locally generated bio-products and services | |  |  |  |  | |  | |  | | |  | | |  | | |
| Harmonisation of international trade regimes in bio-based products | |  |  |  |  | |  | |  | | |  | | |  | | |
| Promote awareness creation and transformative mind-set change for a sustainable Bioeconomy | Develop a Bioeconomy communication and outreach plan | |  |  |  |  | |  | |  | | |  | | |  | | |
| Campaign through branding, documentaries, mass media, social media, Road shows and exhibitions. Development of key messages. Engagement with value and belief system institutions (cultural, religious and education institutions) Social modeling: Create champions and models Governance; Political mindset change and buy in and ownership. | |  |  |  |  | |  | |  | | |  | | |  | | |
| Benchmarking tours for knowledge transfer and best practices | |  |  |  |  | |  | |  | | |  | | |  | | |
| Establish a national bio-innovation excellence award and grant  *Recognition of excellence. Reward; Have competitions and contests at various levels (industry, educational institutions and the general public)* | |  |  |  |  | |  | |  | | |  | | |  | | |
| Cleaner production strategy Reduce, Reuse and recycle | |  |  |  |  | |  | |  | | |  | | |  | | |
| Have a Bioeconomy resource and information systems, catalogue, databases and profiles. | |  |  |  |  | |  | |  | | |  | | |  | | |
| Establish a Bioeconomy innovation platform | |  |  |  |  | |  | |  | | |  | | |  | | |
| To strengthen institutional, human capacity and cooperation for Bioeconomy | Create a National Bieconomy Platform | |  |  |  |  | |  | |  | | |  | | |  | | |
| Establish appropriate structures in respective MDAs and LGs to support and facilitate effective Bioeconomy implementation | |  |  |  |  | |  | |  | | |  | | |  | | |
| Organize Annual Bioeconomy conference | |  |  |  |  | |  | |  | | |  | | |  | | |
| Harmonize and strengthen linkages among Bioeconomy stakeholders | |  |  |  |  | |  | |  | | |  | | |  | | |
| Mainstream efficient use of Bioresources in all MDAs and LGs | |  |  |  |  | |  | |  | | |  | | |  | | |
| Develop non-tax incentives and training programs for institutions to adapt training to meet the needs of the Bioeconomy workforce. | |  |  |  |  | |  | |  | | |  | | |  | | |
| Establish International exchange of programs on Bioeconomy | |  |  |  |  | |  | |  | | |  | | |  | | |
| Development of requisite infrastructure for Bioeconomy (infrastructure) i.e. establishment Certification and accrediting of reference laboratories for quality assurance, diagnostics, training and research ( also add in infrastructure) | |  |  |  |  | |  | |  | | |  | | |  | | |
| Awareness creation. Sustained sensitization on Bioeconmy to influence Social attitudes and perspective towards the Bioeconomy. | |  |  |  |  | |  | |  | | |  | | |  | | |
| Establishment of biosciences/Bioeconomy centres/Institutions for skills development | |  |  |  |  | |  | |  | | |  | | |  | | |
| Piloting Bioeconomy projects. Bioeconomy projects will be identified, fast-tracked and piloted before spreading to the entire country. | |  |  |  |  | |  | |  | | |  | | |  | | |
| Put in deliberate effort to procure and consume Bioeconomy products and services (Commercialization). Procuring bio-based products and services used in government institutions will support markets, promote innovations and further create jobs and shared prosperity. | |  |  |  |  | |  | |  | | |  | | |  | | |
| Establish start-up credit to promote local innovators and encourage entrepreneurship | |  |  |  |  | |  | |  | | |  | | |  | | |
| Create local industries i.e. cottage industries especially in rural areas where bio-resources are predominantly produced | |  |  |  |  | |  | |  | | |  | | |  | | |
|  | Support opportunities for the development of public- public and public-private partnerships. | |  |  |  |  | |  | |  | | |  | | |  | | |
|  | Establish and implement Bilateral and multi-lateral bio-science protocols and agreements to support Bioeconomy | |  |  |  |  | |  | |  | | |  | | |  | | |
|  | Harmonize international trade of bio-based products | |  |  |  |  | |  | |  | | |  | | |  | | |
|  | Foster collaborations for biosciences research to facilitate technology transfer | |  |  |  |  | |  | |  | | |  | | |  | | |
|  | Develop, enhance and enforce Intellectual Property Rights regimes among partners | |  |  |  |  | |  | |  | | |  | | |  | | |
|  | Establish an interministerial Bioeconomy committee | |  |  |  |  | |  | |  | | |  | | |  | | |
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| **Objective** | **Intervention** | **INDICATOR** | **BASELINE**  What is the current value? | **TARGET**  What is the target value? | **DATA SOURCE**  How will it be measured? | **FREQUENCY**  How often will it be measured? | **RESPONSIBLE**  Who will measure it? | **REPORTING**  Where will it be reported? |
|  | **Goal** | Percentage of Grades 6 primary students continuing on to high school. | 50% | 60% | Primary and high school enrolment records. | Annual | Program manager | Annual enrolment report |
|  | **Outcomes** | Reading proficiency among children in Grade 6. | Average score: 47 | Average score: 57 | Reading proficiency tests using the national assessment tool. | Every 6 months | Teachers | 6 monthly teacher reports |
|  | **Outputs** | Number of students who completed a summer reading camp. | 0 | 500 | Summer camp attendance records. | End of every camp | Teachers | Camp review report |
|  | Number of parents of children in Grade 6 who helped their children read at home in the last week. | 0 | 500 | Survey of parents. | End of every camp | Program officer | Survey report |

# **8.0 COMMUNICATION STRATEGY**

MoSTI will develop and implement a communication strategy for the successful implementation of this policy, this strategy will include, among others:

1. Bioeconomy key messages and identifying communication materials.
2. Key stakeholders (institutions and/or persons) to involve in the communication process.
3. Mode and medium of communication and dissemination
4. Frequency and duration of communication
5. Evaluation of effectiveness of communication
6. Policy versions in major local languages.
7. Capacity building in science communication
8. Feedback/ response mechanisms

The successful implementation of this policy requires implementation of a comprehensive communication strategy.

# **9.0 FINANCING ARRANGEMENTS**

Implementation of this Policy requires mobilization of financial resources for capital investment and implementation of activities through diversified sources of funding. Financing from GOU, bilateral and multilateral development partners, public private partnerships, civil society and other sources will support implementation of this Policy. The Ministry responsible for Finance, Planning and Economic Development will evaluate the need for additional resources required to carry out these roles and allocate a fair share of the country’s budget for Bioeconomy development.

Budgeting for this Policy will be carried out by the different implementing MDAs for carrying out strategies and interventions under different sectors and cross-sectoral areas. Provisions have been made for the costs of mainstreaming and integrating Bioeconomy across government business and the cost of reviewing the implementation of this Policy. The mobilisation and utilisation of funds under this policy will follow the Public Finance and Management Act 2015. The Ministry responsible for Finance, Planning and Economic Development in collaboration with the Ministry of Science, Technology and Innovation will establish resource mobilisation partnerships for Bioeconomy development.

# **ANNEX**

**SWOT Analysis**

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| --- | --- |
| **Strengths**   * Political goodwill; created * Strategic geographical location, land linked * Rich biodiversity (aerial, below ground, blue economy) * Youthful innovative population * Training institutions | **Weaknesses**   * Weak intra & inter-agency collaboration * Fragmented regulatory frameworks * Land fragmentation * Limited Human capacity * Rudimentary technologies e.g. hand hoe * Undeveloped value chains * Limited value addition |
| **Opportunities**   * Ready market from neighbours * Suitable Climate (TWO SEASONS) * Presence of development partners * New and emerging technologies (AI, BIOTECH, Blockchain, IoT Internet of things, Big data,) | **Threats**   * Climate change * Diseases and pests * Decline in bio resources |

1. ElChichakli et al. 2016; Kircher 2014 [↑](#footnote-ref-1)