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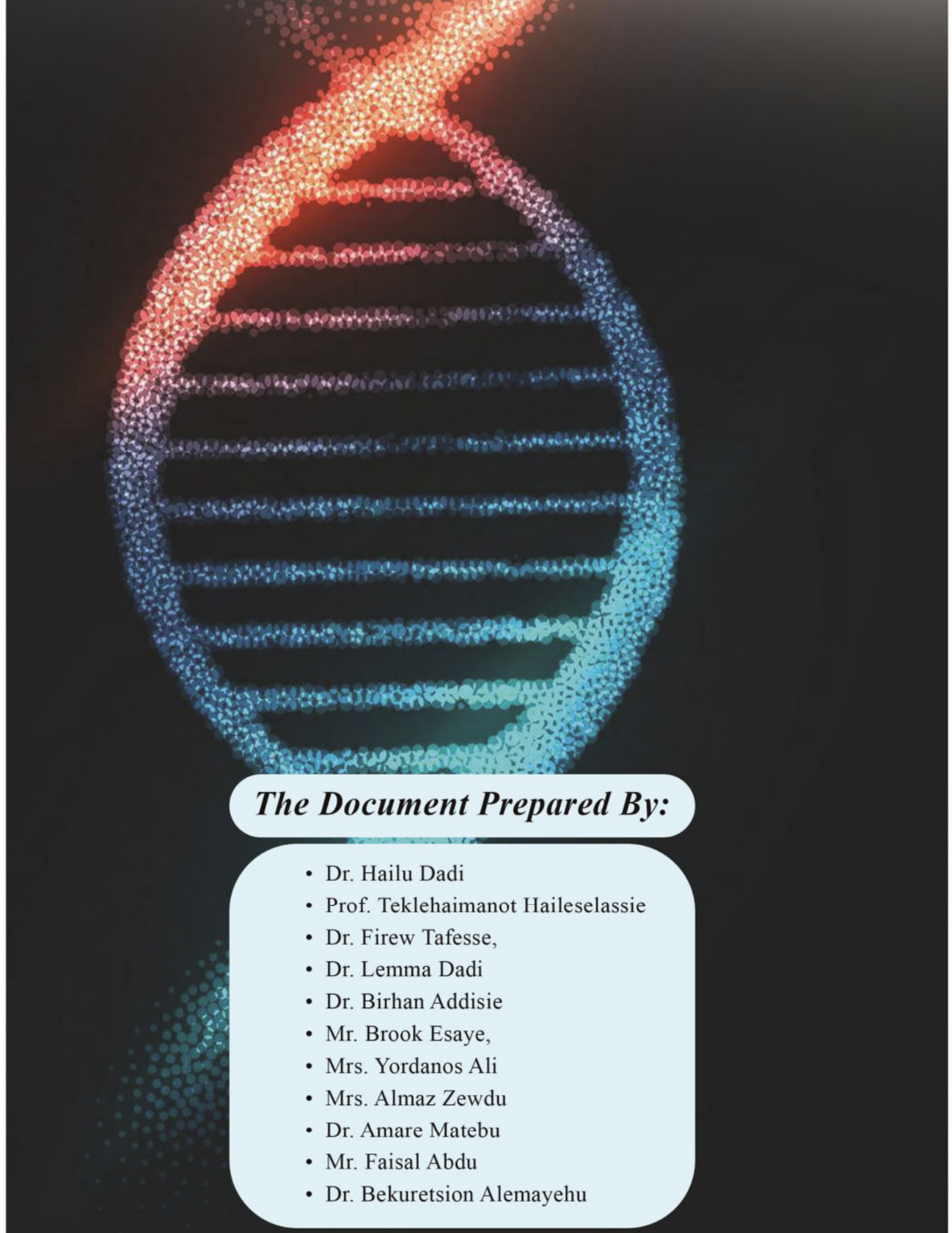
NATIONAL BIOECONOMY STRATEGY

Building a Circular and Sustainable Economy for Ethiopia

(2025–2030)

The FDRE Ministry of Innovation and Technology,

Bio and Emerging Technology Institute
Addis Ababa, Ethiopia
November/2025



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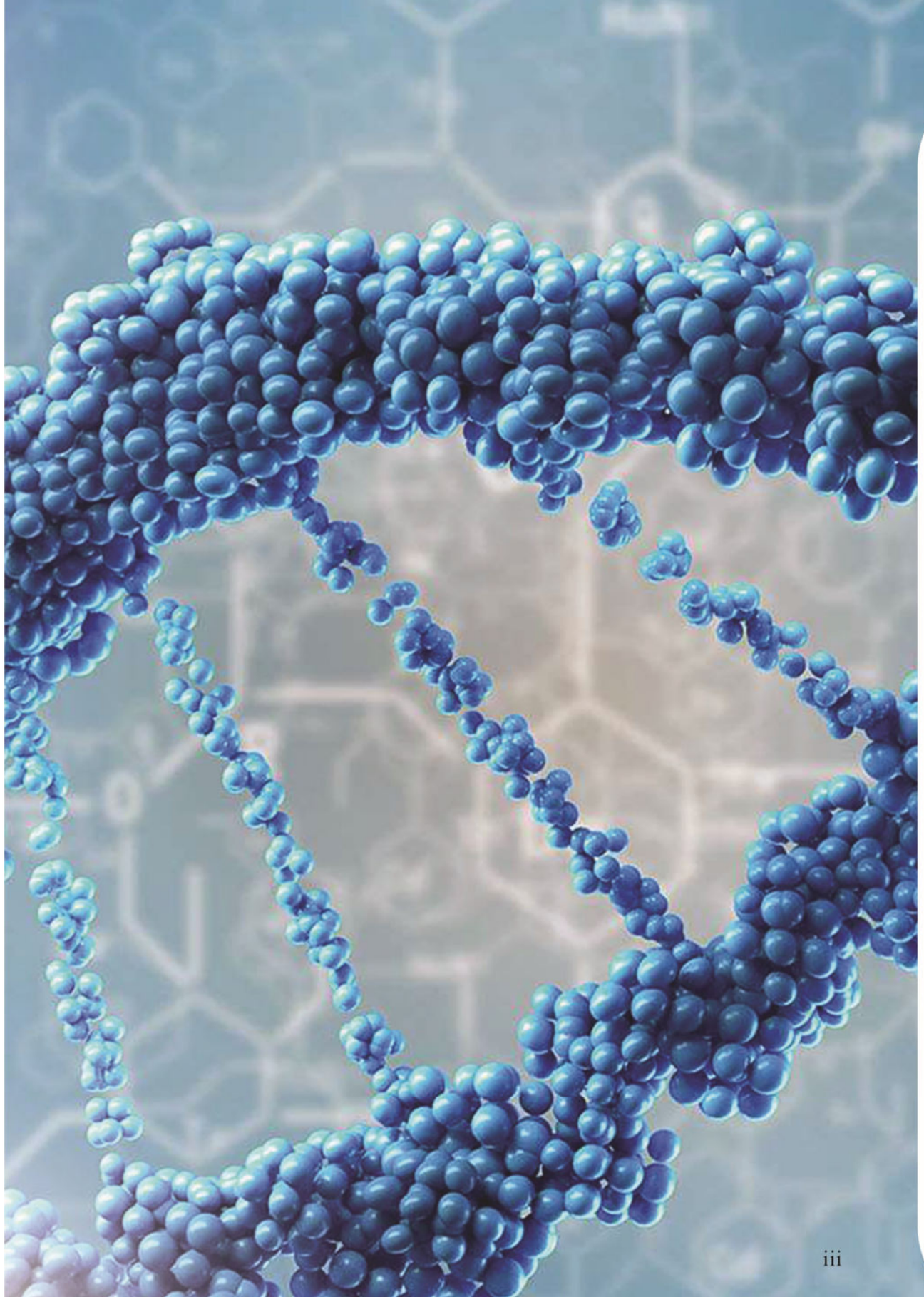

Lists of Acronyms

AfDB	African Development Bank
AHRI	Armauer Hansen Research Institute
ATI	Agricultural Transformation Institute
B2B	Business-to-Business
BEAC	Bioeconomy Advisory Committee
BETin	Bio and Emerging Technology Institute
CoE	Center of Excellence
DBE	Developmental Bank of Ethiopia
EBI	Ethiopian Biodiversity Institute
ECAA	Ethiopian Civil Aviation Authority
EED	Ethiopian Enterprise Development
EFD	Ethiopia Forestry Development
EIAR	Ethiopian Institute of Agricultural Research
EIC	Ethiopian Investment Commission
EPA	Environmental Protection Authority
EPHI	Ethiopian Public Health Institute
EWCA	Ethiopian Wildlife Conservation Authority
FDRE	Federal Democratic Republic of Ethiopia
GBS	Global Bioeconomy Submit
GDP	Gross Domestic Product
GERD	The Great Ethiopian Renaissance Dam
GoE	Government of Ethiopia
HLIs	Higher Learning Institute
IAIPs	Integrated Agro-Industrial Parks
ICT	Information Communication Technology
IP	Intellectual Property
IPDC	Industrial Parks Development Corporation
IPR	Intellectual Property Right
KPIs	Key Performance Indicators

M&E	Monitoring & Evaluation
MiNT	Ministry of Innovation and Technology
MoA	Ministry Of Agriculture
MoCT	Ministry of Culture and Tourism
MoF	Ministry of Finance
MoH	Ministry of Health
MoI	Minister of Industry
MoLS	Ministry of Labor & Skills
MoT	Ministry of Trade
MoTL	Ministry of Transport and Logistic
MoTRI	Ministry of Trade & Regional Integration
NBS	National bioeconomy strategy
NGOs	Non-Government Organization
NQIs	National Quality Infrastructure
NSTI	National Science Technology and Innovation
OECD	The Organization for Economic Cooperation &Development
PA	Precision Agriculture
R&D	Research and Development
Reg ARI	Regional Agricultural Research Institute
SDGs	Sustainable Development Goals
SMEs	Small and Medium size Enterprises
SOs	Strategic Objectives
STIP	Ethiopian Science, Technology and Innovation Policy
SWOT	Strengths, Weaknesses, Opportunities and Threats
TVETs	Technical and Vocational Education and Training
UNIDO	United Nations Industrial Development Organization

Definitions

Biobased Products: - refers to products that are derived from raw materials such as plants, animals, microbes and other renewable agricultural, marine, and forestry biomass.

Biochemical: - relating to organic chemicals derived from living organisms through chemical processes in living organism.

Bioeconomy: - is a knowledge-based use of the country's rich biological resources in various sectors of the economy such as agriculture, forestry, industry, health, energy, tourism and aquaculture for the production of bio-based products and services in an environmentally sound and sustainable manner to ensure sustainable economic growth, and improve livelihood of the society.

Bioenergy: - is a form of renewable energy generated from biomass fuel derived from plants, animals and microbes.

Biofertilizer: - are substances that contain microbes, which helps in promoting the growth of plants and trees by increasing the supply of essential nutrients to the plants. It comprises living organisms which include mycorrhizal fungi, blue-green algae, and bacteria.

Biomass Fuels: - are fuels that come from organic material such as harvest residues, purposely grown crops and organic waste from farms, our homes, and industries.

Biomass: - refers to renewable organic material that comes from plants, animals and microbes.

Biopolymers: - are polymers produced from natural sources either chemically synthesized from a biological material or entirely biosynthesized by living organisms.

Biosimilars: - are biologic drugs that is highly similar to a biologic drug that was already authorized for sale.

Biopharmaceuticals: - are complex medicines made from living cells or organisms, often produced using cutting-edge biotechnological methods.

Circular Economy: - A circular economy is an economic model which promotes valorization of resources so as to maximize efficient resources utilization and mitigate waste generation. Unlike the traditional linear economy, which follows a "*take, make, dispose*" pattern, a circular economy emphasizes sustainability by promoting the reuse, recycling, and regeneration of materials and products.

Gene Editing: - refers to alteration of the genetic material of a living organism by inserting, replacing, or deleting a DNA sequence, typically with the aim of improving some characteristic of a microbes, crop or farm animal or correcting a genetic disorder.

Novel Foods: - are types of food that does not have a significant history of consumption or is produced by a method that has not previously been used for food.

Underutilized Food: - Plants that have market value but are not commonly grown in the field and are rarely found in the market such as: Bamboo, Moringa; Taro; Cassava; Amaranthus and others

Value-addition: - is a saleable commodity that has been enhanced with additional qualities that make it worth a higher price than the raw materials used to make it.

Valorization: - refers to the process of transforming biowastes to value added products such as feed products, biofertilizers, biopolymers, biochemicals, bioenergy to offers an economical and environmental opportunity.

Startups: - newly established companies or ventures that leverage biological resources, processes, and technologies to create innovative products and services aimed at addressing challenges in sectors such as agriculture, healthcare, environmental sustainability, and industrial processes. These startups typically focus on utilizing renewable biological materials and advancing biotechnological solutions to contribute to a sustainable economy.

Statement from the Ministry of Innovation and Technology (MiNT)

Dear all,

As the Ministry of Innovation and Technology (MiNT), we are excited to introduce the bioeconomy strategy as a key driver of sustainable development in Ethiopia. The bioeconomy represents a transformative approach to leveraging our rich biological resources – from agriculture to biotechnology – to create value, generate wealth, and protect our environment.

Ethiopia is blessed with abundant biodiversity and natural resources, making it an ideal candidate for harnessing the potential of the bioeconomy. By investing in this strategy, we can unlock new economic opportunities, drive innovation, and promote sustainability across key sectors such as agriculture, forestry, and healthcare.

The bioeconomy is not just about economic growth; it is also about addressing pressing challenges such as climate change, food insecurity, and healthcare access. By promoting sustainable practices and supporting research and development in biotechnology, we can develop innovative solutions to improve food security, mitigate the effects of climate change, and enhance healthcare outcomes for all Ethiopians.

It is crucial that we come together as a nation to prioritize the bioeconomy strategy and invest in the necessary infrastructure, policies, and partnerships to support its growth. By collaborating with government agencies, industry stakeholders, academic institutions, and civil society, we can unlock the full potential of our biological resources and pave the way for a more prosperous and sustainable future for Ethiopia.

We call upon all citizens to embrace the bioeconomy strategy and join us in shaping a brighter future for our country through the power of innovation, technology, and sustainable development. Together, we can build a resilient, inclusive, and thriving economy that benefits all Ethiopians for generations to come.
Sincerely,

Blete Molla Getahun (PhD)

Minister, FDRE, Ministry of Innovation and Technology (MiNT)

Statement from Director General, Bio and Emerging Technology Institute (BETin)

As the Director General of the Bio and Emerging Technology Institute BETin) I am thrilled to highlight the critical importance of embracing the bioeconomy strategy for sustainable development in Ethiopia. The bioeconomy represents a groundbreaking approach to harnessing the potential of our biological resources to drive economic growth, promote innovation, and protect our environment. In a country rich in natural resources and biodiversity, the bioeconomy offers a unique opportunity to leverage our strengths in agriculture, fisheries, industry, forestry, environment, healthcare, ecotourism and other sectors to create a more prosperous and sustainable future. By investing in these sectors and promoting sustainable practices, we can not only enhance productivity and improve food security but also generate new economic opportunities and create jobs for our citizens.

Furthermore, the bioeconomy is a catalyst for innovation and research. By fostering a culture of scientific discovery and technological advancement, we can develop new solutions to address pressing challenges such as climate change, food insecurity, and employment opportunities. Biotechnology, in particular, holds immense potential for transforming agriculture, industries and driving economic growth.

It is crucial that we come together as a nation to prioritize the bioeconomy and invest in the necessary infrastructure, policies, and partnerships to support its growth. By working collaboratively with government, industry, academia, and civil society, we can unlock the full potential of our biological resources and pave the way for a more sustainable and prosperous future for all.

By embracing the bioeconomy strategy, we can build a more resilient, inclusive, and prosperous future for our country. Let us seize this opportunity to create a sustainable economy that benefits all citizens and preserves our natural resources for future generations.

Sincerely,

Kassahun Tesfaye, Professor

Director General, Bio and Emerging Technology Institute (BETin)

Statement from Deputy Director General, BETin

Since our inception in 2008, BETin has been entrusted with the critical responsibility of coordinating national-level applied research and driving the impact of products in the bio and emerging technology sector. Our mandate encompasses ensuring research effectiveness and fostering an enabling environment through the development of national operating policies, strategies, and guidelines.

Over the past years, our institution has diligently conducted extensive research, culminating in the crafting of this comprehensive strategy. The National Bioeconomy Strategy not only highlights the abundant biotechnological resources available in our country but also provides detailed guidance on optimizing their utilization. This strategy document serves as a valuable resource for all stakeholders in the bioeconomy sector, facilitating informed decision-making and promoting sustainable growth.

We extend our heartfelt gratitude to the dedicated team responsible for preparing this document, as well as the primary editors, reviewers, and experts who have played a pivotal role in its successful completion. Their unwavering commitment and expertise have shaped this strategy into a robust framework that aligns with our national priorities and aspirations. We would also like to express our special appreciation to UNDO for their invaluable financial support, which has significantly contributed to the realization of this important initiative.

As Deputy Director-General, I take immense pride in our collective achievements thus far. However, this National Bioeconomy Strategy is just the beginning of our journey towards harnessing the full potential of bio and emerging technologies for the greater benefit of our nation. With your continued support and collaboration, we are confident that we will make significant strides in fostering innovation, driving economic growth, and addressing societal challenges.

Thank you for your unwavering commitment to the advancement of the bioeconomy sector.

Dr. Hailu Dadi

Deputy Director-General
Bio and Emerging Technology Institute (BETin)

Executive Summery

The advancement of the knowledge-based economy stands as a crucial economic paradigm globally. The bioeconomy is a sector where knowledge, innovation, and technology play essential roles for nations growth and development. It provides the opportunity to create value-added products applicable across various industries, including food, energy, and manufacturing. It is not only generating employment and wealth but also links smallholder farmers, youths and small and medium enterprises (SMEs) to emerging bio-based value chains. Countries in the EU and more than 60 other countries and regions in the world including Africa, have developed bioeconomic strategies and use it for their economic benefits. Easten African Bioeconomy strategy is one of the regional bioeconomic strategic document developed by East Africa Countries (EACs) and set into operation since 2021 where Ethiopia had a lion share. The strategy was developed with the aim of achieving regional bioeconomic integration and use their bioresources for their respective national economic growth so as to benefit from the African Continental Free Trade Area (AfCFTA. In the recent (2024) EACs bioeconomy report Ethiopia's Sustainable Aviation Fuel and avocado oil production value chain were mentioned as emerging bioeconomy initiatives and bio businesses[1].

In the Ethiopian context and for the purpose of this strategy, bioeconomy is defined as knowledge-based use of the country's rich biological resources in various sectors of the economy such as agriculture, forestry, industry, health, energy, tourism and aquaculture for the production of bio-based products and services in an environmentally sound and sustainable manner to ensure sustainable economic growth, and improve livelihood of the society. Within this context, Ethiopia should pursue a bio-based and sustainable circular economy based on the principles of mitigating waste and pollution, keeping products and materials in use, and regenerating natural systems through optimal and sustainable use of renewable biological resources.

Ethiopia is a country endowed with abundant biodiversity that can generate huge renewable bioresources that could have offered the opportunity to enhance economic growth. However, these resources are not fully exploited in such a way to significantly contribute to sustainable economic growth. This is mainly due to fragmented bio-based development activities; lack of integration among public, private sectors, developmental partners and non-governmental organizations working

[1] Virgin, I., Lutta, A., Senyagwa, J., Osano, P., Tesfaye, K., Tafesse, F., Ochanga, P., Munganyinka, E., Masharabu, T., Ongol, M., Adhiambo, R., Muyambi,F., Kilelu, C., Haileselassie T, 2024. The State of Bioeconomy in Eastern Africa: 2024. Stockholm Environment Institute, The East African Science and Technology Commission and Bioinnovate Africa

on bioeconomy; insufficient utilization of human resource and infrastructure; poor market linkage and low level of regional and international partnership.

Surveys conducted by the Ethiopian Statistical Service in 2022 indicate that the youth unemployment rate in Ethiopia stands at approximately 19.2%[2]. To address this challenge, Ethiopia has set an ambitious goal in its 10-Year Development Plan (2021-2030) to reduce urban unemployment to 9% by creating job opportunities for 15 million citizens. Similarly, the country has planned structural economic transformation to decrease the share of agricultural sectors' to GDP from 32.6% to 22% by 2030 while, the industrial sector's share is expected to increase from 29% to 35.9%. Specifically, the manufacturing segment is forecasted to expand significantly, growing from 6.9% to 17.2%. A key element in realizing this vision is leveraging the potential of the bioeconomy. This approach will pave the way for the creation of innovative businesses and biobased industries that support new product development, value addition, and waste valorization, all of which drive economic growth and create sustainable employment opportunities for young people. By investing in bioeconomic initiatives, Ethiopia can generate jobs while fostering innovation and environmental sustainability, ultimately leading to a more resilient economy.

Therefore, in order for our country to get all important benefits from the immense renewable bioresources, it is imperative to develop a national bioeconomy document to strategically lead biobased economic growth and development activities. Thus, after conducting survey and assessing the experiences of other countries' national and regional bioeconomy strategies, this national strategy document is developed by identifying four core intervention areas, namely:

Agriculture with the specific objective to introduce new bio-based technologies and solutions to strengthen food and feed production, ensuring food and nutrition security.

Health with the goal to establish a bio-based healthcare and wellness sector that enhances the well-being of the population, aligns with national priorities, and leverages indigenous knowledge and practices.

Bio-based Industrial Development with the specific objective to develop industries that stimulate sustainable economic growth and add value to under-utilized renewable bioresources and biowastes in the country.

[2]The Federal Democratic Republic of Ethiopia Ethiopian Statistics Service: Key Findings on the 2022 Urban Bi-Annual Employment Unemployment Survey (A Comparative Analysis of February 2022 and June 2022 with annual average)

Sustainable Environment with the aims to foster a sustainable environment and generate economic benefits by prioritizing waste valorization through innovative solutions, ultimately creating new job opportunities.

To address these intervention areas, five strategic objectives are identified with their respective implementation strategies.

The main goal of this strategic document is to create a cohesive national bioeconomy framework that encourages the sustainable development and use of bioresources. It aims to enhance value addition through innovative research and development, promote collaboration among institutions, and increase awareness of biobased products and services, all of which will contribute to environmental sustainability and economic growth.

Related national policies and strategies including 10 Years Development Plan (2021-2030), Science Technology and Innovation (STI) policy, 10 Years National Biotechnology R4D Program and others have been taken into consideration while preparing this document.

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01 Introduction

Over several decades, the global economy has been driven by the exploitation of non-biological natural resources such as minerals and fossil fuels. Specifically, the first industrial revolution saw the harnessing of fossil fuels (coal) and the steam engine to develop new economies that are now based on the exploitation of these resources. Dependence on intensive use of fossil oil, coal and gas, especially in developed and emerging economies, has come at a cost that has led to serious environmental challenges and climate impacts. A significant mass of biodiversity is also being lost due to overexploitation of natural resources that are feedstock for many industries. The current huge population growth, emerging disease burden, and higher living standards have also created huge demands that cannot be sustainably met by the existing economic system. The land required for the production of raw materials is competing with the production of food and animal feed. Thus, the above challenges have led to a global push towards a new economic paradigm called bioeconomy.

The term "bioeconomy" is interpreted in various ways by different actors and it is evolving overtime. The Global Bioeconomy Summit[3] has defined bioeconomy as "the production, utilization and conservation of biological resources, including related knowledge, science, technology, and innovation, to provide information, products, processes and services across all economic sectors aiming towards a sustainable economy". According to the East African regional bioeconomy strategy document (2020)[4], Bioeconomy is described as "the sustainable production and exploitation of biological resources and knowledge to support food and industrial feedstock production; bio-based industrial sector and protection of ecosystem services and mitigation of climate change". Generally, explained as an economy which puts innovation in bio-based products, processes and business models at the center and a bio-based circular economy as the organizing framework.

In the Ethiopian context and for the purpose of this strategy, bioeconomy is defined as knowledge-based use of the country's rich biological resources in various sectors of the economy such as agriculture, industry, health, energy, forestry, tourism and aquaculture for the production of bio-based products and services in an environmentally sound and sustainable manner to ensure reliable economic growth, and improve livelihood of the society. Within this context, Ethiopia should pursue

[3] GBS (2018). The Global Bioeconomy Summit Communique. https://gbs2018.com/fileadmin/gbs2018/Downloads/GBS_2018_Communique.pdf
[4] https://www.iacgb.net/lw_resource/datapool/systemfiles/elements/files/2ebdbc71-a097-11ed-9ee4-dead53a91d31/current/document/EAC-Regional-East-Africa-Bioeconomy-Strategy.pdf

a bio-based and sustainable circular economy based on the principles of minimizing waste and pollution, keeping products and materials in use, and regenerating natural systems through optimal and sustainable use of renewable biological resources.

Bioeconomy offers the opportunity to produce value-added products with applications in many sectors involved in the production of food, energy and industrial goods, thereby creating jobs, generating wealth, and connecting smallholder farmers to new bio-based value chains[5]. Countries in the EU and more than 60 other countries and regions in the world including Africa, have developed bioeconomic strategies and use it for their economic benefits.

Bioeconomy has a potential economic contribution, for new employment opportunities and it is estimated that the current global value of the bioeconomy is approx. 4 trillion USD (4.7 % of global GDP) and according to some projections its value will rise to 30 trillion USD by 2030, which is a third of the global economic value[6]. Bioeconomy has also showed its contribution in different countries. For instance, according the report by USAID in 2017[7], the biobased products industry significantly impacted the U.S. economy by supporting 4.6 million jobs through direct, indirect, and induced contributions, accounting for a total value of $470 billion. For every biobased job created, 2.79 additional jobs emerged in other sectors, resulting in 1.65 million jobs directly tied to the industry and 2.96 million spillover jobs in related fields due to the demand for goods and services. The industry generated $162 billion in direct sales and $309 billion in spillover sales. Moreover, biobased products not only strengthen the economy but also positively affect the environment, substituting approximately 9.4 million barrels of oil annually and potentially reducing greenhouse gas emissions by an estimated 12.7 million metric tons of CO_2 equivalents each year.

Therefore, in order for our country to get all important benefits from bioeconomy, it is imperative to develop a national bioeconomy strategy. Thus, the strategy is developed after conducting analysis on the strengths, weaknesses, opportunities and threats (SWOT) and assessing the experiences of others' national and regional bioeconomy strategies. Moreover, related policies and strategies including 10 Years Development Plan (2021-2030), STI policy, 10 Years National Biotechnology R4D Program, Scientific literatures, and others have been taken into consideration while preparing this document.

This national bioeconomy strategy document is developed by identifying four core focus areas, namely: Agriculture; Health; Bio-based Industry and Sustainable Environment. Under these focus areas, five strategic objectives are identified with their respective implementation strategies.

Generally, the overall objective of this strategic document is to establish a comprehensive and coordinated national bioeconomy framework that promotes the sustainable development and utilization of bioresources, enhances value addition through innovative research and development, fosters collaboration among institutions, and raises awareness of biobased products and services, thereby contributing to environmental sustainability and economic growth.

More specifically, the strategy aims to achieve the following objectives:

- Increase the potential for exporting high-value bio-based products that boosts food and nutrition security, employment opportunities, environmental sustainability
- Promote biobased industrial developments and their competitiveness in such a way to enhance import substitution and promote export market,
- Promote circular economy that enhances a sustainable environment and generate economic benefits through waste valorization,
- Strengthen technical competencies and institutional capacities towards cutting-edge biotechnology research and innovation in agriculture, health, industry and environmental sectors,
- Fostering awareness, integration, and harmonization of the bioeconomy across diverse sectors.

[5] Chulok, A. (2021). Bioeconomy in the Twenty-First Century: Global Trends Analysis Perspective. In: Koukios, E. and Sacio-Szymańska, A. (eds.) (2021). Bio#Futures: foreseeing and Exploring Bioeconomy. Springer Nature Switzerland AG, Switzerland.
[6] https://wcbef.com/tuote/a-status-of-the-global-bioeconomy/#:~:text=The%20importance%20of%20the%20bioeconomy,of%20the%20global%20economic%20value
[7] https://pbpc.com/usda-biobased-economic-impact-analysis/

1.1. The Need for Bio-economy strategy in Ethiopia

Ethiopia is a country endowed with abundant biodiversity that offers the opportunity to enhance its economic growth. However, these resources are not fully exploited in such a way to significantly contribute to sustainable economic growth. This is mainly due to poor and fragmented bio-based development activities; weak integration among public, private and non-governmental organizations working on bioeconomy; insufficient utilization of human resource and infrastructure; poor market linkage and low level of regional and international partnership. Nevertheless, the government of Ethiopia has prepared STI policy and set Vision 2030; Ethiopia: An African Beacon of Prosperity where building a climate-resilient middle-income economy; is one of the key strategic pillars of Ethiopia's Ten-Year Perspective Plan (2021-2030) that puts the four economic sectors (agriculture, health, industry and the environment) as top priority areas of development.

Surveys conducted by the Ethiopian Statistical Service in 2022 reveal that the youth unemployment rate in Ethiopia is approximately 19.2%. To tackle this issue, Ethiopia has set an ambitious target in its 10-Year Development Plan (2021-2030) to reduce urban unemployment to 9% by creating job opportunities for 15 million citizens. Additionally, the country aims for a structural economic transformation that will decrease the agricultural sector's contribution to the GDP from 32.6% to 22% by 2030, while increasing the industrial sector's share from 29% to 35.9%. Within the industrial sector, the manufacturing segment is expected to see significant growth, rising from 6.9% to 17.2%. A crucial aspect of achieving this vision is harnessing the potential of the bioeconomy. This strategy will facilitate the development of innovative businesses and biobased industries that promote new product development, value addition, and waste valorization, all contributing to economic growth and creating sustainable employment opportunities for young people. By investing in bioeconomic initiatives, Ethiopia can generate jobs while fostering innovation and environmental sustainability, ultimately leading to a more resilient economy.

Hence, developing bioeconomy strategy is crucial to address the aforementioned challenges and to support current government initiative for the proper application of bio-based development activities so as to improve the livelihood of the society, and to enable national, regional and international partnerships in a coherent and integrated manner. Formulating this bioeconomy strategy is also crucial in order for the government to give proper emphasis and support for the effective implementation of the bioeconomy.

1.2. Scope of Bioeconomy Strategy

Bioeconomy being a multi-sectoral issue, the national bioeconomy strategy is to be implemented by different ministries, research institutes, learning institutes, industries, enterprises, developmental partners and private sectors both at the federal and regional state levels. The strategy covers all bio-based research and development, innovation, products and services in the country. The strategy primarily focuses on institutions working in agriculture, health, industry, aquaculture, forestry, environment, ecotourism, digital technology and any institutes working in areas related to biological products and services. This strategy provides a direction for all bioeconomy related activities for the coming six years (2025 – 2030).

1.3. Vision & Mission

VISION

To see Ethiopia among the nations having robust bio-based economy by the year 2030

MISSION

To develop a sustainable, inclusive economy that make use of the nation's plentiful natural resources to provide bio-based goods, energy and services that raise people's standard of living.

1.4. Guiding Principles

The implementations of the national bioeconomy strategy will be guided by the following principles;

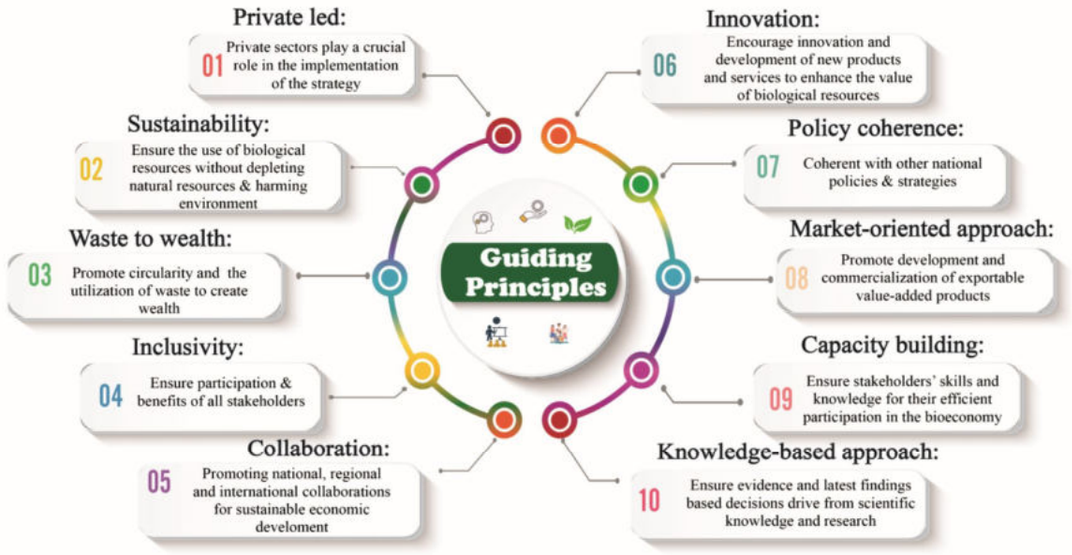

Figure 1: Guiding principles of the bioeconomy strategy

02

Situation Analysis

2.1. Opportunities and Strengths

In this section opportunities available in the country in terms of the availability of human resources, infrastructures, established R&D institutions, and modest financial support have been recognized. In addition, government efforts have been put in place for the establishment of industrial parks, free trade zones, special economic zones and the availability of supporting policies.

Ethiopia has a lot of opportunities to utilize its huge bio-resources in plants, animals and microorganisms found in its diverse terrestrial and aquatic ecosystems and could immensely benefit from the envisioned bioeconomy strategy. For sustainable use of these resources in the bioeconomic development, the country has put in place considerable enabling policy environments and commitments. To this end, several ministries and various institutions therein have already developed roadmaps, policies and strategies that promote bio-based economic developments. To cite some of these national documents: Agricultural Transformation Agenda, Livestock and Fisheries Development Roadmap, Ethiopia's Long term low emissions and climate resilient development strategy, Biorefinery, Biotechnology, Crop Technology and Innovation, National Energy Technology, Traditional Medicines, Pharmaceutical, Sugar Technology, Leather Technology and Textile Technology Roadmaps are among the many. These roadmaps and upcoming ones from other institutions could promote the use of untapped huge biomass in the country.

Another opportunity for developing the bioeconomy in Ethiopia is the presence of Research and Development institutions and Higher Learning Institutes (HLIs) operated by the Federal Government and Regional States. The presence of a high proportion of youth population and trainable graduates from universities and TVETs can be considered as a fertile ground. These ensure sustainable educated human resources to be engaged in bioeconomy-related research, innovation and business. The country is also endowed with very diverse traditional knowledge, culture and values that have been accumulated over millennia to conserve, value-add and exploit bioresources.

In addition, exponentially improving public expenditure on road, airport, railway and, national IT infrastructure over the years that significantly facilitate transport and access to both local and global market. Ethiopia has also invested in a number of agro-processing industrial parks, expantion of irrigation facilities and farm land and sugar manufacturing plants with high potential to attract

multinational enterprises, which could transfer modern production and management systems to contribute to bioeconomy development in the country.

2.2. Challenges and Gaps

Despite the aforementioned opportunities and strengths, there are several challenges and gaps including, food and nutrition insecurity, low productivity, recurrent drought, climate change, environmental pollution, conflicts, rain-fed farming system, shortage of foreign currency, high unemployment rate, high population growth, emerging diseases burden, poor access to infrastructure by smallholders, limited number of highly skilled human capacity, inadequate R&D supporting environment, that needs to be addressed.

A full-fledged bioeconomy development requires adequate infrastructure (advanced laboratories, workshops, energy, water, irrigation, roads, ICT, etc.) across the country. The level and standards of infrastructure for R&D in modern technology and biosciences that is currently existing in various higher education institutes, research institutions and industries may not be adequate. In many instances, the institutions are not suitably organized to execute collaborative research with the application of cutting-edge and innovative technologies.

The R&D in the country is at an infant stage and a lot remains to be done to reach the desired level. The existing bioeconomy-related research and innovation activities are limited both in number and in scope, with scattered efforts of project-based activities in higher education institutions, research centres, and development organizations. In addition, there are generally weak linkages between research institutes and industries coupled with poor research products commercialization.

Moreover, there is a lack of funding and seed money sources to support the innovation chain through all the stages, from research and development to the market. Although public R&D is important for inclusive knowledge development, public research organisations and universities in the country have not been effective in moving ideas and technologies beyond research into the market space. The gap between research, the private sector and commercialization is wide and needs to be bridged. At present, limited attention has been given to product development and commercialization in majorities of research and development activities. This approach is unproductive and has to be transformed so that it spans the full stretch from basic research through product development to commercialization. There is a general shortage of professional incubation services in the country that

can assist the bioeconomy innovation process and ensure that all actors in the innovation system are properly supported to fulfil their complementary roles.

In terms of private sector involvement in bioeconomic development, there are limited number of large-scale bio-processing industries. Inadequate financial resources and limited number of venture capital are hindering the development of private industries. There is also insufficient partnership among R&D actors and business-to-business (B2B) collaboration at national, regional and international levels.

The bioeconomy sector requires professionals with a diverse set of skills including, biotechnology, artificial intelligence (AI), engineering, data analysis, marketing, social sciences and entrepreneurship. However, there is a gap between demand and supply of skilled manpower in the above fields. Such shortages can hinder the growth of the bioeconomy sector and limit its potential to address the national development challenges.

Despite the existence policy and legislation in different sectors (science and technology, agricultures, environment, health, biotechnology, industry) there should be up to date guidelines, standards and regulations that can support the growing bioeconomy to become a major driver for environmentally sustainable and inclusive economic development.

Table 1: Summary of SWOT analysis for the development of bioeconomy in Ethiopia

Strength	Weakness	Opportunity	Threat
• Presence of a considerable number of universities, and research institutions • Existence of several ongoing innovative research and development programmes • Availability of valuable indigenous knowledge • Presence of large proportion of youths (30% ; 15 -29 years) • Expansion of postgraduate programs for supply of qualified and skilled researchers • Presence of different national policies and roadmaps as benchmark to support the bioeconomy • Government commitments and initiatives to promote biodiversity • Establishment of industrial parks • Green legacy initiatives • Irrigation • Bounty of the basket 'የሌማት ትሩፋት' : Urban agriculture • Home-grown economic reform • Ecotourism development (ገበታ ለሃገር) • የበጋ የመስኖ ስንዴ (Irrigation farming) • Corridor development (የኮሪዶር ልማት) • Riverside development	• Poor implementation of policies promoting R&D, innovations and incubation • Absence of startups supporting ecosystem • Existence of poor procurement system • Absence of incentivizing policies for private industries engaged in knowledge-based economy, R&D and innovation • Poor infrastructure, logistics and market linkage • Low productivity and limited raw material supply • Insufficient development and use of biodiversity • Low attention for commercialization of research outputs • Limited engagement private sector in production of value-added products • Unavailability of standards and regulatory frameworks for biobased products • Inadequate number of state-of-the-art laboratories that supports cutting-edge research and development activities • Limited number of technologies on value-added biobased products destined for commercialization • Existence of fragmented activities and poor integration among organizations • Limited capacity to transfer, adapt and utilize advanced technologies • Insufficient budget, incentives and fund for R&D, innovation, incubation, & commercialization	• Presence of abundant and diverse biological resources • Growing industrial sector with high demand • Expansion of agro-industrial parks • Recognition of biotechnology as the engine of economic growth. • High market demands for value-added export products • Commitment of the government to foster biotech R&D; • Existence of local and international collaborators for biotechnology R&D; • Ethiopia's being a diplomatic hub fosters international cooperation • Geographical location advantage for international market • Presence of a large number of trainable youths' population • Completion of the Great Ethiopian Renascence Dam (GERD) • Presence of new international economic cooperations like BRICS	• Instability at national, regional and international levels • Lower-level competency for technology and innovation • Foreign exchange instability • Dependency on international donations, aids, and loans • Climate change challenges • Inadequacy to meet international quality/ standards • Emerging and re-emerging diseases (Example: COVID -19)

03

Strategic Focus Areas (SFAs)

A combination of comprehensive SWOT analysis incorporating perspectives of key stakeholders have been considered to determine the strategic choices for this national strategy. This strategy focuses on the development of new bio-based products and services, add value, use resources in novel, innovative and sustainable ways. Specifically, the strategy covers optimization and innovative use of biomass-based resources generated from agriculture, forestry, livestock, and aquaculture for production of food, feed, energy and other materials. Accordingly, four strategic focus areas (SFA) – *Agriculture, Health, Bio-Based Industries, and Sustainable Environment*- are identified as the core of this strategic document.

Figure 2: Strategic Focus Areas (SFAs) of the bioeconomy strategy

3.1. Strategic Objectives (SOs)

The bioeconomy represents a transformative approach to economic development that leverages biological resources for sustainable growth. To effectively harness the potential of the bioeconomy, five strategic objectives are outlined, each contributing to a holistic framework aimed at fostering a sustainable and resilient economic landscape.

Figure 3: Strategic Objectives (SOs) of the bioeconomy strategy

Value Addition and Employment Creation: This objective focuses on enhancing the value of biological resources through innovative processing and utilization methods. By promoting the development of high-value products (biofertilizers, biochemicals, biosimilars etc), derived from renewable biological materials, with the aim to support food and nutrition security, emergence of new industries, export market and stimulate job creation across various sectors.

Biobased Industrial Development: The shift towards biobased industries is crucial for reducing dependence on fossil-based materials and minimizing environmental impacts. This objective seeks to promote the establishment and growth of industries that utilize renewable biomass for the production of food/feed, chemicals, materials, and energy. Thereby, promote biobased innovation, import substitution, export market, job creation, biomass valorization.

Circular Economy and Sustainable Environment: this objective advocates for the efficient use of resources and the minimization of waste through recycling, reusing, and recovering materials. It also seeks to promote the establishment and growth of industries that utilize biobased industrial/ agricultural residues for the production of biobased agricultural inputs (feed, biofertilizers etc), chemicals, materials and energy. By integrating sustainable practices into the bioeconomy, we aim to enhance environmental stewardship while promoting resource efficiency. This includes developing systems that support waste valorization and sustainable land management practices, ultimately leading to improved ecosystem health.

Research, Development, and Innovation: Continuous investment in research and development is essential for advancing the bioeconomy. This objective prioritizes fostering innovation through collaborative research initiatives that explore new biotechnologies, sustainable agricultural practices, and advanced processing techniques. By creating a conducive environment for innovation, that can drive technological advancements that enhance productivity, sustainability, and competitiveness in the bioeconomy.

Awareness Creation and Capacity Building: To fully realize the potential of the bioeconomy, it is vital to engage stakeholders at all levels. This objective focuses on raising awareness about the benefits of a bio-based economy and building capacity among businesses, communities, and policymakers. Through education and training programs to equip individuals with the knowledge and skills necessary to participate in and contribute to the bioeconomy effectively.

3.1.1. (SO1);Value-addition and Employment Creation

The bioeconomy offers a valuable opportunity to boost food security, sustainability, and economic growth by strategically harnessing underutilized resources and indigenous knowledge. This section presents six strategies to fully capitalize on bio-based resources. In Ethiopia, there is an urgent need to tap into underutilized food and feed crops such as cassava, enset, taro, bamboo, anchote, yam, different vegetables etc. and animals like quale, partridge, duck, fish, pork and rabbit. Research and innovation focused on these resources can enhance food and nutrition security while diversifying diets and building resilience against food shortages. Additionally, producing bio-based agricultural inputs such as feed and feed additives, biofertilizers, biopesticides, and bio-stimulants is crucial for promoting sustainable and climate-resilient agriculture. This strategy not only supports the reduction of reliance on increasingly expensive chemical fertilizers and feed additives but also encourages environmentally friendly farming practices. Utilizing indigenous knowledge is essential for developing bio-based traditional medicines, cosmetics, wellness products, biopharmaceuticals, and biosimilars to meet the growing demand for natural resource-derived products.

Ethiopia's agricultural sector, a cornerstone of its economy, is undergoing a transformative shift through the implementation of the National Digital Agricultural Extension and Advisory Services (NDAEAS) initiative. This innovative program harnesses digital technology to provide farmers with timely information, expert advice, and access to markets, significantly enhancing productivity and sustainability. By promoting best practices in farming and facilitating biobased knowledge sharing, the NDAEAS empowers farmers to adopt value-added production techniques. This not only increases the quality and marketability of agricultural products but also fosters entrepreneurship and job creation within rural communities. As a result, the initiative plays a pivotal role in strengthening Ethiopia's bioeconomy, driving economic growth while ensuring food security and environmental sustainability for future generations. Thus, the Digital Economy and Bioeconomy Strategies will be synergized for greater economic impact, social prosperity, and environmental sustainability. The Ethiopia Agricultural Datahub, with its vast data collection and advanced features, is poised to revolutionize the agricultural sector, enabling bio-innovation startups and Cluster Farming-centered precision agriculture solutions.

This strategic objective also aims to empower women through the provision of small-scale technology that leverages the vast reservoir of indigenous knowledge they possess. This innovative approach will not only generate supplementary income for these women but also contribute to the overall economic development of rural Ethiopia by unlocking the value of underutilized natural resources.

Fostering their development and commercialization can drive economic diversification and satisfy consumer preferences for sustainable and ethically sourced goods. Importantly, these initiatives will generate increased employment opportunities across various sectors. By investing in bioeconomy-related activities, we can create jobs in agriculture, processing, research, and retail, ultimately contributing to economic stability and community development.

Strategy 1: Maximize the potential use of underutilized food and feed source

- Encourage and support RDI that are focused on exploring, characterization, fortification and promotion of underutilized food and feed resources in a way to maximize their role in assuring the national food and nutrition security.

Strategy 2: Enhance production of bio-based agricultural inputs

- Support production and utilization of biobased agricultural inputs including biofertilizer, bio-stimulants (biopesticides, bioherbicides and bioinoculants) and innovative animal feeds, through financing RDI, arranging investment incentives and market linkages

Strategy 3: Cluster Farming-centered Precision Agriculture (PA) for Digital Bio-innovation Ecosystem

- Strengthen capacity for the development of robust data value chain useful for Precision Agriculture Technologies including data acquisition - smartphone, satellite imagery, Internet of Things unmanned aerial vehicle (UAV); big data analytics such as cloud platforms; and data applications, bio-apps for smartphones, bio-innovation startups through financing RDI in areas of bioinformatics, AI, nanotechnology, biotechnology and green chemistry and facilitate investment for promoting bio-innovation startups ecosystem in the agriculture commercialization cluster value chain.

- Analyze barriers for adopting PA technology solutions by smallholder farmers based on the Five A's of Technology Access Framework: availability, affordability, awareness, ability, and agency to identify interventions that maximize the uptake of PA technologies.

Strategy 4: Promote indigenous knowledge and bio-based traditional medicines, biopharmaceuticals and biosimilars development

- Strengthen capacity to explore, develop, commercialize and utilize herbal medicines, biopharmaceuticals and biosimilars through financing RDI and promoting awareness schemes and investment initiatives in the sector.

Strategy 5: Promote the development and commercialization of bio-based cosmetics and well-being products

- Enhance supports of RDI, investment initiatives and local skills focusing on the development and commercialization of bio-based cosmetics and well-being products

Strategy 6: Increase employment opportunities

- Strengthen financial and capacity building supports to startups, SMEs and industries engaging in the development and commercialization value-added products to enhance their role in promoting self-employment and additional job creation.

3.1.2. Bio-based Industrial Development (SO2)

Strengthening agro-processing industries is one of the first step in the quest to build a robust bioeconomy. Investing in facilities that transform raw agricultural products into value-added goods, we can not only reduce post-harvest losses but also create a diverse range of products that meet local and international demands. This enhancement will stimulate local economies, provide farmers with better income, and ensure that communities have access to nutritious foods. Another vital strategy is to promote the production of microbial starter cultures and enzymes. These biological agents play a crucial role in food fermentation and preservation, enhancing flavors and extending shelf life. By encouraging local production, we can reduce dependency on imported cultures and enzymes, fostering innovation and self-sufficiency within our food systems. This initiative not only supports food quality but also opens doors for new business opportunities in biotechnology. We must also focus on encouraging the local production of industrial inputs such as pulp and paper, bio-chemicals and other biopolymers, from renewable resources. By leveraging our abundant natural materials, we can develop sustainable alternatives to conventional plastics and chemicals.

This shift not only reduces environmental impact but also positions local industries at the forefront of the green economy, promoting innovation and attracting investment. Finally, these strategies collectively aim to increase employment opportunities across various sectors. As agro-processing industries expand, as microbial cultures become more accessible, and as renewable industrial inputs are developed, new jobs will emerge in manufacturing, research, and distribution. This influx of employment will not only enhance economic stability but also empower communities, fostering a sense of ownership and pride in local resources.

Strategy 1: Enhance Agro-processing industries

Promote industries' engagement in value-added and novel foods production and building capacity of value chain actors on post-harvest loss mitigation and products safety and quality

Strategy 2: Promote the production of microbial starter culture and enzymes

- Strengthen support of endeavors to locally produce and commercialize starter cultures and enzymes

Strategy 3: Encourage the production of industrial inputs such as bio-chemicals and biopolymer locally from renewable resources

- Enhance support to RDI and investment to drive industrial scale production, commercialization and utilization of bio-chemicals and biopolymers

Strategy 4: Increase employment opportunities

- Strengthen financial and capacity building supports to Startups, SMEs and industries engaging in value-added products development and commercialization and enhance their role in promoting self-employment and additional job creation.

3.1.3. Circular Economy and Sustainable Environment

A circular economy is an economic model that focuses on optimizing resource use and minimizing waste generation through the valorization of resources. In contrast to the traditional linear economy, which operates on a "take, make, dispose" approach, a circular economy prioritizes sustainability by encouraging the reuse, recycling, and regeneration of materials and products.

The circular economy and sustainable environment can be significantly advanced through the promotion of climate-smart agriculture, particularly via innovative practices like insect farming. By cultivating species such as black soldier flies, silkworms, and mealworms, we can enhance food security while reducing environmental impact. These insects serve as a sustainable protein source and aid in waste reduction by converting organic materials into valuable resources.

Furthermore, prioritizing the efficient use of freshwater resources is essential for supporting agriculture and aquaculture, ensuring local communities have access to fish and other aquatic food sources while preserving ecosystems. Enhancing the utilization of biowaste from agricultural and agro-industrial activities can also bolster the national economy. Developing systems to process these wastes into biomaterials, bioenergy, and biochemicals reduces landfill waste and promotes a circular economy.

The valorization of biomass for bioenergy generation such as biogas, biodiesel, and bioethanol is crucial for creating renewable energy solutions that lessen reliance on fossil fuels, thereby enhancing energy security and sustainability. Addressing environmental pollution through bioremediation techniques is vital for restoring ecosystems and improving public health, contributing to biodiversity conservation.

Moreover, promoting ecotourism can stimulate economic growth by leveraging natural resources and biodiversity to support local economies and conservation efforts. Integrating One-Health initiatives is essential for recognizing the interconnectedness of human, animal, and environmental health, thereby fostering sustainable development and effective disease prevention. Overall, these strategies collectively contribute to a circular economy that emphasizes sustainability and resource optimization while protecting ecosystems and promoting community well-being.

Strategy 1: Encourage climate smart agriculture (insect farming such as BSF, Sericulture, Mealworm etc)

- Enhancing support for RDI, initiatives and investments engaging in climate smart agriculture

Strategy 2: Encourage the production and utilization of freshwater resources utilization

- Support of RDI, initiatives and investments that promote the production and utilization of freshwater resources

Strategy 3: Enhance the contribution of biowaste in the circular economy

- Invest on supporting Startups, SMEs and industries engaged in exploration, production, commercialization and promotion of biowaste-based organic fertilizers, animal feeds, biochemicals and biopolymers.

Strategy 4: Promote valorization of biomass for bioenergy generation

- Strengthen support for RDI, Initiatives and investments in biomass valorization and bioenergy production and commercialization

Strategy 5: Enhance bio remediation of environmental pollution

- Create enabling policies and regulation on environmental health and safety and support bio-remedy RDI for tackling pollutants

Strategy 6: Ensure sustainable biodiversity conservation and utilization

- Promote eco-friendly livelihood and maximizing carbon sequestration while subsequently mitigating greenhouse gas GHG emission

Strategy 7: Fostering ecotourism development

- Invest in ecotourism development and promotion in a way it guarantees the benefit of local community

Strategy 8: Mainstreaming One-Health initiatives

- Enhance RDI and increase awareness on one-health concept

Strategy 9: Increase employment opportunities

- Encourage the engagement of SMEs and large industries in the sector

3.1.4. (SO4); Research Development and Innovation

The initiative centered on cutting-edge Research, Development, and Innovation (RDI) in bioeconomic development aims to enhance agricultural efficiency through advancements in biotechnological plant productivity and animal genetic reconstitution. By leveraging genetic engineering and molecular techniques, the initiative focuses on improving crop resilience—specifically targeting drought and pest resistance—and enhancing livestock traits through genetic reconstitution.

In addition to plant and animal biotechnology, the initiative emphasizes advancements in microbial genetic engineering to maximize benefits for industrial and medical applications. A key component of this initiative is capacity building, which involves providing resources and training for researchers, farmers, and industry stakeholders to effectively adopt and implement these biotechnological advancements.

The initiative promotes sustainable agricultural practices that not only increase productivity but also minimize ecological impacts, thereby supporting food security and rural development. By enhancing agricultural output, creating market opportunities, and boosting competitiveness, it contributes significantly to the overall bioeconomic landscape.

Furthermore, the initiative encourages collaboration among academic institutions, industry players, and government entities to foster innovation and facilitate knowledge sharing within the biotechnology sector. This collaborative approach is essential for driving forward the RDI agenda and achieving meaningful progress in bioeconomic development.

Strategy 1: Strengthen research that promotes sustainable agriculture, health, industry and environment

- Enhance cutting-edge biotechnology RDI in agriculture, biobased industrial development, assuring safe and sustainable environment and health and wellbeing

3.1.5. (SO5); Awareness Creation and Promote Bioeconomy Activities across Sectors

The initiative emphasizes the critical role of awareness creation and capacity building in the successful implementation of a bioeconomic strategy. By integrating bioeconomy principles into various sectoral policies, the initiative aims to ensure that bioeconomic activities are consistently adopted across different industries.

To achieve this, the initiative will establish platforms dedicated to raising awareness about the benefits and opportunities presented by the bioeconomy. Engaging stakeholders is essential for fostering a collective commitment to sustainability and ensuring that all parties understand their roles in this transition.

Furthermore, the initiative prioritizes enhancing the skills and knowledge of researchers, small and medium-sized enterprises (SMEs), and industries regarding bioeconomic products and services. This capacity building is crucial for empowering these groups to effectively innovate and implement bioeconomic strategies.

To support these efforts, a comprehensive policy framework will be developed, aligning with incentives that encourage participation in the bioeconomy. Additionally, regulatory schemes will be established and operationalized for emerging innovative bioeconomic products and services, ensuring that they meet necessary standards while promoting growth.

Together, these initiatives aim to create a cohesive approach that not only builds awareness but also equips stakeholders with the necessary tools and knowledge to contribute to a resilient and sustainable bioeconomy.

Strategy 1: Facilitate the integration and harmonization of bioeconomy in to different sectors

- Build capacity of different relevant sectors on concepts and significance of bioeconomy in growth and development of national economy

Strategy 2: Facilitate awareness creation platforms for public and youths

- Organize public awareness platform that signify the importance of bioeconomy for sustainable development

Strategy 3: Establish system to promote engagements of youths and woman in bioeconomy through awareness creation, capacity building, financing Research Development and Innovations (RDI) and investment incentive

- Organize youth awareness platforms that signify the importance of bioeconomy innovative entrepreneurship, job creation and for sustainable development
- Provide financial supports to youth's researchers and entrepreneurs

Strategy 3: Improve the capacity on bioeconomy products and services

- Design and implement capacity building training on benefits of bioeconomy-based products and services

Strategy 4: Guidelines, standards and regulation

- Develop, promote and implement policy frameworks and regulations that support enhance the role of bioeconomy in Ethiopian economy

04

Key Strategic Operational Enablers

Strategic operational enablers are required to help translate the strategic intentions into programs, action plans and ultimately into outcomes and impacts. The key enablers for the successful delivery of the National Bioeconomy Strategy includes:

- Proper implementation (and amending as appropriate) of existing policies, legislations, strategies and guidelines put in place to support the development of bioeconomy,
- Enhancing the bioeconomy innovation ecosystem and putting in place startups Act that facilitates the establishments of biobased startups businesses, and SMEs,
- Create an enabling environment to strengthen youth inclusiveness in to different bioeconomic activities that supports innovative, knowledge-based entrepreneurships,
- Capacity development in all areas of bioeconomy;
- Catalyzing relevant and productive partnerships and collaborations to drive bio-innovations and bio-businesses, and
- Effective communication is needed to facilitate coordinated and effective implementation of the bioeconomy strategy.

A summary for each enabler is presented below along with specific examples of interventions that must be undertaken under each operational enabler.

4.1. Policy and Legislation

Policies and legislation that will enhance the creation of demand for bio-based products need to be in place. In line with this, the Ethiopian Government has taken various policy and legislative initiatives for spurring bioeconomy development in the country. To develop a functional bioeconomy in Ethiopia, proper implementation (and amending as appropriate) of existing policies and legislations and putting in place new ones to support the development of bioeconomy is important. Thus, beyond this, the priority intervention areas in policy and legislation initiatives are summarized below:

- The existing regulatory frameworks for intellectual property, access to and use of genetic resources, biosafety and the ethics of biosciences and industrial standards need to be examined and revised so as to keep pace with the rapid technology development.

- Formulation of regulatory framework for food and feed safety and establishment of clear and coherent standards for novel food products.
- Establishment of an Intellectual Property (IP) management system that strikes the right balance between the interests of innovators (including public and private institutions) and the wider public, while still fostering an environment in which creativity and innovation can flourish.
- Public procurement system catalyzing and supporting the development of bio-based value chains and sustainable production need to be developed to ease the current stifling procurement procedures.
- Establishment of regulations that promote the roles of bioeconomy in national economic growth.
- The National Quality Infrastructure (NQIs) needs to be strengthened.

4.2. Capacity Building

Building human and infrastructural capacity for research, entrepreneurship and business development is required to drive strong bioeconomy value chains in Ethiopia. Beyond human capacity and R&D infrastructure, entrepreneurial skills and competencies are critical for innovative ideas to move to commercialization. These include the ability of companies to embrace innovative ideas, and the attitude toward entrepreneurial risk. In addition, new and rapidly emerging technologies will continue to provide opportunities for improving bio-based production and value chains. Thus, Ethiopia needs to further build human and infrastructural capacities to access and harness these strategically important technologies and adapt them to local needs. In line with this, the priority intervention areas in capacity strengthening (both human and infrastructure) are summarized below:

- Enhance capacity in modern biosciences and related technologies
- Bio-based curricula need to be developed at all levels of education
- Build know-how in bioeconomy entrepreneurship at public sector institutions
- Build infrastructure for research and innovations that support bioeconomy
- Strengthening local and community-based bioprocessing structures.
- Establish clusters (comprising R&D, incubation centers, techno-parks, A center of excellence (CoE), scale-up facilities, manufacturing, ICT, import and export)

4.3. Financing

Access to capital and credit facilities under reasonable terms is critical for innovation and for realizing the bioeconomy vision in Ethiopia. Public funding (from national budget allocations and funding agencies) is often the base for R&D efforts in the public sector and academia. But, to successfully bring R&D products or innovation of new bio-products to market, mechanisms to share risks and new funding partnerships including startup funds such as idea and lease financing schemes are necessary, in which innovation, risks and business development costs are borne by several different parties.

Creative financing models will have to be explored. For example, matched funding programs, and venture capital could be developed, in which R&D institutions co-invest with industry partners, thereby ensuring commitment from industry and reducing risks for all parties. In many donor-funded projects, funding remains concentrated in the R&D phase of the innovation cycle, with inadequate provision made for large-scale application and commercialization of technology or products. For innovation to have impact and assist the journey towards a bioeconomy, a range of funding models for sharing costs and raising necessary capital will be needed. Examples include regional and national public sector innovation funds; venture capital; philanthropic investments; blended financing mechanisms, etc. The Ethiopian Development Bank, the African Development Bank (AfDB) and similar other institutions will be appropriate partner in this endeavor.

A summary of financing ecosystem that can fund all stages of the development of products and viable business is as follows: -

- Avail funds in various forms- loans, grants and donations, guarantees, tax incentives, royalty agreements, and internationally generated funds.
- Facilitate co-financing schemes to encourage investment in the biosciences
- Establish venture capital (especially for scaling-up viable startups to commercialization, implement competitive “lab to market” funding and incentives).
- Resource allocation that is in line with the economy will be assigned for the technology generation and adaptation activities of research and higher education institutes.
- A considerable budget in line with the national GDP should be allocated for R&D, innovation and start-ups.

4.4. Communication

Communication plays an increasingly important role in innovation and is particularly important in the development of a bioeconomy. It is not a one-way process, but requires a constant dialogue between science, business and society. Efforts to encourage stakeholders to participate in evidence-based discussions are needed that also allow for discussion of broader issues.

Communication is necessary to build relationships and establish trust and legitimacy with future product-development partners and end-users of the technology. It is also important to obtain information and feedback about preferences and needs from the public and relevant stakeholder groups (such as farmers, agribusiness actors etc.) which can be built into the programmes within the Strategic Thematic Areas to improve the chances of uptake and acceptance of the technology.

The priority intervention areas in communication are listed below:

- Develop an outreach program to help communicate opportunities of bioeconomy via mainstream and social media channels.
- Setup regular and ad-hoc Inter-ministerial groups for communication and coordination of the bioeconomy activities.
- Enhance capacity that improve science communications.

4.5. Youths

Approximately 71% of Ethiopia's population falls under the age of 30 years[8]. This means a significant portion of the population is comprised of young people, which presents opportunities for the country's development. Incorporating youth into the future bioeconomy is crucial for fostering innovation, sustainability, and inclusivity. Here are several strategies to engage and empower young people in this sector:

- Education and Training

[8] Ethiopia's Key: Young People and The Demographic Dividend : Policy Brief ; By Shelley Megquier and Kate Belohlav December 2014

Integrate bioeconomy-related subjects into school and university curricula, focusing on sustainability, biotechnology, and environmental sciences.

Offer vocational courses that provide practical skills in bio-based industries, such as agriculture, waste management, and renewable energy.

- Awareness Campaigns

Organize workshops and seminars to raise awareness about the importance of the bioeconomy and its potential career opportunities.

Utilize social media platforms to engage youth in discussions about the bioeconomy and share success stories.

- Entrepreneurship Support

Create incubators focused on bioeconomy startups, providing resources, funding, and guidance for young entrepreneurs.

Facilitate access to grants, competitions, and investment opportunities for youth-led bioeconomy initiatives.

- Research and Innovation

Offer grants specifically for research projects led by young scientists and innovators in bioeconomy.

Encourage collaboration between universities, research institutions, and youth organizations on bioeconomy projects.

By implementing these strategies, we can empower youth to play a vital role in shaping a sustainable and innovative bioeconomy for the future.

05

Institutional Frameworks, Monitoring & Evaluation

5.1. Institutional Frameworks

Successful implementation of the National Bioeconomy Strategy calls for coordinated action among pertinent government institutions, non-government stakeholders, private sectors and the society at large. Bioeconomy being a multi-sectoral issue, the National Bioeconomy Strategy is to be implemented by different ministries, bodies and agencies of the government, both at the Federal and regional state levels. Besides, nongovernment actors at all levels of administration also play important complementary roles in the course of implementation of the National Bioeconomy Strategy by providing different support services. The private sector also plays a crucial role in implementation of this strategy. Supporting the development and deployment of well-coordinated, functional innovative partnerships and collaborations at national and as appropriate at regional and global levels is needed to create a thriving and sustainable bioeconomy in Ethiopia that leverages on available science, technologies and innovations.

Figure: 4 Provides arrangement of the different bodies that could be involved in the national bioeconomy strategy implementation processes. The illustration below presents relevant stakeholders/actors.

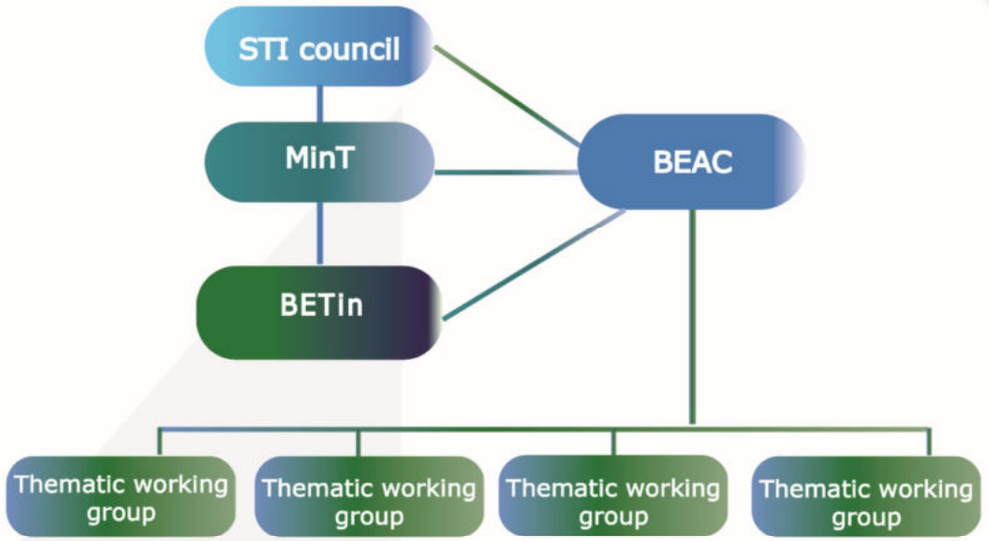

Figure 4: Proposed institutional arrangement for the implementation of national bioeconomy strategy

5.1.1 Duties and Responsibilities of NSTI Council

NSTI Council is the main body that takes the responsibility at the national level to lead, guide and coordinate the overall implementation of the National Bioeconomy Strategy by different stakeholders. The main tasks of the council are:

- Ensure the mainstreaming of the National Bioeconomy Strategy across different macro-economic and sectoral growth strategies of the country as well as its coordination and monitoring mechanisms.
- Approve the nomination of BEAC members (constituted from different ministries, academia, research institutions, private enterprises, associations, and development partners) which will provide technical support to NSTI council. BEAC members will be organized based on based on the recommendations of MinT and BETin.
- Providing support to create a favorable environment for the development of operational enablers that support the implementation of strategic issues.
- It will support the initiation and identification of national programs, projects and guidelines that enhances the implementation of the strategy; follow up, evaluate and set directions for their implementation in each sector;
- It will ensure the allocation of appropriate finance and resources required for the implementation of strategy;
- Ensure coordination and collaboration among different stakeholders within and outside of government to prevent the duplication of research work and resource waste;
- It will serve as an advisory body to the government on issues pertaining to bioeconomy related matters;
- Revision the provisions of the National Bioeconomy Strategy as deemed necessary. This may include prioritizing, sequencing, and addition and/or deletion of particular aspects of the National Bioeconomy Strategy.

The NSTI Council shall be assisted by MInT and BETin, which will provide secretariat and technical supports, respectively in running its regular activities in relation to implementation of this strategy.

5.1.2 Roles of MinT

The MInT is mainly responsible to lead an integrated and coordinated implementation and oversight on strategic outcomes at the national level.

- MInT, with support from NSTI Council and BEAC, will provide executive leadership and oversee the implementation of the activities. In doing this, MInT and the NSTI Council will ensure effective governance that fosters coordination and collaboration among stakeholders and enhances participation, transparency and alignment with relevant sectoral policies.
- Approve the nomination of BEAC members (constituted from different ministries, academia, research institutions, private enterprises, associations, and development partners) which will provide technical support to NSTI council. BEAC members will be organized based on the recommendations of MinT and BETin.

5.1.3 Bioeconomy Advisory committee

The BEAC will be established to ensure that the program focuses on national priorities and promotes coordination between the different components of the national biobased research, development and innovation ecosystem. The BEAC will have members to be recruited from a diverse group of institutions (academia, civil society, the research institutes, the industry and concerned government offices) by considering the four thematic areas of the strategy.

The BEAC will:

- Be an advisory body appointed by the Ministry of Innovation and Technology via the recommendation of BETin,
- Oversee and provide support in the implementation of this national bioeconomy strategy
- Ensure that the implementation by the various actors is aligned with national priorities
- Identify national bioeconomy priorities, in addition to those mentioned in this document
- Recommend to MInT/BETin and other funding agencies, the appropriate programs and expenditure on bioeconomy in the country
- Promote the investment of venture capital in relation to bioeconomy and the search for industrial partners,

- Support in resource mobilization for bioeconomy program implementation (skills, funds and facilities)
- Facilitate and advice on forging collaboration and partnerships with proper regional and international partners, and
- Establish a sub-technical advisory committee for agricultural, medical, industrial and environmental biotechnology, and biosafety.

5.1.4 Roles of BETin

BETin is a national research institute legally mandated to initiate policies and strategic documents in light with the government priority agendas and programs. Hence, BETin has initiated the devolvement of the national bioeconomy strategy since 2022 together with other relevant stakeholders. Therefore, BETin plays a crucial role in the implementation of the national bioeconomy strategy by contributing to various aspects. Here are some key roles that the BETin may play:

- As a technical advisory body to MinT and NSTI council related to;
  - Effective, integrated and coordinated implementation, monitoring and evaluation (M & E) of bioeconomy activities at the national level,
  - Nomination and how BEAC members would be organized.
- As a secretariate for BEAC
- Support in resource mobilization for bioeconomy program implementation (skills, funds and facilities).

5.1.5 Roles of Sectorial Government Organizations

Efficient implementation of the National Bioeconomy Strategy needs the coordination and collaboration of all sectoral government organizations. This group, which includes organs of the federal and regional sectoral governments and local administrations, is charged with the responsibility to perform the following major tasks in the implementation of the strategy.

- Responsible for implementing the strategic issues related to their sectors.
- Coordinate the current institutional arrangements in terms of their mandates, functions, and activities with respect to bioeconomy-related issues.

- Strengthen key research infrastructures institutions' mandates to support the implementation of the strategy and encourage collaboration both regionally and nationally.
- Build capacity of participants at each level to successively enhanced bioeconomic development.

5.1.6 The Role of Other Research Institutes and Higher Learning Institutes

Research institutes and higher learning institutes should play a major role in the development of the bioeconomy. As a result, it's critical to give research institutes the opportunity to be integral to the expansion of bioeconomy development initiatives. Consequently, the research institutions' and higher learning institutes' roles in implementation of this strategy will be as follows: -

- Undertake various bio-based R&D projects that can meet economical and societal demands by establishing a modern, problem-solving, competitive and robust research and development system.
- Ensure the accessibility on bio-based research outputs by transforming them into products and services.
- Establish a collaboration and network to link stakeholders focused on bio-based research and development work.
- Ensuring the accessibility and distribution of science-based information to develop demand-driven bio-based products.

5.1.7 The Role of the Private Sector

The role of the private sector should be high in bioeconomy development activities. Therefore, it is important to enable the private sector to play a leading role in the growth of bioeconomy development activities. Thus, the role of the private sector will be as follows: -

- Play a leading role in promoting a culture of entrepreneurship that is essential for the growth of bioeconomy development activities through the establishment and development of bio-based micro, small, medium-scale and large enterprises.

- Besides, the private sector will play a major role in the implementation and execution of problem-solving market-oriented research, expansion of infrastructure projects, resource allocation, and the production of bio-based products and services.

5.1.8 Role of Other Stakeholders

Efficient implementation of the national bioeconomy strategy needs the collaboration of all participants in the economic sector as well as the overall society. The term "other stakeholder" refers to representatives from non-government organizations, financial institutions, media, society and other related participants that are directly or indirectly involved in the various activities of bioeconomic-related developments. Thus, the role of other stakeholders will be as follows;

- To build an understanding, create awareness and strengthen the dialogue amongst the key actors and the general public about the concept of a bioeconomy, as well as its contribution to the national development plan.
- Facilitate access to appropriate capital, financing and credit facilities to support the implementation of priority strategic initiatives that deliver the delivery of national bioeconomy outcomes.
- Provides appropriate support in terms of building human and infrastructural capacity for research, entrepreneurship and business development required to drive strong bioeconomy value chains in the country.

5.2 Implementation Modality

Following discussions at the Cabinet and ultimately its adoption, implementation of the national bioeconomy strategy shall be facilitated through the following modalities:

- Establishing appropriate structure (bioeconomy advisory committee) with in NSTI Council. The coordination and facilitation role of national bioeconomy strategy implementation is to be undertaken by the NSTI Council. Thus, establishing appropriate structure in form bioeconomy advisory committee with in NSTI Council is an important milestone before embarking on the implementation of the strategy.
- As an essential element in the strategy implementation process, it is necessary to have a shared understanding of the bioeconomy strategic issues and its outcomes and strategic intervention areas for achieving such outcomes. This could be done through workshops organized by the MinT and BETin with relevant stakeholders with whom the core strategic issues and intervention areas are discussed and communicated, possibly with some amendments if deemed necessary. At this level, a checklist of issues needs to be provided to different sector and macroeconomic policymaking institutions (and on a regular basis afterward) to ensure that basic bioeconomic strategic issues are taken into consideration in their strategy and development plan formulation process.
- Establish a coordination mechanism among key bodies such as MinT, MoA, MoI, MoTRI, MoLS, MoF, MoP, etc and other relevant ministries with clearly defined roles and responsibilities in terms of strategy implementation, data collection, data analysis, and information exchange and dissemination. Similarly, it is of paramount importance that pertinent federal institutions and their regional counterparts are on board in the course of implementing the national bioeconomy strategy;
- Put in place a well-functioning M&E system consistent with the national Ten Years Development Plan M&E system that is functionally linked down to the grass root level that generate information both ways (bottom-up and top-down) to be able to regularly compute indicators of bioeconomy outcomes.

5.3 Monitoring and Evaluation of Strategy

A system will be established for the regular monitoring and evaluation of the success and synergy of the mission, objectives and goals of this strategy. The NSTI Council will monitor and evaluate the performance and outcome of this strategy every two years of the strategy implementation period (2025 -2030 GC). To this end, a monitoring and evaluation framework should be devised by the NSTI Council.

Progress in the implementation of the national bioeconomy strategy needs to be tracked and monitored on a regular and continuous basis to provide feedback to policymakers and planners through the NSTI Council. Such feedback information is of paramount importance for those concerned institutions responsible for the implementation of the strategies. Identification of the problems in a situation where strategies are not implemented as desired helps to devise appropriate mechanisms to address implementation gaps. This is to ensure that the targets of the bioeconomy strategy and the action plan for bioeconomy will be achieved.

The impacts of the national bioeconomy strategy shall be evaluated using established key performance indicators (see Annex I) to determine its effectiveness in meeting the strategic objectives (SO1; SO2; SO3; SO4; SO5).

5.4 Strategy Review

Similar to other strategies, the bioeconomy strategy is dynamic and can be revised in response to current developments and changes in the external environment. Economic structural transformations and shifts in government policy, along with insights gained from monitoring and evaluation (ME) results, may necessitate a beneficial review.

Therefore, the strategy review process should leverage ME findings while also taking into account the contemporary and emerging social, political, and economic contexts both domestically and globally. The NSTI Council will be responsible for overseeing the strategy review process.

Annex 1: Strategies, Activities, Outputs, KPI and Responsible Institutions

SO1: Value-addition and Employment Creation												
Strategy	Activity	Output	Key Performance Indicators	BL	Y-1	Y-2	Y-3	Y-4	Y-5	Y-6	Estimated Budget for 6-Ys ($ 10^6)	Responsible Institution(s)
1: Maximize the potential use of underutilized food, feed source crops and animals	Enhance RDI on underutilized food sources	Financed RDI on underutilized plant and animal food sources	No. of underutilized food crops identified and customized	0	5	10	10	10	10	12	1	MoA, ATI EIAR, BETin, Regional ARI
			No. of underutilized animals identified and customized (fish & poultry)	0	2	2	2	3	3	6	0.75	
	Promoting economic and nutritious benefits of underutilized food sources	Promotion and advocacies performed	No. of promotion performed	1	1	2	2	2	2	2	0.25	MoA, MoH, BETin, EPHI, ATI, EIAR, Regional ARI
2: Enhance production of bio-based agricultural inputs	Establish system to promote the utilization of biofertilizer, bio-stimulants (biopesticides, bioherbicides & bioinoculants) through financing, investment incentive, research grants and, market linkage	Financial support provided for startups on biobased agricultural inputs	Amount of financial support offered (1K$)	0	500	1000	1250	1500	1750	2000	-	MInT, MoLS, MoF, BETin, HLIs
			Volume of bio-stimulants employed in agricultural production (m^3)	0	0.125	0.25	0.5	1	1.5	2	1	
			No of market linkage platforms organized	2	2	2	2	2	2	2	0.83	MoT, MInT, MoLS
			Proportion of standardized biofertilizer utilized (%)	20	25	30	35	40	45	50	20	MoA, MoH, BETin, ATI, EIAR, Regional ARI
		Investment incentives provided	No of investments engaged in biobased agricultural inputs production	2	1	1	1	1	1	1	3	MoF, MoI, MoT
		Research fund mobilized	Amount research fund mobilized for biobased agricultural inputs production (K$)	10	15	20	25	30	35	40	-	BETin, MInT, EIAR and regional ARI, HLIs
		Awareness and capacity building	No of farmers and cooperatives attended the training	3000	5000	10000	15000	25000	30000	45000	2,2	MoA, EIAR, MoLS, BETin, HLIs
	Establish system to promote the	Advanced RDI to support for animal	No of new animal feed products developed	2	2	2	4	5	8	10	15.5	MoA, BETin, MInT, EIAR and regional ARI,

	utilization of animal feeds through bio innovative researches, and grants, financing, investment incentive and, market linkage	feed production	No of IP granted	2	2	2	4	5	8	10		HLIs
			Amount of grants for research projects (10^6)	-	1	1	2	2.5	4	5		
			No of research articles published	-	2	2	4	5	8	10		
			No of startups engaged in premix development	-	1	1	1	1	1	2	7	
		Improved investment incentives	No of investors attracted to the sector	0	2	1	1	1	2	2	36	MoF, MoI, MoT, MInT
			Amount of improved feed produced locally through bio innovative technologies (kgs)									
			Increase in premix import substitution (%)	0	5	7	9	12	15	20	-	
			No of SMEs engaged in improved feed production	0	2	2	3	5	5	10	0.37	
			No of new industries engaged in improved feed production	-	-	1	3	1	2	1	16	
			No of market linkage opportunities created to investors	2	2	2	2	2	2	2	0.6	
		Capacity building and awareness creation	No of capacity building and awareness schemes organized	-	2	2	2	2	2	2	0.6	MoA, BETin, MInT, EIAR and regional ARI, HLIs
			No of attendees on capacity building programs	-	12	9	9	9	9	12	0.03	
3: Promote indigenous knowledge and bio-based traditional medicines, biopharmaceuticals and biosimilars development	Establish the development and utilization of herbal medicines, biopharmaceuticals and biosimilars through financing, investment incentive, awareness creation, capacity building and research grants	Financial support provided for startups on engaged in herbal medicine, biopharmaceuticals and biosimilars	No. of startups engaged in traditional medicine	0	-	-	1	1	2	1	5	MoH, EPHI, AHARI, MoF, MoI, MoT, MInT, HLIs
			No. of certified traditional medicine service providers	-	-	-	1	1	1	1		EIPA, EFDA, AHARI, EPHI, MoH
			No of IP granted	-	-	-	1	1	1	1		
			No. of research projects granted		3	4	6	6	8	10	9.2	MoH. AHARI, EPHI, MInT
		Investment incentives provided	The number of investments engaged in herbal medicine / wellness products	1	2	2	2	2	2	2	1.2	MoF, MoI, MoT, HLIs
			No. new botanical garden established	5	2	2	2	3	4	2	7.5	MoH, MInT, MoA, EIAR, regional ARI, HLIs
			No. of newly developed and commercialized herbal medicines	5	1	2	3	2	3	2		MoLS, MInT,
		Awareness creation platforms organized	No of databases established on herbal medicine	-	1	-	-	1	-	1	1	MoH, MInT,

		and capacity building trainings provided	No of ICT supports rendered (market linkage created, software programs developed)	-	2	2	2	2	2	2	2.4	MInT,HLIs,
			No of capacity building trainings offered to practitioners on processing technologies	-	1	1	1	1	1	1	0.35	MInT, BETin,
			No of public awareness creation platforms organized	-	2	2	2	2	2	2	1.8	EIPA, EFDA, AHARI, EPHI, MoH
		Enhanced RDI on traditional medicines development	No of research projects granted	-	6	10	14	18	22	26	4.8	MoH, EPHI, AHARI, MoA, BETin, MInT, EIAR and regional ARI, HLIs
			No of scientific articles published	-	3	7	8	9	8	9		
			No of survey conducted on traditional medicine	-	2	-	2	-	2	-	0.6	
4: Promote the development and commercialization of bio-based cosmetics and well-being products	Establish system to that supports development and commercialization of bio-based cosmetics and well-being products through RDI, awareness creation, capacity building, financing, and investment incentives.	Enhanced RDI on bio-based cosmetics and well-being products	Amount of budget allocated for RDI (K$)	-	75	100	125	150	150	200	-	
			No of projects granted	-	3	5	7	12	17	19	0.7	
			No of scientific articles published	-	1	4	5	9	14	16		
			No. of new biocosmetics products developed	-	5	10	12	14	16	18		
			No of startups engaged	-	3	5	7	9	10	9	20	
		Supports provided for SMEs and industries engaged on bio-based cosmetics and well-being products	No of SMEs engaged	-	2	3	5	7	9	7	0.42	MoLS, MoTRI, MoI, MInT, MoF, BETin, HLIs
			No of new investors joined the biobased cosmetic and well-being sector	-	-	-	-	1	1	1	3	
			No. of new biobased cosmetics and personal wellness products developed and commercialized	-	3	5	7	9	11	14		
		Awareness creation platforms organized and capacity building trainings provided	No. of IP certification granted	-	3	5	7	9	11	14		EIPA, EFDA, AHARI, EPHI,
			No. of database established	-	1	-	1	-	1	-	1	MInT, MoH, MoA,
			No of capacity building trainings on processing technologies	-	-	2	2	2	2	2	0.5	BETin, MInT, EIAR and regional ARI, HLIs
			No of awareness creation and marketing platforms (Mobile apps, showcases) created	-	-	2	2	2	2	2	0.75	MoLS, EFDA, AHARI, EPHI MoT, MoI, MInT, MoF, BETin, HLIs
5: Increase employment opportunities	Encouraging the engagement of SMEs and large industries in value added products	Jobs created by established SMEs. Startups and industries	No. of new job opportunity by Startups	-	7	7	14	14	21	21		MoLS, MoTRI, MoI, BETin, MInT. MoF.
			No. of new job opportunity by SMEs	-	60	75	135	195	225	270		
			No. of new job opportunity in industries	-	225	270	360	315	405	270		

SO2: Bio-based Industrial Development												
Strategy	**Activity**	**Output**	**Key Performance Indicators**	**BL**	**Y-1**	**Y-2**	**Y-3**	**Y-4**	**Y-5**	**Y-6**	**Estimated Budget for 6-Ys ($ Million)**	**Responsible Institution(s)**
1: Enhance Agro-processing industries	Encouraging processing industries engagement in value added and novel food production	Industries engaged in value addition	No. of processing industries engaged in production of value-added agricultural products	137	20	40	40	40	60	100	1500	IPDC, EIC, MoTRI, MoI, BETin
			Amount of revenue generated from export of value-added products (Billion $)	1.8	0.26	0.52	0.52	0.52	0.78	1.3	-	
		Improved engagement in novel food processing	No of industries engaged in novel food production	-	-	1	1	1	1	1	5	
			No. of novel foods produced	-	-	2	2	2	2	2	-	
	Enhanced capacity building trainings for value chain actors about postharvest loss, product quality and safety	Enhanced tailored made capacity building trainings for value chain actors	No of GAP trainings offered (RTC)	-	8	8	8	8	8	8	2.4	ESI, ECAE, EFDA, BETin, ENAO, IPDC, EIC, MoTRI, MoI,
			No of GMP trainings offered	-	8	8	8	8	8	8	2.4	
		Encourage the establishment of quality testing facilities	No of product quality testing facilities available within the agro-processing industry		1	1	1	1	1	1	6	
2: Promote the production of microbial starter culture , enzymes and fermented proteins	Establish system to promote the utilization of local microbial starter culture and enzymes or fermented protein through financing, investment incentive, research grants, RDI and infrastructure development	Enhanced supports for investors	The number of investments engaged	-	-	1	2	3	4	5	15	MoF, IAIPs, EIC, MoTRI, MoI, ESI, ECAE, EFDA,
			No. of starter culture or enzyme technologies commercialized	-	-	1	2	3	4	5		
			Import substitution (%)	0	0	7	9	14	18	20		
		Research fund and infrastructure available (like bioreactor, lyophilizer etc)	No of startups got financial support	-	5	6	10	16	20	30	1	MoLS, MInT, BETin, HLIs,
			No of projects engaged on fermented protein as food supplement or additives	-	1	1	2	2	2	1		MInT, BETin, HLIs, EIAR
			No. of advanced pilot scale laboratories with full facilities	-	1	1	1	1	1	5		HLIs, BETin,
			No. of gene bank facilities to sustain potential microbes	-	1	1	1	1	1	1	6	EBI, BETin, EIAR, HLIs,
3: Encourage the production of industrial inputs such as bio-chemicals & biopolymer locally from renewable resources	Promote the Industrial scale production and utilization bio-chemicals (antioxidants, antimicrobials, collagen, gelatin, carbon based nano compounds, hydroxyapatite etc) through RDI, financing and investment incentives.	Enhanced RDI in biochemical development	No. Research project projects granted	-	3	4	6	8	9	10	40	MoI, MoLS, MInT, BETin, HLIs,
			No of new biochemicals developed	-	2	3	5	7	8	9		
			No of startups engaged in biochemical development	-	1	2	4	6	7	8		
		Enhanced investment in biochemicals production and commercialization	Number of new industries involved	-	-	-	1	3	1	1	6	MoI, MoLS, EIC, MoTRI, MoF
			No. new biochemicals developed and commercialized	-	-	-	1	3	1	1		
			Percentage of import substation (%)	-	-	-	2	6	9	11		
	Promote the production and commercialization of biopolymers (polysaccharides, fibers, cellulose, casein, gluten etc) production from biomass through RDI, financing and investment incentives.	Enhanced RDI in biopolymers development	No. Research projects granted	-	3	4	6	8	9	10	50	MoI, MoLS, MInT, BETin, HLIs,
			No of new biopolymers developed	-	2	3	5	7	8	9		
			No of new startups engaged in biopolymer development	-	1	2	4	6	7	8		
			No of research articles published	-	3	4	6	8	9	10		
		Enhanced investment in biopolymer production and commercialization	No. industries engaged in biopolymers production	-	-	-	1	3	1	1	60	MoI, MoLS, EIC, MoTRI, MoF
			No. new biopolymers developed and commercialized	-	-	-	1	3	1	1		
			Percentage of import substitution	-	-	-	2	6	9	11		
4: Increase employment opportunities	Encouraging the engagement of SMEs and large industries in value added products	Job created and, SMEs and Startups established	No. of new job opportunity by Startups	-	49	70	126	210	203	252		IPDC, MoI, MoLS, EIC, MoTRI, MoF
			No. of new job opportunity in industries	-	1500	3150	3375	3750	5025	8100		

SO3: Circular Economy and Sustainable Environment												
Strategy	**Activity**	**Output**	**Key Performance Indicators**	**BL**	**Y-1**	**Y-2**	**Y-3**	**Y-4**	**Y-5**	**Y-6**	**Estimated Budget for 6-Ys ($)**	**Responsible Institution(s)**
1: Encourage climate smart/ resilient agriculture (insect farming such as BSF, Sericulture, Mealworm etc)	Establish system to promote the production and utilization of insects through awareness creation, capacity building, financing, RDI and investment incentive	Enhanced RDI in insect technologies	No of research projects granted	-	5	8	11	14	18	20	2.3	EIAR, BETin, MoA, MInT, HLIs
			No of startups engaged in insect-based technologies	-	3	5	9	12	16	18		
			No of research articles published and knowledge disseminated	-	4	7	10	12	16	18		
		Investment in insect-based technologies	No, of SMEs engaged	-	7	12	17	22	27	33	1.2	MoLS, MoA, MInT, BETin, MoI, MoF, ESI, EFDA, ECAE, EIC
			No of insect-based products developed and commercialized	-	2	3	7	10	14	14		
			No of industries established	-	-	-	1	1	1	1	4	
		Enhanced awareness and capacity built	No of trainees participated in capacity building workshops	-	260	260	260	260	260	260	0.86	MoLS, MoA, MInT, BETin, MoI,
			No of public awareness organized	-	650	650	650	650	650	650	0.15	
2: Encourage the production and utilization of freshwater resources	Establish system to promote the production and utilization of freshwater resources through awareness creation, capacity building, financing, RDI and investment incentive	Enhanced RDI in freshwater resources development	No of research projects granted	-	-	-	1	1	1	2	0.1	EIAR, Regional ARI, BETin, MoA, MInT, HLIs
			No of research articles published	-	-	-	1	1	1	2		
			No of new food products developed	-	-	-	1	1	1	2		
		Investment in freshwater resources	No, of SMEs engaged in freshwater resources development	-	-	1	4	5	7	10	0.4	MoLS, MoA, MInT, BETin, MoI,
			No of freshwater resources-based foods developed and commercialized	-	-	-	1	1	1	2		
		Enhanced awareness and capacity built	No of trainees attended in capacity building workshops	-	30	50	60	70	80	100	0.24	
			No of public awareness organized	-	650	650	650	650	650	650	0.15	
3: Enhance the contribution of biowaste in the nation economy	Encourage production and utilization of organic fertilizer from biowastes	Enhanced RDI	No of research projects granted	-	3	5	7	9	11	13	0.12	EIAR, Regional ARI, BETin, MoA, MInT, HLIs
			No of scientific articles published	-	1	3	5	7	9	11		
			No startups established	-	-	2	3	5	8	12		
			No of new technologies developed	-	-	1	1	2	2	3		
		Increased investment in waste valorization	No of SMEs engaged	-	-	2	3	5	8	12	0.45	MoLS, MoA, MInT, BETin, MoI, EIC
			No of industries involved in biowaste valorization	4	3	4	6	7	8	12	40	
			% of organic fertilizer substituted	-	2	3	5	6	7	10		
		Enhanced awareness and capacity	No of trainees attended in capacity building training	-	260	260	260	260	260	260	0.86	EIAR, Regional ARI, BETin, MoA, MInT, HLIs
			No of market linkage platforms and showcases established	-	13	13	13	13	13	13	3	
	Encourage production and utilization of animal feeds from biowastes	Enhanced RDI	No of research projects granted	-	3	5	7	9	11	13	4.8	EIAR, Regional ARI, BETin, MoA, MInT, HLIs
			No of scientific articles published	-	1	3	5	7	9	11		
			No startups established	-	-	2	3	5	8	12		
			No of new technologies developed	-	-	1	1	2	2	3		
		Increased investment in waste valorization	No of SMEs engaged	-	-	2	3	5	8	12	0.36	MoLS, MoA, MInT, BETin, MoI, EIC
			No of industries involved in biowaste valorization to animal feeds	4	3	4	6	7	8	12	44	
			Amount of animal feed produced from biowaste (tons)	-	40	60	80	100	125	140		
		Enhanced awareness and capacity	No of capacity building training organized	-	260	260	260	260	260	260	0.86	MoLS, MoA, MInT, BETin, MoI, EIC
	Promote the Industrial scale production and utilization bio-chemicals (antioxidants, antimicrobials, collagen, gelatin, carbon based nano compounds, hydroxyapatite etc) through RDI, financing and investment incentives.	Enhanced RDI in biochemical development	No. Research project projects granted	-	2	3	5	7	9	10	3.6	MoI, MoLS, MInT, BETin, HLIs
			No of startups engaged in biochemical development	-	-	1	2	4	5	5		
			No of new biochemicals developed	-	1	2	4	6	7	8		
		Enhanced investment in biochemicals production and commercialization	Number of new industries involved	-	-	-	1	1	1	1	4	MoI, MoLS, EIC, MoTRI, MoF
			No. new biochemicals developed and commercialized	-	-	-	1	3	1	1		
			Percentage of import substation (%)	-	-	-	1	4	6	8		
	Promote the production and commercialization of biopolymers (polysaccharides, fibers, cellulose, casein, gluten etc) production from biomass through RDI, financing and investment incentives.	Enhanced RDI in biopolymers development	No. Research projects granted	-	2	3	5	7	8	9	3.4	MoI, MoLS, MInT, BETin, HLIs,
			No of new startups engaged in biopolymer development	-	1	2	4	6	7	8		
			No of new biopolymers developed	-	1	2	4	6	7	8		
			No of research articles published	-	3	4	6	8	9	10		
		Enhanced investment in biopolymer production and commercialization	No. industries engaged in biopolymers production	-	-	-	1	3	1	2	7	MoI, MoLS, EIC, MoTRI, MoF
			No. new biopolymers developed and commercialized	-	-	-	1	3	1	1		
			Percentage of import substitution	-	-	-	1	5	8	9		
4: Promote valorization of biomass for bioenergy generation	Creates valorization system to convert waste biomass into efficient heat and steam energy sources	Enhanced RDI on energy efficient technology development	No of research projects granted	-	4	6	8	12	14	16	3	MInT, BETin, EPA, MoWE
			No. of startups established	-	2	4	6	8	11	14		
			No of scientific publications	-	3	5	7	11	13	15		

	through RDI, financial support, capacity building and investment incentives,	Increased investment in waste valorization for energy production	No. of bioenergy SMEs established	-	1	3	5	6	7	9	4	MoI, MoLS, EIC, MoTRI, MoF
			Amount of investment engaged in waste valorization for bioenergy production	-	-	-	1	1	1	1		
			No. of energy efficient technologies developed and commercialized	-	1	3	6	7	8	10		
		Enhanced awareness and capacity building	No of awareness and capacity building schemes organized	-	-	20	20	25	25	30	0.024	MInT, BETin, EPA
	Promoting utilization of marginal/inarable land for energy crops production	Enhanced RDI	No of research projects granted	-	5	10	15	20	25	25	5	MInT, BETin, EPA, HLIs
			No. of startups established	-	-	2	4	6	8	10		
			No of scientific publications	-	3	5	7	11	13	15		
		Increased investment in waste valorization for energy production	No. of SMEs established on energy crop cultivation	-	-	1	3	5	7	9	3.5	MoTL, ECAA, MoI, MoLS, EIC, MoTRI, MoF
			Amount of investment engaged in waste valorization for bioenergy production	-	-	-	-	1	1	1		
			No. of energy efficient technologies developed and commercialized	-	-	-	-	1	1	1		
	Creates valorization system to convert waste biomass into biofuel through RDI, financial support, capacity building, investment incentives and recognitions	Enhanced RDI	No of research projects granted	-	1	3	5	7	9	11	3.6	MInT, BETin, EPA, HLIs
			No of new technologies developed	-	1	2	4	6	8	10		
			No of research articles published	-	1	2	4	6	8	10		
		Increased investment in waste valorization	No of investors attracted to biofuel sector	-	1	2	2	3	5	7	20	MoTL, ECAA, MoI, MoLS, EIC, MoTRI, MoF
			Percentage of import substitution	-	-	1	2	3	4	6		
			No, of attendees participated in the capacity building training	-	20	40	40	40	40	40	0.22	MInT, BETin, EPA, MoLS
	Creates valorization system to convert waste biomass into the production and utilization of the production and utilization of biogas through RDI, financial support, capacity building and investment incentives	Enhanced RDI	No of research projects granted	-	3	5	7	9	11	13	4.8	MInT, BETin, EPA, HLIs
			No of research articles published	-	1	3	5	7	9	11		
		Increased investment in waste valorization	No of investors attracted	-	-	1	1	1	1	1	5	MoTL, MoWE, MoI, MoLS, EIC, MoTRI, MoF
			No of improved biogas technologies developed and commercialized	-	-	1	1	1	1	1		
			Increase in percent of households using biogas technologies	-	0.5	1	1.5	2	2.5	3		
		Enhanced awareness and capacity	No. of awareness platforms		200	400	400	400	400	400	2.2	MInT, BETin, EPA, MoLS,
5: Enhance bio	Reduce the impacts	Improved	No of projects granted	-	-	2	2	2	3	3	0.25	EPA, MInT, BETin,

remediation of environmental pollution	of pollutant using biological agents through innovative researches, regulation, capacity building	research and innovation	No of startups working on bioremediation	-	-	-	1	1	2	2		HLIs
			No of bioremediation technologies developed	-	-	-	1	1	1	1		
			No of research articles	-	-	1	1	1	1	1		
		Investment	No. of industries engaged in development of bioremediation technology	-	-	1	1	1	1	1	5	EPA, MoI, MoF,
			No. of bioremediation technologies adopted and commercialized	-	-	1	1	1	1	1		
6: Ensure sustainable biodiversity conservation and utilization	Strengthen biodiversity conservation	Enhanced RDI	No of projects granted	-	-	2	3	4	5	6	2	EFD, EWCA, EPA, EBI, BETin, MInT, MoF, HLIs
			No of research articles published	-	-	1	2	3	3	5		
		Improved biodiversity conservation	No. of genetic resource conservation sites	-	-	1	1	1	1	1	6	
			No. of full genome sequencing systems established	-	-	1	1	1	1	1		
			No. of ecological park built.	-	-	-	1	-	1	-		
		Enhanced awareness and capacity	No. of participants attended awareness rising and capacity building trainings	-	3000	4000	4000	4000	4000	4000	0.84	
			No. of biodiversity ICT system established	-	1	1	1	1	1	1		
		Improved carbon sequestration scheme	Land cover change due to green legacy and other initiatives (%)	-	2.5	3.5	4.5	5.5	6.5	7.5	40	
			No. of seedlings planted (billion)	7.5	8.5	9.5	10.5	11.7	12	13		
			Amount of carbon sequestrated (million metric tons CO_2E) (million metric tons)	-	0.8	1.6	2.4	3.2	4	4.8		
			Greenhouse gas emission reduction million metric tons equivalent (CO2E)	-	98.7	106.3	120.5	134.4	148.4	162.3		
			Income generated from carbon trading ($) (million $)	-	16,7	33.4	50.1	66.8	83.5	100		
7: Fostering ecotourism development	**E**nhance the roles of ecotourism on the national economic development	Increased investment on eco-tourism destinations	No of eco-tourism destination sites	-	1	1	1	1	1	1	120	ERA, MoCT, EIC, MoLS
			No of employment created	-	400	400	400	400	400	400		
		Infrastructures developed	Road construction (km)	-	300	400	400	500	600	600		
		Awareness creation and	No of local tour guides received training	-	50	60	70	80	90	100	0.09	

		capacity building	No of local community participated in awareness creation platforms	-	3000	4000	4000	4000	4000	4000		
8. Mainstreaming One-Health initiatives	Enhancing integrated human, animal and environmental health program	Enhanced RDI	No of funded research projects	-	10	15	20	25	30	35	135	MoH, MoA, EPHI, EPA, BETin, HLI, MInT
			Number of publications	-	8	13	18	23	27	32		
			Number technologies developed	-	-	1	1	2	1	1		
		Capacity building and awareness creation	No participants attended the capacity building training	-	25	35	50	50	50	50	0.13	
			Public awareness stages organized	-	3000	4000	4000	4000	4000	4000		
9: Increase employment opportunities	Encouraging the engagement of SMEs and large industries in the sector	Job created and, SMEs and large industries	No. of job created by large industries		700	1200	2000	2600	2800	3900		MoI, MoLS, EIC, MoTRI, MoF
			No. of job created by SMEs		135	330	540	750	1020	1350		
			No. of job created by Startups		42	126	224	329	455	567		

SO4: Research, Development and Innovation (RDI)												
Strategy	**Activity**	**Output**	**Key Performance Indicators**	**BL**	**Y-1**	**Y-2**	**Y-3**	**Y-4**	**Y-5**	**Y-6**	**Estimated Budget for 6-Ys ($)**	**Responsible Institution(s)**
1: Strengthen research that promotes sustainable agriculture, health, industry and environment	Conduct applied research aimed at improving plant productivity	Improved plant varieties	No of plant varieties released from research	24	14	18	24	28	30	34	2.92	EIAR, BETin, MoA, MInT, HLIs, Regional ARI, ATI
			No of Genome edited plant varieties commercialized	-	-	-	-	1	1	1		
	Augment biotechnology RDI capacity and infrastructures	Enhanced national plant biotechnology RDI capacity and infrastructures	No of advanced plant biotechnology laboratories and facilities	-	-	-	2	1	1	1		
			Grant mobilized for research	-	0.24	0.36	0.48	0.56	0.6	0.68		
			No of articles published	-	12	16	22	26	28	32		
	Conduct applied research aimed at improving animal productivity through animal breeding, genetic reconstitution and chicken AI	Improved animal breeds	No of local breed animal with improved traits	-	-	1	1	1	1	1	53.5	
			No of genetically reconstituted animal	-	-	-	1	1	1	1		
		Enhanced national animal biotechnology RDI capacity and infrastructures	No of trained community members	-	-	50	100	150	200	250	2.5	
			No of advanced animal biotechnology laboratories and facilities	-	-	-	2	1	1	1		

SO5: Awareness Creation and Promote Bioeconomy Activities Across Different Sectors												
Strategy	**Activity**	**Output**	**Key Performance Indicators**	**BL**	**Y-1**	**Y-2**	**Y-3**	**Y-4**	**Y-5**	**Y-6**	**Estimated Budget for 6-Ys ($)**	**Responsible Institution(s)**
1. enhance the Integration and harmonization of bioeconomy in different sectors	Conduct awareness creation workshops to policymakers on bioeconomy and its benefits	Tailored awareness creation programs to policymakers	No of relevant participated	-	42	42	42	42	42	42	0.24	BETin; MInT, HLIs
2.Emproved awareness creation platforms for public	Conduct public awareness on biobased natural resources	Improved public awareness on biobased products and services	No of public awareness platforms created	-	2	2	2	2	2	2		
			No of community participants	-	200	200	200	200	200	200		
3. Establish system to promote engagements of youths in bioeconomy through awareness creation, capacity building, financing, RDI and investment incentive	Conduct short and long-term youth awareness creation and capacity building trainings about bioeconomy and biobased natural resources Provide financial supports to youth's researchers and entrepreneurs	Improved engagements of youths in to biobased innovation, research and entrepreneurships supporting the bioeconomy	No of youths who participated in awareness creation and capacity building trainings	-	2000	2000	2000	2000	2000	2000	12	MoLS, BETin; MInT, HLIs; MoI, MoTRI
			No of youth's research projects granted	-	10	20	30	40	50	60		
			Number of financial supports for biobased youth entrepreneurships ($million)	-	1	1	2	2	2	2		
4.Improve the capacity on bioeconomy products and services	Conduct trainings on bioeconomy products and services	Improved capacities on bioeconomy products and services	No of capacity building trainings organized	-	1	1	1	1	1	1	6	
			No of firms attended	-	50	75	85	100	120	200		
5.. Establishments of new standards regulation, guidelines, manuals supporting bioeconomy	Promote enterprises that are engaged in sustainable biobased economic development through recognition, policy supports, guidelines and regulation.	Developed policies	No of policies, guidelines, directives, strategies developed	-	1	1	2	3	2	3	7.6	MoPD, PSI, BETin, EIAR, MInT, MoJ
		Formulated standards and guidelines, manuals	No of new standards and production guidelines established	-	-	-	50	100	150	200		ESI, ECAE, EFDA
		Established unit (s)	Established to regulate and recognize enterprises engaged in sustainable biobased economic development	-	-	-	1	-	-	-		EPA, MoI, BETin, MoTRI
		Recognized enterprises	No of recognized (eco-labeled) enterprises	-	-	-	3	4	5	5	0.4	EPA, MoI, BETin
6. Establish national Database on biobased, inputs, value chain actors, products and services												ATI, MInT,

Annex 2:Role of Stakeholder and links to Strategic Objectives

Lead Sector (Focus area)	Roadmaps/Policies/Strategies	Initiatives/Programs	Bioeconomy SOs Index	Partners
MInT (Agriculture, Health, Biobased Industry, Sustainable Environment)	○ STIP, ○ Digital Economy 2024 ○ Digital agriculture and advisory services (DAEAS) Roadmap 2030 ○ Biotechnology R4D Strategy ○ National Manufacturing Industry Policy 2024-2030\ ○ Livestock Information System Roadmap for Ethiopia	○ Ethiopia's Digital Agriculture and Advisory Services (DAEAS) Roadmap 2030 ○ 5-Million Coders ○ Ethiopia Digital Foundations Project 2023 -2027 ○ innovation and Entrepreneurship Ecosystem Development ○ Ethiopian Agri-SME Financing Ecosystem ○ JICA Project NINJA ○ National Innovation Fund ○ Ethiopian entrepreneurship ecosystem ○ Ethiopia's startup ecosystem ○ National Priority Technology Capability Program	SO1, SO2, SO3, SO4 SO5 SO-4–SI-1 SO-5–SI-1: SO-5–SI-2 SO-5–SI-3. SO-5–SI-4:	BETin, MoA, ATI, MoI, MoH, DPG, MoPD, EIAR,
MoA	○ 10-Year Development Plan ○ Climate Resilient Green Economy (2011-2030) ○ Ethiopia Climate-smart Agriculture Roadmap (2020-2030) ○ Ethiopia National Food and Nutrition Policy(2021-2030) ○ Livestock and Fishery Development Master Plan ○ Ethiopia's Food System Transformation Roadmap (2022-2030). ○ Ethiopia's National Agriculture Investment Plan (NAIP 2021-2030) ○ Agricultural Extension Strategy of Ethiopia 2017 - 2027 ○ Seed System Development Strategy (2017 -2027)	○ Agricultural Growth Program (AGP), ○ Ethiopia Agriculture Investment Flagship Investment ○ Participatory Agriculture & Climate Transition Program(2024-2030) ○ Food System Resilience Program(2-21-2030) ○ Sustainable Use of Rehabilitated Land for Economic Development Program (2022-2030) ○ Building Resilience for Food and Nutrition Security (BREFONS 2022 - 2027)	SO1-SI1 SO1-SI2 SO-3–SI1 SO-3–SI-3:	DPG, EIAR, ATI, Private sector
	○ Postharvest Management Strategy in Grains (2018 - 2028) ○ Horticulture Research Strategy 2016 2030 ○ National Pulses Value Chain Development Strategy 2016 -2026 ○ Ethiopia Wildlife Conservation Policy and Strategy ○ National Biodiversity Strategy and Action Plan (2010 - 2025) ○ FOREST GENETIC RESOURCES CONSERVATION STRATEGY OF ETHIOPIA (2002 -) ○ MoA Ethiopia Wildlife Conservation Policy and Strategy (2005-)	○ Livestock and Fisheries Sector Development Project (2022-2030) ○ Resilient Landscape and Livelihoods Project ○ Productive Safety Net Program-5 ○ Sustainable Land Management Program (SLMP), ○ Food System Resilience Program(2022-2028) ○ Participatory Agriculture and Climate Transformation Program ○ Livestock Information System Roadmap for Ethiopia		
MoWE	○ Environmental policy of Ethiopia ○ (2015-2025), ○ National Energy Policy (-) , ○ Climate Resilient Green Economy (2011-2030) ○ National REDD+ Strategy (2016 - 2030). ○ FOREST GENETIC RESOURCES CONSERVATION STRATEGY OF ETHIOPIA (2002 -)	○ National Biogas Program (-) ○ Updated Nationally Determined Contributions, Reduce degradation and improve the productivity of natural resources (-), ○ Scaling-Up Renewable Energy Program ( ) ○ Reduce degradation and improve the productivity of natural resources	SO-3–SI—1 SO-3–SI-4	MoA, MoH, DPG,
MoH	○ MoH Health Sector Transformation Plan II 2020 - 2025 ○ National Health Equity Strategic Plan 2021 - 2025 ○ National Strategy and Plan of Action for Pharmaceutical Manufacturing Development 2015–2025 ○ Health Information System Strategic Plan (2020/21-2024/25) ○ National Strategic Plan for the Prevention and Control of Major Non-Communicable Diseases (2020/21-2024/25) ○ Antimicrobial Resistance Prevention and Containment Strategic Plan - The One Health Approach - 2021-2025. ○ National adolescents and youth health strategy (2021-2025) ○ Integrated urban sanitation and hygiene strategy action plan 2015 - 2035	○ Health Professionals' Competency Assessment and License ○ Seqota Declaration (SD) [2015 - 2030] ○ Sustainable Undernutrition Reduction in Ethiopia Program (2019-2030)	SO1-SI3: SO1-SI4 SO2-SI–4:	EPHI, MoA,

MoI	○ Ethiopian Industry Development Roadmap April 2014 -2025 ○ National Industry Development Policy and Strategy 2012-2025 ○ National Manufacturing Industry Policy ○ Ethiopian Industrial Development Strategic Plan,2013-2025 ○ National Import Substitution Strategy for Selected Manufacturing Industry Sub-Sectors in Ethiopia 2023-2030 ○ Manufacturing Industry Capacity Development Strategy and Action Plan	○ Enhancing quality and quantity of industrial raw material and input Project 2015- 202 ○ Enhancing investment capability and business climate project ○ Widening professional certification services for technicians, technologists, and engineers in major manufacturing project ○ Enhancing technology development and transfer project 2015 -2025 ○ Developing and diversifying markets project 2015 -2025	SO2-SI–1 SO-3–SI-1 SO2-SI3: SO2-SI–4: SO2-SI5	EIIDI, MoTRI
EFCCCC (Agriculture, Health, Bio-industries, Sustainable Environment)	○ ENVIRONMENTAL POLICY OF ETHIOPIA (2015-2025), ○ Forest Development, Conservation, and Utilization Policy and Strategy (-), ○ National Biodiversity Strategy and Action Plan ○ Updated Nationally Determined Contributions ○ National Plastic Waste Management Strategy and Roadmap	○ Reducing Emission from Deforestation and Forest Degradation,	SO-3–SI-4 SO-3–SI-5: SO-3–SI-6: :	MoA, MoI, EED, DPG, MoWE
EFDA	○ EFDA Food and Health Products Regulatory Sector Transformation Plan II 2020-2025 ○ Regulatory Preparedness and Mitigation Strategy for Emergency Health Threats 2020 2030	○ Improve regulation of safety of cosmetic products program ○ Reducing Emission from Deforestation and Forest Degradation,	SO1-SI3: SO1-SI4:	BETin,
MoCTD	○ CRGE forAgriculture and Forestery 2015 - 2030 ○ ENVIRONMENTAL POLICY OF ETHIOPIA (2003-present) ○ National Biodiversity Strategy and Action Plan (2010 - 2025) ○ National Energy Policy ○ Ethiopia Wildlife Conservation Policy and Strategy ○ Ethiopia Wildlife Conservation Policy and Strategy	○ Green Legacy ○ Gebeta Le Hager	SO-3–SI-7	EEFCCC, MoA, ATI, Farm Africa
BETin	○ 10-Year Development Plan ○ Ethiopia Agriculture Investment Plan 2020-2030 ○ CRGE ○ STIP (2010-2020)	○ Improve regulation of safety of cosmetic products program ○ Ethiopian Statistical Development Program 2023 - 2027	SO2-SI2: SO2-SI3 SO2-SI4: SO-4–SI-1—SA-1	FAO, BMGF, FAO, MoA, MPD, MoH, IAIPs

	○ Biotechnology R4D (2022 - 2030), ○ Digital Economy (2021-2030)		SO-4–SI-1—SA-1 SO-5–SI-1 SO-5–SI-2 SO-5–SI-3 SO-5–SI-4	
MoPD	○ Ethiopia's Long-term Low Emissions and Climate Resilient Development Strategy (2020 - 2050) ○ A Homegrown Economic Reform Agenda - A Pathway to Prosperity (2021 - 2030) ○ 10-Year Development Plan/ (2021 - 2030)	○ Ethiopian Statistical Development Program 2023 - 2027	SO-5–SI-1: SO-5–SI-4	CSA, Policy Institute, DPG
AHRI	○ Ethiopia Diagnostic Diagnostic Research and Development Roadmap 2024-2030	○ Bioequivalence and pharmacovigilance studies.	SO1-SI3	BETin, EFDA, MoH
MoLS	○ National Social Protection Strategy 2016 - 2030	○	SO1-SI5	MoA, ATI, MInT, BETin, IAIPs
Agritech SME Finacial Platforms	○ Intiatives: Ethiopia Policy and Commercial Banks	○ ENKOPA SUMMIT	SO1-SI5	MInT

Annex 3:

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List of Organization Participated and Contributed During the Validation Workshop

- Addis Ababa University,
- Addis Ababa Science and Technology University
- Adama Science And Technology University
- Agricultural Transformation Institute
- Armauer Hansen Research Institute
- Arba Minch University
- Environmental Protection Authority,
- Ethiopian Agricultural Authority
- Ethiopia Forestry Development
- Ethiopian Biodiversity Institute
- Ethiopian Civil Aviation Authority
- Ethiopian Enterprise Development
- Ethiopian Institute of Agricultural Research
- Ethiopian Investment Commission

- Ethiopian Public Health Institute
- Ethiopian Wildlife Conservation Authority
- Farm Africa
- Global Green Growth Institute
- Gonder University,
- Haramya University,
- Intellectual Property
- Minister of Industry
- Ministry Of Agriculture
- Ministry of Culture and Tourism
- Ministry of Finance
- Ministry of Health
- Ministry of Industry,
- Ministry of Labor & Skills
- Ministry of Trade & Regional Integration
- Nature Feed PLC
- Policy Study Institute,
- Regional Agricultural Research Institute
- Regional Innovation and Technology Institute
- United Nations Industrial Development Organization and other Private industries