



# Making the Business Case for a Bioeconomy in Africa

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## Introduction

The bioeconomy involves the use of scientific knowledge to add social and economic value to biological resources in an environmentally sustainable way. It is widely regarded as a growth and development pathway that contributes to lower carbon emissions, better preservation of biodiversity, and greater prospects for decent jobs and livelihoods (Malabo Montpellier Panel 2022; IACGB 2024). A bioeconomy is attractive to policymakers because of attributes that are benign to the environment and appealing to consumers: (1) it is biologically based, using biomass (biodiversity) as the primary raw material; (2) it is scientifically driven, underpinned by innovation, for example, in the production of new goods and services; (3) it is cross-sectoral, involving the expertise and participation of diverse disciplines—agriculture, environment, health, industry, and education; and (4) it is sustainable, reducing emissions and minimizing waste. In other words, a life cycle analysis of any biologically based product or process should find a net environmental benefit for both inputs and outputs. Social benefits might include equity, justice, and inclusiveness in using biological resources, as well as management of the necessary trade-offs when investments are made involving the use of biodiversity, water, and land resources. Ultimately, the added value of the bioeconomy is expressed in healthier foods; safer medicines; cleaner energy; useful substances from biological waste and other environmentally friendly processes in the manufacturing, distribution, and consumption of goods and services; and most of all, decent jobs for the largely youthful population in Africa.

## Why a Bioeconomy?

Regions such as Africa, which have significantly lower carbon emissions than the rest of the world, could have a competitive advantage in developing sustainable bioeconomies. Africa has abundant renewable biological resources, including crops, forests, fish, animals, and microorganisms, to which value can

be added in a sustainable way, producing novel food; safer medicine; environmentally friendly materials, products, and textiles; and bioenergy. The continent also has a large land mass, of which about 60 percent is arable. Therefore, it can support both large and smaller but intensive agricultural production. With advanced bioprocessing and biomanufacturing, biologically based value-added products and services can be produced and delivered to consumers in a sustainable manner. The continent can also contribute to carbon emissions reduction by adopting innovative pathways that use microorganisms to capture carbon directly from the air (Lang 2022).

## Making a Bioeconomy Business Case

A business case for a bioeconomy in Africa can be made along the dimensions of economic stability, biodiversity richness, emerging biotechnology capacity, agricultural potential, and forward-looking bioeconomy policies. Each of these dimensions is explained below.

### Economic Stability

Most countries in Africa now have the fundamentals for economic growth. There is relative macroeconomic stability in several countries where markets are liberal and fiscal policies are functional. The African Development Bank Report 2024 projects growth of at least 4.0 percent per year in the medium term (AfDB 2024). Much of this growth is driven by investments in the security of persons and property as well as in infrastructure, including roads, railways, and electricity. Foreign companies have also expressed increasing interest in investing in Africa. However, growth must increase to at least 7 percent per year and be consistently maintained there if Africa (where gross national incomes per capita range between US\$3,996<sup>1</sup> and \$12,375) is to realize its ambition of achieving upper-middle-income status in the medium and long term. Scholars and policymakers believe that diversifying sources of growth would enable the continent to achieve higher growth rates. A bioeconomy arguably offers additional

<sup>1</sup> All dollar amounts are in US dollars.

opportunities for economic diversification and economic growth, and enables countries to fully benefit from the African Continental Free Trade Agreement (ACFTA), which was signed on March 21, 2018, in Kigali, Rwanda (World Bank 2020). ACFTA not only provides opportunities for regional trade but also helps Africa to connect with global bioeconomy supply chains. Countries would, however, need to step up efforts in adding value to biological resources, including biowaste conversion. A relatively easy way to start could be through adding value to multiple-use, starchy crops like maize, sorghum, and cassava, which are widely grown in Africa south of the Sahara and can serve both food and feed needs. Another is through developing industrial applications, for example, in the production and use of sustainable biofuel and other industrial chemicals (Duarte Pasa, Almeida Scaldadaferri, and dos Santos Oliveira 2022). This type of targeted value addition can create opportunities for linking primary production to bioprocessing oftakers and eventually to global supply chains for sustainable green chemicals.

The World Business Council for Sustainable Development Report 2020 projects that the global bioeconomy is growing at 3.3 percent annually and will be a \$7.7 trillion market by 2030 (WBCSD 2020). By adding value, numerous uses of biological resources can be found: for example, biowaste can be turned into biofertilizers and energy, and high-value green chemicals can be recovered from the waste. These new uses bring new business prospects and jobs, thus diversifying the economy. The extent of the economic impact of a bioeconomy requires more study. Nevertheless, anecdotal evidence of emerging biologically based innovations—such as biological waste conversion using black soldier flies (BSF) and earthworms—show a growing number of small- and medium-size enterprises adopting nature-positive solutions in the crop and livestock production systems of East, West, and Southern Africa, increasing incomes and job opportunities. Farmers are using BSF larvae as an affordable and environmentally sustainable alternative protein in fish and poultry feed. They also use frass (compost from BSF) fertilizer in vegetable and fruit farming, generating net environmental and economic benefits (Beesigamukama, Subramanian, and Tanga 2022; Beesigamukama et al. 2022; Abro et al. 2020; Chia et al. 2020).

### Biodiversity Richness

Africa is endowed with rich biodiversity, including plants, animals, insects, and microorganisms that offer a strong foundation for developing a bioeconomy. This biodiversity also encompasses important indigenous or traditional

knowledge, which provides leads for scientific discovery and validation. During the COVID-19 pandemic, several African communities resorted to herbal remedies from the wild to manage symptoms of the disease. In Uganda, for example, an herbal medicine (Covidex) developed by a private company (Jena Herbals Limited) and a university (Mbarara University of Science and Technology) was demonstrated to be effective in relieving severe symptoms of COVID-19 (Ogwang et al. 2024). Other groups in several parts of the continent used immune boosters from all kinds of herbs, including mint, ginger, and lemon, to make concoctions and drinks that many believed were useful in managing the disease (Xinhua 2021).

In the early 1990s, conversations addressing access to genetic resources and benefit sharing under the Convention on Biological Diversity (CBD) triggered interest in the untapped value of biodiversity (CBD 1992). The CBD recognizes that genetic resources and the traditional knowledge associated with them have economic and social value. The principle of justice enshrined in the CBD is that communities that are custodians of genetic resources should also benefit from their use. The CBD argues for a fair and equitable distribution of benefits and burdens with respect to the conservation and use of biodiversity. This argument posits that traditional or indigenous knowledge associated with biodiversity provides important leads for screening active compounds that are used in the food and pharmaceutical industry. The argument also extends to the use of beneficial microbes collected from communities where these microbes are endemic to make economically useful products such as microbial enzymes for use in manufacturing. Consequently, several countries now have mechanisms to grant access and negotiate benefits, including prior informed consent and material transfer agreements. These mechanisms have been codified in the 2010 Nagoya Protocol on Access and Benefit-Sharing of genetic resources and institutionalized in most African countries that are party to the CBD (CBD 2010). However, benefit-sharing arrangements should be developed in such a manner that they do not hinder progress in the beneficial use of biological resources and the advancement of the bioeconomy.

### Biotechnology Capacity

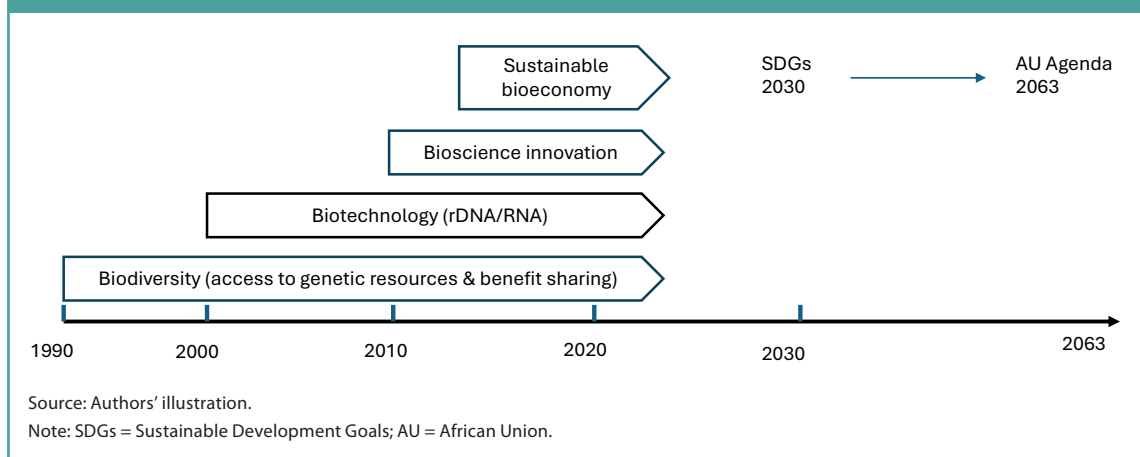
Related to the CBD discussion is the advent of modern biotechnology, that is, the use of recombinant DNA (rDNA) in pharmaceutical, crop, and livestock production. The use of rDNA techniques, especially in crop improvement, continues to attract both significant interest and controversy in Africa. Experimental

trials of genetically modified (GM) crops with resistance to particular diseases, such as maize resistant to the maize stem borer, cotton resistant to the ball worm, bananas resistant to nematodes and banana wilt disease, cassava resistant to the cassava brown streak virus, and soy with herbicide tolerance, to name but a few, have been successfully conducted in most African countries, including Burkina Faso, Ghana, Kenya, Nigeria, South Africa, and Uganda. All of these trials demonstrated success and high efficacy in pest and disease control as well as tolerance to drought conditions. Studies have shown that farmers in South Africa who adopted white GM maize that is resistant to the devastating maize stem borer could increase their yields by up to 35 percent compared with conventional (non-GM) varieties (Koch 2004), an outcome associated with welfare benefits of nearly \$700 million (Ala-Kokko et al. 2021). However, so far only GM cotton has been widely released commercially—first in Burkina Faso, Ethiopia, and Sudan, with other countries considering the same to boost their textile industry. Increasingly, modern biotechnology applications are finding niches in industrial manufacturing, signaling that besides meeting food security challenges, forming links with industry is also critical (Weisenfeld et al. 2023). Industry provides much-needed jobs and increases incomes for families when their produce is linked to agro-processing and to markets.

Perhaps the greatest gains so far have been investments in modern biotechnology, especially in academic and research settings, that have led to the rapid advancement of bioscience tools and knowledge. These investments include micropropagation techniques and selection markers for crops of interest for breeding that have had immediate applications in crop and animal improvements. Amid the increasing maturity of bioscience knowledge platforms and the production of several biologically based prototypes in public research institutes—and alongside the need to conserve biodiversity and reduce emissions—policymakers and scholars now think that a bioeconomy would be an improved growth pathway, with increased inclusion and relevance

to the economy. Furthermore, this pathway should be closely linked to the Sustainable Development Goals for 2030 and the African Union Agenda 2063 (AUC 2013) (see Figure FI.1). These development frameworks call for sustainable industrialization, climate change mitigation, skills for youth, and societal transformation in a positive way (African Union Commission 2013).

**FIGURE FI.1—THE EVOLVING AFRICAN BIOECONOMY**



**TABLE FI.1 —KEY PRODUCTIVE SECTORS OF THE EAST AFRICAN ECONOMY**

Country	Population in millions	GDP (US\$bn)PPP	Industry	Agriculture	Services	Manufacturing	CO2 Emissions (kt)
Burundi	12.6	2.78	10.6	28.7	44.8	9	713
Ethiopia	120.3	111.27	21.6	37.6	36.3	5	18,098
Kenya	53.0	110.35	17.0	22.4	54.4	7	19,447
Rwanda	13.5	11.07	20.3	24.1	47.8	9	1,382
Tanzania	63.59	67.87	29.8	25.9	34.3	8	14,436
Uganda	45.85	40.53	27.1	23.8	41.8	16	5,675

Source: World Bank (2023).  
Note: GDP = gross domestic product; bn = billion; PPP = purchasing power parity; kt = kilotons.

## Agricultural Potential

Agriculture provides the main feedstock for the bioeconomy. Africa has 60 percent of the world's arable land (AGRA 2022), which if sustainably used can provide the much-needed biomass for the bioeconomy. In East Africa, for example, agriculture contributed on average 30 percent of the gross domestic product (GDP) in 2023 (see Table FI.1) (World Bank 2023). Countries are eager to reduce the share of agricultural GDP while increasing the share of manufacturing through value addition and agro-processing. In a modern industrialized economy, manufacturing should contribute more than 20 percent of GDP (World Bank 2023). This represents an opportunity to advance the bioeconomy in Africa given that growth in manufacturing is likely to be biobased, taking advantage of the agricultural produce and feedstock.

## Forward-looking Bioeconomy Policy

The bioeconomy began gaining momentum in the United States and in Europe through a knowledge-based bioeconomy initiative in the early 2000s in the European Union (EU) (Patermann and Aguilar 2018). This initiative later evolved into a bioeconomy roadmap in the United States in 2012 and a bioeconomy strategy for the EU in 2012. South Africa was proactive and in 2013 became the first African country to develop a dedicated bioeconomy strategy, closely following developments in the EU; and in June 2024 Namibia published its national bioeconomy strategy, becoming the second country in Africa with such a strategy. To date, more than 65 countries all over the world have developed dedicated bioeconomy strategies (IACGB 2024). In Africa, the East African Community (EAC) is the first regional economic bloc to develop a dedicated regional bioeconomy strategy (EAC 2022). The strategy is anchored on the sustainability pillars of environmental sustainability, climate change adaptation and mitigation, and sustainable production and consumption. Priorities for the strategy include food security and sustainable agriculture, health and well-being, sustainable energy, and biologically based industrialization. Implementation of the strategy harnesses opportunities for global collaboration and partnerships to advance the bioeconomy according to the unique needs and values of the region. In particular, value addition, biowaste conversion, and ecosystem services are key enabling activities promoted by the strategy. The strategy is appealing because it combines the different productive and economic sectors to focus on value addition or creation as well as the development of prospects for sustainable businesses and jobs. The

cross-sectoral nature of the EAC regional bioeconomy strategy is in tandem with the global consensus that views a bioeconomy as "sustainable," emphasizing low carbon emissions, biodiversity conservation, and no pollution of air, water, or land (von Braun 2018).

## Conclusion

There is a growing recognition that the development of a bioeconomy in Africa will increase the economic and social value of regionally traded, biologically based goods and services. These goods and services emanate from technologies and investments aimed at adding value to agricultural production; converting biological waste into useful material (thus promoting circular production); and connecting national, regional, and global biologically based value chains. Consequently, countries with a vibrant bioeconomy would arguably be the ones to fully participate in and benefit from the ACFTA. Given its distributive nature, a bioeconomy will incentivize micro-, small-, and medium-size enterprises and the informal sector, which together make up a large part of the African economy. Therefore, African countries should develop bioeconomic clusters of innovation and entrepreneurial activities based on renewable biological resources and their unique needs and natural advantages. These efforts should culminate in what would become the African bioeconomy, connecting with the rest of the world.