

Uganda TNA Summary 2020

Overview

Uganda is an East African nation with a rapidly growing economy and a population of over 45 million. Despite its classification as a Least Developed Country (LDC), Uganda has shown consistent GDP growth driven by agriculture, industry, and services, with agriculture employing 70% of the population. The **Vision 2040** framework aims to transform Uganda into an upper-middle-income country by harnessing its natural resources, human capital, and technological innovations. Key priority areas include agriculture, energy, water, and infrastructure, with science, technology, and innovation (STI) playing a critical role in achieving sustainable development and addressing socio economic challenges outlined in the **National Development Plan III (NDPIII) 2020-2025**. Uganda's first TNA focused on agriculture given its important role and linkages with other sectors in the country's short- and medium-term development priorities.

Agriculture

23.5% of GDP (70% employment)

Industry

26% of GDP

Services

43.5% of GDP

Priority Technology Needs

Uganda's STI Sector Development Plan (SDP) emphasizes technology as key to overcoming development challenges and achieving goals of inclusive growth, sustainability, and socio-economic transformation under Vision 2040. The NDPIII highlights agriculture as a key investment area and aims to transform it from a low-wage to an industrialised sector with higher quality jobs and incomes. Priority technologies are needed across the entire value chain, from primary production (improved seeds and livestock breeds, drip irrigation, and synthetic fertilizers), to post-harvest management (biomass driers, mechanization, and refrigeration), to value-addition (processing tech and market information).



Agriculture - Primary Production

Technologies such as drip irrigation, genetically improved seeds and animal breeds, synthetic fertilizers, and motorized tillers and weeding machines are critical for improving agricultural productivity. These solutions address the needs of smallholder farmers, who form the backbone of Uganda's agriculture, by increasing yields, enhancing resilience to pests and diseases, and ensuring food security. Additionally, rainwater harvesting and innovations like precision farming and vertical agriculture promote efficient use of limited resources, aligning with Uganda's climate adaptation goals.



Agriculture - Post-Harvest Management

Uganda experiences significant post-harvest loss due to poor harvest and handling practices, inadequate storage conditions, and delays in marketing produce. Technologies like solar dryers and cold chain systems are essential to minimize post-harvest losses, particularly in grains, fruits, and vegetables. Solar dryers preserve grains and pulses by preventing spoilage due to moisture, and can help to improve product quality and overall processing hygiene. Cold chain systems, such as cold storage facilities, refrigerated trucks and refrigerators, are essential to keep produce and fresh on their way to markets, however their adoption rate is still very low in Uganda. These technologies enhance food security, increase farmers' incomes, and support agro-industrial value chains, making them critical to Uganda's agricultural transformation.



Agriculture - Value Addition

Agricultural value addition is at the heart of Uganda's overall growth strategy and its agro-industrialisation programme aims to increase commercialisation and competitiveness of agricultural production and agro-processing, with a view to increase export value of selected agricultural products, boost agricultural sector growth rate, and improve labour productivity. Priority technologies at this stage include: food preservation (e.g. canning, pickling, drying, freeze-drying, irradiation, pasteurisation, smoking, and chemical additives) and processing technologies (e.g. mixing, transformation and structuring); and leather-processing technologies for semi- and fully-finished leather, as well as for the manufacturing of leather goods. These innovations create employment opportunities, stimulate economic growth, and strengthen agro-industrial linkages.



Energy

Access to energy is vital across the entire agricultural value chain. Off-grid solar systems can expand rural electrification and support agricultural processes by providing energy for irrigation, cold storage, and household use. These technologies can help reduce reliance on non-renewable energy sources, lower costs for rural households, and contribute to environmental sustainability, aligning with Uganda's green energy goals.

Uganda's prioritized technologies in agriculture across the value chain underscore the country's commitment to sustainable development and economic transformation. Smallholder farmers, who constitute the majority, stand to benefit from innovations like drip irrigation and improved seeds, addressing low yields and food insecurity. Post-harvest losses, which account for 30-40% of produce, are mitigated through solar dryers and cold chain systems. Renewable energy technologies, particularly solar mini-grids, address the 27% rural electrification gap, powering agriculture and rural industries. **By investing in these technologies, Uganda can enhance productivity, ensure food security, create jobs, and build resilience to climate change, driving long-term socio-economic growth.**

Country Context & Science, Technology, and Innovation Landscape

Uganda adopted its first STI Sector Development Plan (SDP) with a view to create a vibrant national science and technology innovation system that can support its development ambitions. The SDP maps out the sector development strategy, priorities and interventions for realizing the transformational impact of STI on the economy in pursuit of NDP III and Vision 2040 goals. Uganda's abundant natural resources and youthful population also provide a strong foundation for leveraging STI. The expanding ICT infrastructure, supported by initiatives such as the National Backbone Infrastructure, lays the groundwork for digital transformation across sectors. With 78% of Ugandans under the age of 30, the nation has a demographic advantage to build a skilled workforce, foster innovation, and accelerate economic growth.

Human Development Index Rank: 162/193 (UNDP, 2019)

43M

Population
(UBOS, 2019)

78%

Youth <30
(UNICEF, 2015)

6.3%

GDP Growth
(WB, 2019)

\$822.06

GDP per capita
(WB, 2019)

24.36%

Urbanization
(UBOS, 2019)

4.6%

Tertiary Enrollment
(CEIC, 2014)

Global Innovation Index Rank: 115/131 (WIPO, 2020)

Frontier Technology Readiness Index Rank: 126/160 (UNCTAD, 2020)

14.96%

Internet Penetration
(ITU, 2019)

0.14% of GDP

R&D Expenditure
(2014)

\$2 Billion

FDI Inflow
(WB, 2019)

18.9%

Access to Electricity
(WB, 2020)

34.2

PCI Index
(UNCTAD, 2020)

60% of adults

Financial Inclusion
(BOU, 2020)

While Uganda has adopted a STI Plan, its ecosystem is still underdeveloped due to several factors. **Investment in research and development remains insufficient, accounting for less than 0.5% of GDP, which limits technological advancement and innovation.** Financial barriers restrict the adoption of modern technologies owing to low purchasing power, particularly in rural areas where households lack access to even basic services like electricity. The digital divide between rural and urban areas further limits ICT-based solutions, while low tertiary enrollment rates, at just 4.6%, limit the availability of skilled professionals and technical know-how. Moreover, traditional farming practices and inadequate infrastructure reduce agricultural productivity and leave farmers vulnerable to the effects of climate change. There is also no common platform for key sector players to deliberate on sectoral challenges and potential solutions including technological solutions.

Uganda's strengths lie in its robust policy framework and regional connectivity. The **National Science, Technology, and Innovation Policy** (2020) prioritizes STI as a driver of socio-economic development, while partnerships with neighboring countries and international organizations facilitate knowledge exchange and innovation. **The government's commitment to renewable energy and agricultural modernization further supports economic resilience.** There are significant investment opportunities in areas that include vocational training and financial inclusion. Also, the low rate of adoption of technologies such as drip irrigation, cold chain systems, solar dryers, food and leather processing and many others, indicate that there exists an opportunity for investment across the entire agricultural value chain.

Key Recommendations

To advance its STI agenda and further develop its ecosystem, Uganda needs to focus on

- Increasing R&D investment beyond the current 0.14% of GDP.
- Improving digital access.
- Expanding access to affordable electricity.
- Improving STEM education.
- Bridging the rural-urban divide through:
 - ICT-based solutions,
 - Renewable energy deployment,
 - Targeted skill-building programs.
- Fostering public-private partnerships.
- Enhancing financial inclusion to provide the resources and support necessary for Uganda's transformation into a prosperous, resilient, and knowledge-based economy.

In terms of agriculture, Uganda needs to focus on the following:

- Develop different financial models and agricultural investment plans.
- Build capacity and partnerships for sustainable agriculture.
- Create enabling regulatory frameworks for farming.
- Increase government support through the Innovation Fund and related funds.
- Develop infrastructure to accelerate agricultural production.
- Modernize agricultural education and training curriculum.
- Strengthen agriculture support systems, including adoption of appropriate technologies.
- Create an agricultural research fund.
- Provide local training to farmers to identify and adopt appropriate technologies.