



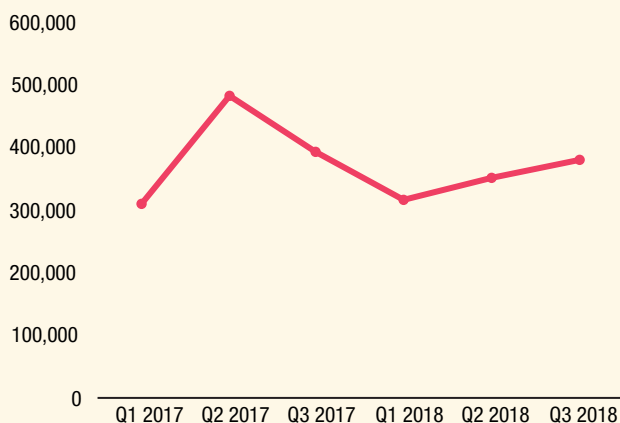
Feeding 398 million people in Africa's largest economy by 2050

Food security challenges and agricultural innovations

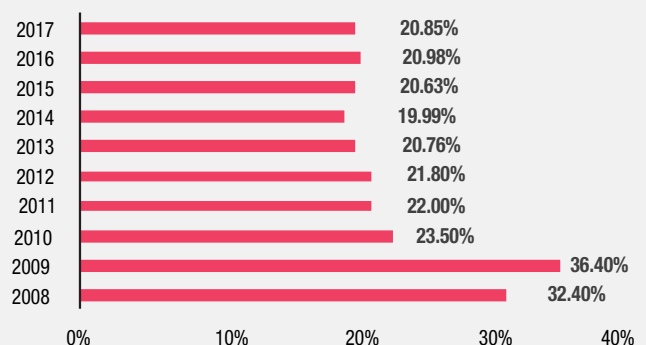
Feeding Nigeria's current and future population is a critical challenge

With over 50% of the country's 198 million people living in rural areas, the economy is highly dependent on agriculture as a means of livelihood. The sector contributed approximately 21% of the country's GDP in FY2017. Despite this, agricultural productivity remains low further dampened by post-harvest losses. Overall, food cultivation is primarily through subsistence farming and characterised by low technology and high labour intensity. Since 2013, the sector's contribution to GDP has remained almost flat on account of low yields, which is further exacerbated by internal conflicts such as terrorism and the herdsmen crisis, as well as the impact of climate change. Nigeria remains a food import-dependent country though, the food import bill declined from ₦481 billion in Q2 2017 to ₦349.9 billion in Q2 2018. However, there is need for caution, as the country's food import bill is slowly on the rise again, as reflected by quarterly growth from Q1 2018 to Q3 2018.

Food Import bill (Q1 2017 - Q3 2018)



Agric contribution to GDP (2008 - 2017)



Source: NBS, PwC analysis

Feeding Nigeria's current and future population is a critical challenge. This challenge necessitates the adoption and application of innovations to agriculture so as to make the sector more competitive and sustainable. Boosting economic growth in agriculture is a function of three factors: farmland expansion, yield growth and reduction in post-harvest losses.

Adoption of innovative systems, technologies and products within the sector can improve agricultural productivity; increase the supply of food output; aid local farmers to produce cheaper and more accessible products; as well as reduce post-harvest losses and enhance storage capabilities for small-holder farmers. Advances in innovations and technologies are key to the future of agriculture, as farmers strive to feed the world with limited natural resources. Some of the current innovations include:

- Development of continent-wide digital soil maps for sub-Saharan Africa
- Licensed indoor vegetable farm in Singapore
- Integrated aquaponic farm (which uses up to 95% less water than traditional horticulture farming) in the United Kingdom
- Solar-powered energy to grow tomatoes in Australia
- Over US\$165 million South African drone industry (a key component of precision agriculture)

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Challenges impacting sustainability and productivity in the Agriculture sector

Globally, the agricultural sector is being weighed down by a number of challenges that impacts the sector's contribution to feeding the world and the growth of the world economy. Some of the challenges comprise

population growth, climate change, greenhouse gas emissions, LW (land and water) shortages, violent conflicts, poor and inadequate technologies, among others.



Population growth



Climate change



Greenhouse gas emissions



Land and water shortages



Violent conflicts



Poor and inadequate technologies

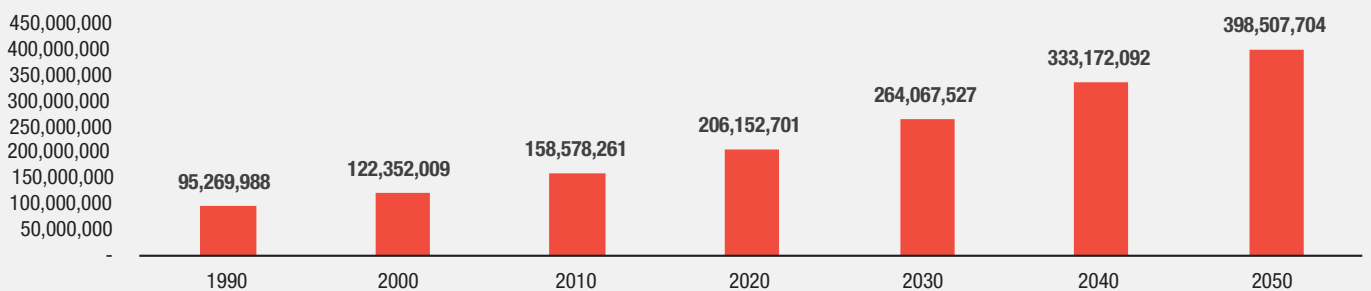
Population growth

The global human population could grow to 9.7 billion people by 2050. In 2018, there were nearly 821 million people (2017: 804 million) who regularly do not have enough food to eat, according to the United Nations. The number of undernourished people have been on the rise since 2014. West Africa accounted for 15.1% share of undernourished people in the world in 2017. On the International Food Policy Research Institute's (IFPRI) global hunger index, Nigeria ranked 103rd out of 119

countries in 2018 implying that the level of hunger in the country is serious.

Nigeria is projected to add no fewer than 202 million people to its current population of 196 million between 2018 and 2050. The country is also expected to surpass the United States, currently ranked the 3rd most populous in the world by 2050.

Population growth in Nigeria (1990 - 2050)

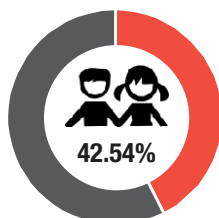


Source: NBS, UN, PwC analysis

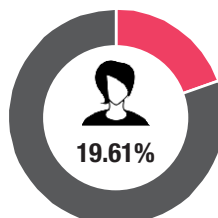
With sustained growth rate of 2.7% annually and fertility rate of 36.9 births per 1,000 people, Nigeria's population will continue to increase for the foreseeable future. Already, only 3.13% of Nigerians are 65 years and

above. As Nigeria's population continues to grow, it is becoming increasingly challenging for food supply to meet demand.

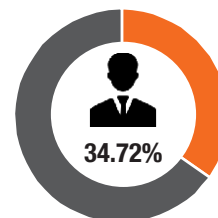
Age demography in Nigeria (2018)



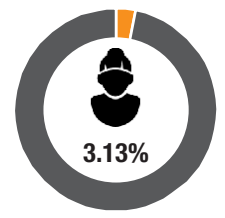
0-14 years



15-24 years



25-54 years



over 65 years

Climate change

The impact of climate change alone could reduce crop yields by half over the next 35 years. In Nigeria, the agriculture sector continues to be impacted by weather hazards, restricting access to food and increasing food insecurity. In 2018, flooding across major farming belts in 10 states ruined crops of 100,000 farmers and damaged over 30% of farmland in the affected areas. This severe weather condition will be more frequent because of climate change, hence the need to build resilience.

Greenhouse gas emissions

According to the Consultative Group for International Agricultural Research (CGIAR), nearly 25% of annual greenhouse gas emissions come from agriculture, forestry and other land use. CGIAR estimates that smallholder farming contributes: up to 32% to global agriculture sector emissions; 42% to the agriculture sector emissions from developing countries; 3.5% of all emissions globally and 4 times more per year than the agriculture sector emissions of the EU or US.

A 3-year analysis of the implications of climate change (2010 – 2013) in Nigeria, conducted by the World Bank, estimated that agriculture accounts for about 60% of the country's cumulative emissions due to deforestation, degraded or fallow land.

Land and water shortages

Desertification affects as much as 60% of Nigeria's land. This is exacerbated by drought and climate change. Also, Lake Chad has shrunk by 90% of its size due to climate change. At its peak, the freshwater lake

located in the Sahelian area of west-central Africa (and a source of water to over 25 million people living in Chad, Cameroun, Niger and Nigeria) was historically ranked as one of the largest in Africa with maximum depth of 36 feet, surface area of 520 square miles and a shoreline of 650 km. Due to the climatic depletion of the lake, cattle herders of Northern Nigeria have had to push farther south in search of water and grazing lands, resulting in friction with crop farmers.

Violent conflicts

Nomadic herdsmen pushing southwards in search of grazing fields and water for their cattle (due to desertification and water depletion in the north) resulted in violent conflicts with crop farmers. Grazing on farmlands and livestock drinking from waterways (such as rivers) have led to disagreements with the farming communities causing a violent cycle of conflicts and reprisals. In addition to the loss of lives, continued violence in the major food producing states have far-reaching consequences on the productivity of Nigeria's agriculture sector.

Poor and inadequate technologies

Poor and inadequate storage and semi-processing technologies has had adverse effect on food security at the national and household-level. Lack of adequate storage facilities has resulted in food scarcity even when there are bumper harvests due to the increased perishability of agricultural products. The traditional storage methods used by farmers are significantly flawed, as they are easily accessible to pests and rodents and are also non-moisture proof.

The strategic importance of agricultural innovations and solutions in Nigeria

Crop output shortfalls, post-harvest losses, violent conflicts and weather threats often prompt price hikes. In 2017, Nigeria witnessed high prices of staple foods. This restricted access to food and increased food insecurity. Such steep prices affect low-income earners due to their significant expenditure on food which often exceeds 65% of their budget spending.

Agricultural Innovations in Africa

Over \$19 million has been invested in agriculture technology since 2016 till date. There are 82 agri-tech startups operating across Africa as at January 2018, 52% of which were established between 2016 and 2018. E-commerce agri-focused platforms accounted for 32.9% of startups. Kenya and Nigeria both lead the agri-tech markets, followed by Ghana. The three markets collectively account for over 60% of active startups in the sector.¹

Agricultural innovations in Nigeria



**Digital
agriculture**



Agri-tech



**Smart
farming**



**Value-chain
innovations**





Digital agriculture

Digital Agriculture is the use of ICT and data ecosystems to support the development and delivery of timely, targeted information and services to make farming profitable and sustainable (socially, economically and environmentally) while delivering safe, nutritious and affordable food for all.²

Farmcrowdy, Nigeria's first digital agricultural platform, has enabled approximately 7,000 farmers and 17,195 farm sponsors. Another digital agriculture platform, ThriveAgric, has been able to scale its operations to 12 states; and enabled 4,000 farmers in the food and agriculture value-chain.

Agritech

Agritech is the use of technology in agriculture, horticulture, and aquaculture with the aim of improving yield, efficiency and profitability. Companies such as Fresh Direct and B.I.C Farm concepts are incorporating hydroponics combined with other agricultural innovations such as aquaponics and vertical farming to improve yield of products. Hydroponic farming is a soil-less method of growing and cultivating crops by using necessary nutrients dissolved in water to aid the growth process. This method is also more efficient and produces a larger volume than traditional farming.

It is estimated that by 2022, the market value of hydroponic fruits and vegetables could grow to US\$27.29 billion. This as a result of increased investments because of its benefits such as increased yields, higher returns on investment and the protection of the environment.

Sources:

1. Agrinnovating for Africa: Exploring the African Agri-Tech Startup Ecosystem Report 2018 report
2. Digital Agriculture: Pathway to Prosperity (ICRISAT)
3. Smart Agriculture Market report (2017 – 2025)

APM terminals
Newspaper sources

Smart farming

Smart agriculture is a process of performing agricultural activities using advanced technologies. Smart agriculture covers a wide range of applications that includes yield monitoring, field mapping, crop scouting but also includes irrigation management, milk harvesting, and many others. The global smart agriculture market is expected to reach US\$15.3 billion by the end of 2025.³

Zenvus is one of the smart farming technologies in Nigeria. The technology uses proprietary smart devices which have electronic sensors to collect soil data (such as moisture, nutrients, pH), sends the data to a cloud server via GSM, satellite or Wifi.

Value-chain innovations

In addition to pre-harvesting agricultural processes, innovations also exist along the post-harvest agriculture value-chain including storage technologies, as well as in the logistics, transportation and distribution systems. For instance, in cold chain solutions, Apapa Container Terminals in partnership with Naija Pride carried out the first successful trial shipment of 18.6 metric tonnes of fresh tomatoes in 2017. Packed into 933 crates, each containing 20 kg in a refrigerated container for a 1,045 km trip from Dutsen Wai (in Kaduna State) to Lagos. Cold chain was developed to solve the issue of logistics and transportation of fresh produce in order to curb wastages. It is estimated that about 15 million metric tons of perishable goods are wasted annually in Nigeria as a result of poor logistics. This innovation will greatly impact the farming industry and reduce wastages, if properly harnessed.

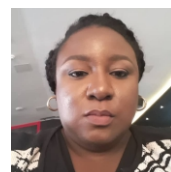
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