Harnessing the Potentials of 4IR Technologies in Nigeria’s Agricultural Sector

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Abstract

This is a 6-page Policy Brief regarding the Potentials of 4IR Technologies in Nigeria’s Agricultural Sector

Introduction

The emergence of the first industrial revolution resulted in the agricultural transformation, which incorporates farm machinery, such as, tractors and bulldozers instead of relying solely on family or paid labour. Notwithstanding, the predominance of peasant farming suggests a low level of mechanization of agricultural practices in Nigeria. The world is braced up for the fourth industrial revolution. This is expected to provide some leeway for Nigeria’s agricultural sector to leverage emerging technologies to address its age-long challenges and boost farm productivity. The fourth industrial revolution (4IR) encompasses a range of new, emerging, and disruptive technologies, such as, Artificial Intelligence (AI), Blockchain, the Internet of Things (IoT), Big Data, Drones, etc. Hence, these technologies can positively impact the productivity and profitability of the agricultural sector and create new local value-added products in Nigeria.

The agricultural sector embraces four activities, including crop production, livestock farming, forestry, and fishery. Despite the various policies of the government to boost agricultural output, the country remains a net importer of food items. This is a fallout from the suboptimal production in the four sub-sectors. With the sudden outbreak of COVID-19, Nigeria’s food import bill grew by 133% year-on-year in 2021Q1. Consequently, imported food inflation in Nigeria averaged 16.8% in the first five months of the year 2021, above its levels of 15.8% and 16.3% in 2019 and 2020, respectively, according to the National Bureau of Statistics (NBS)1. See, https://nigerianstat.gov.ng/elibrary. Before crude oil discovery, agriculture was both the mainstay of the Nigerian economy and the primary source of foreign exchange earnings. The sudden shift of focus from agriculture to crude oil, however, resulted in a drastic decline in the former’s contribution to total GDP to 20% currently from over 40% in the 1960s and 1970s. The growth rate of the sector is abruptly low at 2% per annum.2

The abysmal performance of the agricultural sector cannot be dissociated from the recurring challenges facing the sector, including the predominance of peasant farming (due to land fragmentation), use of crude
implements, inadequate storage facilities, poor infrastructure, unstable input and output prices, huge dependence on the rain-fed irrigation system, poor access to markets and ineffectiveness of government policies and programmes, among others. The overarching objective of this policy brief is to identify the gaps in the use of 4IR technologies in Nigeria’s agricultural sector and suggest ways to harness agtech opportunities as a pathway to achieve inclusive growth.

Application of 4IR Technologies in Nigeria’s Agricultural Sector

2.1 Emerging Agricultural Technologies (Agtech): Where does Nigeria stand?

The advent of the fourth industrial revolution promises to change the structure and productivity of the agricultural sector in Nigeria with the emergence of agri-tech/agtech solutions start-ups. In Africa, three countries, including Kenya, Nigeria, and Ghana, accounted for 60% of the number of agtech start-ups on the continent. Given that agriculture is the largest employer of labour in Nigeria, improved adoption of 4IR technologies would boost productivity whilst limiting the sector’s employment generation capacity going forward. Nonetheless, the adoption of 4IR technologies would create new employment opportunities for creative youths through agtech start-ups.

There are about 10 emerging agricultural technologies across the world. They include Agricultural Biotechnology; Farm Management Software, Sensing & Internet of Things (IoT); Farm Robotics, Mechanization & Equipment; Bioenergy & Biomaterials; Novel Farming Systems; Supply Chain Technologies; Agribusiness Marketplaces; Farm-to-Consumer eGrocery; Agricultural Crowdfunding and Vertical Farming. Of these ten agricultural technologies, only two have been explored in Nigeria, and they are Agricultural Crowdfunding and Agribusiness Marketplaces solutions (see Figure 1). This, therefore, leaves an important gap for the stakeholders in the agricultural sector to explore other agtech solutions to boost productivity, generate employment and reduce poverty.

Figure 1: Analysis of Agtech Solutions Presence and Opportunities in Nigeria

Since 2014, a growing number of agtech companies have begun offering digital solutions to address the challenges faced by smallholder farmers in Nigeria. These solutions aim to improve smallholder farmers’ access to financial services, farm inputs (e.g., good quality seeds, fertilizers, insecticides, and pesticides), equipment (e.g. tractors), and other extension services to farmers. Many agtech solutions improve farming methods and introduce best practices while monitoring farmers’ progress from the start of the farming season.
to the harvest season. New digital tools are also enabling farmers to access markets by connecting them with produce buyers in Nigeria and other African countries (see Box 1).

Nigerian agtech (see Figure 2) companies have benefitted from grant funding, and some have even attracted commercial investments to achieve social impact. These companies have launched digital solutions to improve farmers’ access to markets, finance, assets, and actionable data-driven information. Farmcrowdy and Thrive Agric offer platforms for the general public to crowdfund farmers, while Hello Tractor offers a shared tractor service. AgroMall uses farm data to generate economic identities for farmers, while Crop2Cash’s solution digitizes entire value chains and provides digital payments.

**Figure 2**: Major Agtech Companies in Nigeria


### 2.2 Implications of 4IR on the Agricultural Sector in Nigeria

Farming is faced with incessant insecurity in the Middle Belt arising from Farmers/Herdsmen clashes. The application of 4IR technologies – a process called precision agriculture which accommodates the use of drones, blockchains, and cloud computing – would make it easier for herders to track/monitor the movements of their livestock. To a large extent, this would reduce illegal grazing and consequently douse
the recurring crises between the farmers and herders in the Middle Belt of the country, most especially. The use of 4IR technologies would ultimately replace the traditional open grazing in the North and ranching in the South.

**Poor farm yields are partly associated with illiteracy and excessive application of chemicals.** Applying 4IR technologies would ensure that the right amounts of chemicals, such as fertilizers, pesticides, etc., are applied on the farmlands to improve crop growth and boost farm yields. For example, increasing the use of mobile phones for information exchange, such as disease surveillance and pest tracking, is now common practice. Similarly, drones can survey fields and collect data aggregated alongside sensor data to create a pool of Big Data that can be analyzed using AI and IoT solutions. This allows for precision farming, whereby irrigation and seed disbursement are carried out more efficiently thanks to data analytics. This also allows for smart application of fertilizers, all of which increase yields and reduce the cost of inputs of farming. More importantly, the training of farmers to be receptive to modern technology would go a long way in enhancing agricultural productivity.

**Lack of direct access to the market.** Most rural farmers do not have direct access to urban centres where there is a huge market for their products partly due to poor road networks. As a result, most farmers end up selling their produce at cheaper rates in their rural settlements. Meanwhile, the use of mobile phones would allow farmers in rural communities to connect with consumers directly.

**Figure 3**: Potentials of 4IR in Nigeria’s Agricultural Sector

**Hosted file**


**Source**: Adapted from Agrilinks Team (2020), retrieved from: https://www.agrilinks.org

**Challenges facing the use of 4IR Technologies in Nigeria’s Agricultural Sector**

- Legal restrictions: For instance, drones have been restricted for multiple uses due to insecurity reasons. This is likely to reduce the attraction of 4IR technologies to most farmers;
- Low level of digital literacy: Farming is practised mainly in rural areas, which lack ICT infrastructure and have farmers with little or no exposure to digital skills;
- Poor market penetration;
- Poor access to credit by agribusinesses and smallholder farmers;
- Low level of mechanization, and
- Low public investment in agricultural technologies – agtech solutions are driven mainly by private start-ups on a small-scale basis. Most investments in agtech start-ups favour early-stage agricultural production, with limited funding of other stages along the agricultural value chain.

**Figure 4**: SWOT Analysis for the Adoption of 4IR Technologies in Nigeria

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**Source**: Adapted from GSMA (2020), retrieved from: https://www.gsma.com/

**Positioning Nigeria’s Agricultural Sector for the Benefits of 4IR Technologies**

Considerable rewards emanate from the use of 4IR technologies in agriculture in Nigeria, which is expected to improve the sector’s performance. The consequence of combining drones, IoT, and AI would be more productive farms that enhance food security and well-being, using fewer resources as inputs, which has a positive impact on the environment. However, increased use of technology may also reduce the need for human labour and the number of jobs in agriculture.
Key action points to leverage the benefits of 4IR Technologies in Nigeria’s Agricultural Sector include:

- Provision of adequate funding for the scaling up of agtech start-ups. The agricultural start-ups in Nigeria are small-scale enterprises run by private or a group of individuals. Much efforts have been concentrated on increasing agricultural output through interventionist programmes in Nigeria, such as the Anchor Borrowers’ Scheme at the expense of quality produce. Improved financial support to the agtech start-ups would help fill this gap.
- Creation of awareness among smallholder farmers on the existence of these agtech solutions. The skills gap among farmers could partly explain lower crop yields, less quality agricultural produce, and lower farm income in Nigeria;
- Government policies should be streamlined to harness the benefits of 4IR in the agricultural sector in Nigeria. This would require a relaxation of legislative provisions restricting the use of 4IR technologies, such as drones to military use only, and
- It is no doubt that the rural areas account for the bulk of agricultural produce. There is a need for the provision of modern infrastructure in, particularly, the rural settlements. This would allow farmers to leverage modern technology to boost their productivity and incomes.