

**DRAFT**

**NIGERIA DIGITAL  
AGRICULTURE STRATEGY  
(2020-2030)**



**NOVEMBER, 2020**

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## **Foreword**

The population of Nigeria continues to grow, creating a large demographic of young adults and especially people migrating from the rural areas to the urban areas. The agriculture system is particularly important to sustaining and ensuring the wellbeing of this growing population, by ensuring the nation's food security, round the clock. The agriculture sector also provides a source of employment for people in the rural areas and those on the agriculture value chain across the urban areas.

From onset, the administration of President Muhammad Buhari identified agriculture as the key to addressing the economic crisis and unemployment situation across the country, therefore, the government took deliberate steps to diversify the economy towards agriculture through funding and other relevant schemes. The diversification effort of the federal government promises that the agriculture sector will provide jobs to the teeming youth and the general population. This effort also hopes that agriculture exports from Nigeria will far exceed that of the oil and gas sector, thus improving the economy of the country.

Central to this is rebuilding the connection between research, science, and technologies to build modern systems that allow Nigerian farmers to access Agtech skills and use of innovative solutions to improve productivity in the entire agricultural value chain. Further, for the diversification efforts of the Federal Government to effectively yield expected results, there is need to mainstream digital technologies in the agricultural sector. The Nigeria Digital Agriculture Strategy (NDAS) therefore presents a ten-year strategic plan that will improve the efficiency of the Nigeria agriculture sector through the use of digital technologies both in the rural and urban area. The NDAS will guide the agriculture sector to achieve competitiveness in the global market for agriculture produce while providing employment and source of livelihood for a large population of the country.

The framework also sets out strategic actions to ensure that stakeholders in agricultural sector have the right skills to develop innovative solutions and ideas that will revitalize agro-economy in Nigeria. The National Information Technology Development Agency (NITDA) is committed to improving the national policies as part of major efforts to unlock new opportunities in agriculture. Very importantly, NITDA can play key roles in efforts to improve food security in Nigeria and by extension, in the entire sub-region using new technologies.

Considering the economic diversification efforts of the Federal Government, we believe that the NDAS will improve collaboration amongst key players in the agriculture value chain and enhance

the understanding of stakeholders on the complexities of agriculture and the food security in general therefore giving them the opportunity to access global agro-markets.

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## EXECUTIVE SUMMARY

The Nigeria Digital Agriculture Strategy (NDAS) is a ten-year (2020-2030) plan that provides purpose and direction for adopting digital technologies in agriculture. It is inspired by the Economic Recovery and Growth Plan (ERGP) of the Federal Government and the Agriculture Promotion Policy (APP). It is an offshoot of the Nigeria Smart Initiative and the Nigeria Digital Economy Policy and Strategy (NDEPS) of the President Muhammad Buhari Administration. The NDAS is aimed at supporting the agricultural sector towards achieving the Federal Government's economic diversification policy for increase revenue generation for human and infrastructural development.

With an estimated population of 200million people and a projection to 500million by 2050 (source), agriculture is seen as the alternative to oil and gas for employment generation and wealth creation in Nigeria. Agricultural sector is the major employer in rural areas and hires about 70% of the Nigeria workforce.

However, the sector faces two key challenges which are inability to meet domestic food requirement and an inability to export at standards required for market success. These challenges are basically problems of productivity posed by an input system and farming model that is largely inefficient and archaic; and an inefficient system for setting and enforcing food quality standards and poor knowledge of the market.

Therefore, NDAS is designed to address these challenges, to optimize agriculture value chain through the deployment of disruptive digital technologies to improve production, reduce waste, facilitate access to market and thereby put Nigeria on the path of food security and substantial income generation for human and infrastructural development.

The NDAS is not just about digitalization, it is a deliberate effort to modernize the sector and bring it up to speed. It is an effort to bring together all the agriculture stakeholders from nooks and corners, the Nigerian youth technology savvy to a common platform to communicate and collaborate, and in the process create well-paying jobs for the youth, link products to market and generate income through a well-thought business model – “Data as a Service (DAAS)”.

The NDAS is built on the ideas of the fourth 4<sup>th</sup> Industrial Revolution (Industry 4.0) internet technologies. Broadband connectivity, web-enabled smart phones, mobile applications, social media platform; and disruptive technologies and innovations such as Block chain, Internet of Things (IoT), Artificial Intelligence (AI), Big Data Analytics and Immerse Reality would drive the modernization process.

The strategy frames the strategic intents for Nigeria's digital agriculture by defining the vision, goals, objectives, strategic pillars among others. It identifies basic and enabling conditions for accelerating digital agriculture and proposes ways to address them. In addition, the principles for

digital development are highlighted and emphasized to be strictly followed in all the digital agriculture projects in Nigeria.

Furthermore, the framework for digital agriculture is articulated and the multi-stakeholder nature of the agriculture sector is recognized. It covered the ecosystem and core drivers of digital agriculture as identified by Nigeria Smart Initiatives Policy Framework (NSIPF). All these give rise to strategic initiatives that advance the digital transformation of agriculture in the next ten (10) years.

An implementation governance framework to be anchored by the National Information Technology Development Agency (NITDA) and supervised by the Federal Ministry of Agriculture and Rural Development (FMARD) and the Ministry of Communications and Digital Economy is articulated based on the NSIPF governance structure. The roles and responsibilities of all members within the ecosystem are clearly defined and assigned. The implementation would require the commitment of all stakeholders to achieve the set objectives.

A robust Monitoring and Evaluation exercise is designed for effective and efficient implementation of the programme to achieve the NDAS strategic goals and objectives while policy recommendations are made on key issues to aid the implementation.

NDAS pushes for a Nigerian agriculture sector that promotes the use and adoption of digital technologies and innovations with the following aspirations between 2020 and 2030:

### *Vision*

To make Nigeria **One of the top** three (3) most food-secure country in Africa and top 20 largest exporter of standard agricultural produce by 2030 through the use and application of digital technologies and innovations

### *Goals*

The following goals will be pursued to accelerate the achievement of the vision by using digital technologies and innovations to:

1. Increase agriculture productivity, achieve food security and reduce food wastage by 50%;
2. Create an enabling environment for and attract **seven 7 Million youths** into agriculture business across the agric-value chain;
3. Create an enabling environment to increase agriculture contribution to GDP by 50% and food exportation to the tune of 10 trillion Naira per annum
4. Reduce the effect of climate change on agriculture by 40%;

## Strategic Objectives

The following objectives are set to accelerate achievement of the goals by 2030:

1. To increase Research and Development (R&D) and deployment of digital technologies and innovations across agriculture value chain for the purpose of:
  - a. improving agriculture productivity by 50%;
  - b. reducing food wastage by 50%
  - c. reducing effect of climate change by 40% (yield; quality; cost reduction; appropriate use of water, chemicals, farm inputs etc.);
2. Support every agriculture programme:
  - a. with **digital capabilities** to create sustainable business models and opportunities;
  - b. to create a total of about **10 Million well-paying jobs** across the agriculture value chain (production, harvesting storage, processing, marketing, traceability and consumption); and
3. Ensure every farmer in Nigeria has:
  - a. access to quality inputs;
  - b. grow farm produce that of international standard and
  - c. equal access to market (local and international) for farm produce.

## Value Proposition

There is need for farmers and value chain players to take advantage of the following value propositions that would be enabled by the Government through a digital agriculture strategy:

1. **Access to agricultural information at a click**
2. **Affordable digital innovations to promote food security**
3. Connect farmers to local and global agriculture and food markets

## Guiding Principles

To meet the goals and objectives, the practice and activity in the agriculture will be guided by the following principles:

1. **Agriculture as a Business**
2. **Ecosystem-driven**
3. **Digital Inclusion**
4. **Sustainability**

# 1.0 INTRODUCTION

## 1.1 Overview

The sudden sharp decline of oil revenue at the international market and the negative impact on Nigeria's economy beginning from the second quarter of 2016 heightens the Federal Government's desire, more than ever before, to diversify the economy to non-oil products. Agriculture appears to be the next or better alternative to crude oil and gas by virtue of its natural endowment and huge potentials in wealth creation, job and revenue generation.

Economic diversification puts agriculture as a promising sector that guarantees food security and put the country on the path of sustainable development. In this regard, the Government's plan for the agricultural sector is defined in two strategies. First, to boost productivity of the crop and other sub sectors such as fisheries, livestock and forestry; as well as integrating the value chain and improving access to market. Second, use irrigable land and river basin infrastructure effectively to enable year-round agricultural production. The target is to address the two major challenges of food security and income generation. These two strategies depend on modernizing the sector. It is also through modern commercial agriculture that Nigeria would be able to achieve the United Nations Sustainable Development Goals (SDGs') 1, 2, 3 and 8 (i.e. No Poverty, Zero Hunger, Good Health and Well-being and Decent work and economic growth), and revive the glory of the sector as a major revenue earner of the 1960's – 70's.

In 2018, the contribution of agriculture to GDP was 25.1% while oil contributed just 8.6% (NBS, PWC, 2018). In terms of export from 2016 – 2018 Nigeria oil export was N7.1 trillion, N11.0 trillion and N15.7 trillion respectively, whereas agriculture was meagerly N0.1 trillion, N0.2 trillion and N0.3 trillion respectively. The value of agriculture goods imported was N656.4 Billion while export was N60.7 Billion in 2016. Between 2017 and 2018 the trend continues with N886.8 Billion for import and N170.4 for export; and N851.8 Billion import and N302.3 Billion for export respectively. This trade imbalance was largely due to lack of data and connection to international market.

The Nigerian agricultural sector is full of diverse opportunities. For instance, analysis by the Nigerian Export Promotion Council (NEPC) shows that the total amount of estimated untapped potential by 2021 for Nigerian exports of cocoa beans to the ten best markets (Germany, Malaysia, Singapore, Turkey, Netherlands, Italy, Japan, France, Mexico and Indonesia) is around **\$425 million**. In the same vein, the estimated worth of cocoa butter for the top ten markets was put at **\$81.9 million**, while the value for untapped potential in the market for cocoa paste by 2021 stood at **\$6.3 million**. The untapped market potential for sesame seeds to the top ten markets (China, Japan, South Korea, Mexico, Poland, France, Lebanon, the United States, Canada and the UK) is estimated at **US\$170 million**. According to the NEPC, the largest estimated untapped potentials

for Nigeria is in China, which accounts for an estimated 65% of total potential value. China is currently the third largest agricultural export destination, after Turkey and Japan. Overall, agriculture experts are of the view that the country has the potential to generate **US\$40 billion** annually from export of agricultural goods.

However, we cannot close the gaps in trade and fully maximize the benefit without digitalizing the agricultural sector to open-up for real-time seamless communication and interaction with global market. Global businesses are built on e-Commerce to provide **end-to-end** access.

Therefore, the purpose of the Nigeria Digital Agriculture Strategy (NDAS) is to articulate policy direction and plans for the development of a digital platform for agriculture, where relevant government institutions, farmers, researchers, investors, inventors and innovators, marketers and all other stakeholders would collaborate to push their individual and collective interests.

The Strategy targets a period of 10 year implementation and deployment of resources and disruptive Industry 4.0 Information and Communication technologies and manpower to modernize and improve the agricultural sector. It plans to provide capability to improve the production, supply and marketing of agricultural produce.

## **1.2 The Digital Agriculture Vision**

The vision is *“to make Nigeria top three (3) most food-secured country in Africa and top 20 largest exporter of standard agricultural produce by 2030 through the use and application of digital technologies and innovations”*.

## **1.3 Challenges and Current Situation of Agriculture in Nigeria**

Currently, a number of challenges hamper productivity and performance in the sector. As a result, the nation spends significantly on imports because production is below domestic demand. Crop and animal production and their by-products are at very low state of productivity compared to what is **being** obtained in other parts of the world. Nigeria is currently struggling to feed her population thus unable to make reasonable export in exchange for foreign earnings. Crop and animal production require optimization and new approaches to ensure locally grown food can guarantee and meet national food security and exportation requirements.

Over the past few years **ended in 2019**, real output of the Nigerian economy has grown by 1.2% p.a. while population grew by 2.4% p.a. Unemployment in Nigeria is high and rising despite the fact that many are employed in the agricultural sector. The national unemployment rate increased from 6% in 2014 to about 23% in 2019. Rural unemployment is particularly high and disproportionately affects **the** youth and women.

Rising population growth is not accompanied by a corresponding increase in food production. Climate change and other threats are worsening the situation. The need to end hunger and malnutrition in Nigeria is real. Yet only 40% of the land in Nigeria is cultivated despite the fact that Nigeria has over 80% of its

land arable. Despite being the largest cattle producer in West Africa, Nigeria still imports over 27% of cattle products to meet consumer demand. Some of the challenges includes:

- i. **Poor Extension Services:** with less than 20,000 extension workers across the country, farmers receive limited guidance and training in technology adoption and limited skills in the application of key inputs, such as fertilizers, herbicides and pesticides, leading to over utilization or underutilization of agro-inputs resulting in low productivity and reduced export opportunities.
- ii. **Inadequate rural Infrastructure:** the capacity of the rural communities for massive agricultural production and on-farm processing has been constrained by inadequate road networks, power supply, irrigation infrastructure, storage and processing facilities. Frequently, the incentive for increased production is lowered by the possible harvest and post-harvest losses caused by lack of access to storage/preservation facilities and markets.
- iii. **Limited access to affordable credit:** farmers grapple with limited access to finance and high interest rates. Commercial banks are averse to agricultural lending.
- iv. **Limited access and application of improved inputs:** the markets for agricultural inputs is largely unregulated even with the presence of various agencies responsible for enforcing strict adherence to quality standards. Similarly, the capacity for national production and supply of the much needed inputs, such as fertilizer, seeds, cuttings, breed, vaccines and agrochemicals is very limited.
- v. **Poor linkages between agricultural research and training institutions, input providers and the farmers:** there is lack of policy direction on Innovation leading to limited intellectual properties, spin-offs and large scale commercialization of agricultural research findings. The country relied heavily on researches and innovations on seeds, breeds and chemicals from abroad with minimal efforts on leaning and adaptation.
- vi. **Low level of agricultural mechanization:** the availability and use of tractors in land preparation and other agricultural activities is very low in the country. Nigeria has only seven tractors per 100sqkm compared to the African average of 27 tractors per 100sqkm. This resulted in loss of man hours in clearing, ploughing and general cultivation; inefficiencies and high harvest and post-harvest loses.
- vii. **Lack of sustainable funding of the agricultural sector:** sustainable funding is lacking to drive agricultural development. Achieving agricultural transformation would require funding beyond what the current budgetary allocation would provide.
- viii. **Climate Change and Sustainable agriculture:** climate change is negatively affecting the Nigerian agricultural sector but the policy approach and much needed interventions remained largely ad-hoc. The food security is continually threatened by draught and floods in certain locations of the country and the water management system is largely mundane.
- ix. **Malnutrition:** nutrition and community awareness on nutrition remain a challenge in Nigeria. Recent UNICEF reports revealed that no fewer than 50 per cent of children under five in Nigeria are malnourished. This corroborates the 2018 National Nutrition and Health Survey (NNHS) which revealed that acute malnutrition levels affecting nearly 60% of

children. Clearly, the Food Systems required for providing healthy diets and improved access to nutrient rich foods is weak and underfunded.

- x. Insecurity of Agricultural land and investments: **Insecurity is currently posing greater risk to agricultural production, processing, marketing and delivery of essential services. Many parts of the country are facing peculiar security challenges, ranging from insurgency, kidnapping, cattle rustling, banditry and pastoralists.**

## **1.4 Strategic Policy Directions and Response of the Federal Government to Agriculture Challenges**

Over the years, a range of policies and initiatives have been developed to boost agriculture development. While the policy efforts are commendable, the continued prevalence of inefficient and outdated techniques and practices has been counterproductive. These challenges led to several policy directions by the Federal Government. The policy directions recognize the importance of agriculture as a means of economic growth and diversification. The policy efforts also recognized urgent need to revolutionize the sector to support socio-economic development of the country.

Some of the policy directions are: **a half page statement that will speak to the objectives and strategies of the policy may be need**

1. Agriculture Promotion Policy (APP)
2. Economic Recovery and Growth Plan (ERGP)
3. National Digital Economy Policy and Strategy (NDEPS)
4. Nigeria Smart Initiative Policy Framework (NSIPF)

## 2.0 **DIGITAL** AS AN ENABLER OF AGRICULTURE AND FOOD INDUSTRY

### 2.1 Digital Agriculture

Farming is the oldest industry in civilization, and yet it is the last one to be disrupted by digitalization and new technologies. However, technologies such as SMS, USSD, web, **mobile, blockchain, robotics, remote sensor technology, IoT, big data, Analytics, AI, machine learning among others**, represent a huge opportunity for Africa and in particular, Nigeria to address all the identified challenges and exploit for increased productivity and improved quality of agriculture produce that meet local and international standards. The growth and application of *mobile technologies* and the resulting *digital* services across agriculture value chain **has** capabilities to generate jobs (direct and indirect) and contribute to *economic diversification*.

Digital agriculture is critical in the push to *stem rural-urban migration* and get *young people to drive rural development*. Young people have a huge desire to work and get things done through technology. Though not the only factor, increased use of digital technology in farming and agricultural activities can help to attract and retain younger generations to live in rural communities.

The rising food security concerns and increase in *climate change* demand *real time information* required for agricultural productivity. Access to real-time information is largely dependent on the use and adoption of digital technologies.

Adoption of digital is enabling access to information:

1. On inputs, weather and soil condition,
2. Processing and storage resources,
3. Markets and finance,
4. Food monitoring and consumption requirements.

As farmers and others in the food supply chain embrace technology to drive *greater efficiencies*, there also will be huge opportunities for *technology suppliers and innovators*.

In Nigeria, digital agriculture will help **to**:

1. Maximize production and reduce waste;
2. Reduce costs of production and increase yields; and
3. Minimize environmental impact.
4. Maximize quality and traceability of agriculture produce

A digital agriculture is in line with the digital economy agenda of the Federal Government. It will accelerate the implementation of the objectives of the *Agriculture Promotion Policy* and *Economic Recovery and Growth Plan* as related to agriculture. Furthermore, achieving the UN *Sustainable Development Goals (SDGs)* of a ‘world with zero hunger’ by 2030 will require more productive, efficient, sustainable, inclusive, transparent and resilient food systems (FAO, 2017b p. 140). This can be achieved when agriculture value chain is enabled and powered by *digital technologies and innovations*.

## 2.2 Review of AgTech in Nigeria and other Countries

### Intro

Table 1: Example of digital Agric solutions in Nigeria and other Africa Countries

S/N	Technology	Description	Country
	Zenvus	A digital technology device that measures and analyzes soil data like temperature, nutrients and vegetative health.	Nigeria
	Agrikore	Agrikore is a blockchain based smart-contracting, payments and marketplace system that ensures that everyone in agriculture (Farmers, FMCGs, Agriculture inputs providers, produce aggregators, insurance companies, financial institutions, governments, development partners) can do business with each other in a trusted environment.	Nigeria
3	Hello Tractor:	Hello Tractor is making tractor contracting company. The integration of IoT technology developed through partnerships with hardware companies and its proprietary software and data models allow for tractor contracting to be more profitable and productive. The integration creates an analytics platform that improves decision	Nigeria



making., transparency and efficiency of tractor contracting business.

4 UjuziKilimo

Uses big data and analytic capabilities to transform farmers into a knowledge-based community, with the goal of improving productivity through precision insights. Kenya



5 SunCulture

A drip irrigation kits that use solar energy to pump about 2500L of water from any source up to 70m deep ensuring a steady supply of water for farming. Kenya



6 Farm Drive

Connects unbanked and underserved smallholder farmers to credit, while helping financial institutions cost-effectively increase their agricultural load portfolios. Kenya



7 Farmerline AgroCenta

and Deploy mobile and web technologies that bring Ghana farming advice, weather forecasts, market information, and financial tips to farmers, who are traditionally out of reach, due to barriers in connectivity, literacy, or language.

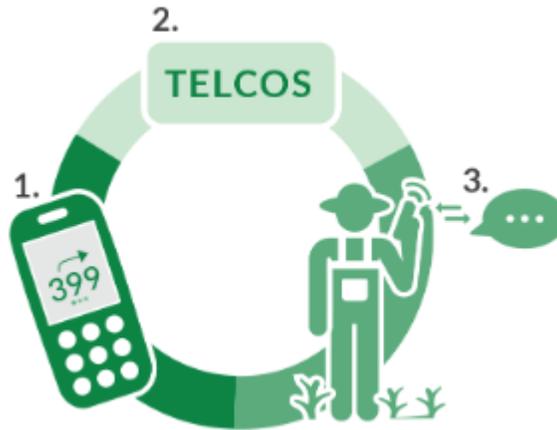


Table 2: Example of Other Countries using Digital Technologies and Innovations

Technology	Description	Country Usage
Open Data	Provides open and interoperable agricultural specialized platform hub on the cloud for the management of spatial and non-spatial data from heterogeneous sources.	Czech Republic, Germany and Spain
Decision Support System (DSS)	It helps farmers predict the weekly yields of tomatoes in a greenhouse with the use of a set of Artificial Intelligence based techniques, namely Artificial Neural Networks (ANNs), Genetic Algorithms (GAs), and Grey System Theory (GST). The prediction was performed by an ANN using a set of optimised input	Slovakia

variables, chosen from all available environmental and measured yield parameters.

Mobile App - Field Atlas App & Field Pass	Facilitate cooperation between farms through the exchange, combination and reuse of data and smart farming technology. Field Atlas APP allows the use of authorized public geodata by mobile devices. Field Pass provides a standardized exchange format for processing and documentation and enables digitized mission organization.	Germany
Precision Agriculture	This uses real time information from GPS satellites to make informed decisions on when to fertilize and irrigate and what crops to plant at what time of the year.  The technology is also closely associated with the use of drones etc.	80% of Australian farmers use GPS on tractors;  70% of US farmers;  Brazil and Argentina are also ahead of the curve
Sensor Technology  M2M or IoT technology	Remote monitoring is now driving change by allowing farmers to monitor their crops and animals using sensors connected to the internet for:  Soil acidity, water retention and nutrient levels  Map soil types, enable variable rate fertiliser application over the lifespan of the crop  Animal health, time for production etc.	
Smartphones and tablets	Provide farmers with more access to information via mobile devices to act as decision aids in the field.	
Blockchain	Provides reliable assurance system for agrobusiness data management and efficient storage using big data technology tools.	Scotland

Transformation of the current agrifood system in Nigeria requires *deliberate actions* and *effective solutions* to different challenges. Digital innovations and technologies are critical part of the solution. Nigeria must also take advantage of her *population, 50% of which is youth*. There is a correlation in *population, geographic size, the use of technology and food production*. The global four largest producing countries of agricultural commodities put *digital technologies at the core of their policy and strategy*:

The following are the largest agricultural producing countries (2019):

China



India



United States (U.S)



Brazil



No country produces food as efficiently as the U.S. Despite having a significantly smaller workforce than China, the total U.S. agricultural product is almost as high. American companies dominate the *food export market*. Second-place *Netherlands exports 35% less than the U.S.* and is closer to *tenth-place China* in terms of *international products*.

This is largely due to the use of digital technologies to improve agriculture efficiency, make information easily accessible to farmers and all the ecosystem players across the value-chain. **The obvious**

Table 3:Top 10 Agricultural Exporters (2018) *Include Nigeria and possibly 2019 data*

S/N	COUNTRIES	EXPORT WORTH (\$)
1	USA	150 Billion
2	Netherlands	94 Billion
3	Germany	86 Billion
4	Brazil	79 Billion
5	France	74 Billion
6	China	63 Billion
7	Spain	50 Billion
8	Canada	49 Billion
9	Belgium	44 Billion
10	Italy	43.7 Billion

Table 4:Africa Top Ten (10) Most Food-secure Countries (2017) by Africa Benchmark Report (ACBR)

S/N	COUNTRIES	EXPORT WORTH (\$)
1	Tunisia	68.20
2	Mauritius	67.33
3	Morocco	64.38

4	Algeria	63.86
5	Egypt	60.03
6	Gabon	58.81
7	South Africa	57.88
8	Ghana	53.57
9	Senegal	52.16
10	Namibia	51.42

# THE NIGERIA DIGITAL AGRICULTURE STRATEGY (NDAS)

## (2020-2030)

Having assessed the agriculture sector challenges and opportunities as well as the inevitability of shying away from digital adoption as a major enabler for agriculture in Nigeria, there is then the need to put orchestrated strategy in place and take deliberate actions to adopting digital innovations in the agriculture sector to address the challenges and take advantage of the opportunities.

### 3.1 The Purpose of the Strategy

The purpose of the strategy is to define directions on how digital technologies and innovations will drive agriculture to address the current challenges and create business opportunities for economic diversification, job and wealth creation. NDAS is to achieve the above by bringing agriculture stakeholders together for a committed cause of moving agriculture from being a source of food to “a business” and commercial ecosystem with capabilities to create sustainable jobs and wealth.”

### 3.2 Aspirations for Digital-enabled Agriculture

NDAS pushes for a Nigerian agriculture sector that promotes the use and adoption of digital technologies and innovations with the following aspirations between 2020 and 2030:

#### *Vision*

To make Nigeria **One of the top** three (3) most food-secure country in Africa and top 20 largest exporter of standard agricultural produce by 2030 through the use and application of digital technologies and innovations

#### *Goals*

The following goals will be pursued to accelerate the achievement of the vision by using digital technologies and innovations to:

1. Increase agriculture productivity, achieve food security and reduce food wastage by 50%;
2. Create an enabling environment for and attract **seven 7 Million youths** into agriculture business across the agric-value chain;
3. Create an enabling environment to increase agriculture contribution to GDP by 50% and food exportation to the tune of 10 trillion Naira per annum
4. Reduce the effect of climate change on agriculture by 40%;

## Strategic Objectives

The following objectives are set to accelerate achievement of the goals by 2030:

1. To increase Research and Development (R&D) and deployment of digital technologies and innovations across agriculture value chain for the purpose of:
  - a. improving agriculture productivity by 50%;
  - b. reducing food wastage by 50%
  - c. reducing effect of climate change by 40% (yield; quality; cost reduction; appropriate use of water, chemicals, farm inputs etc.);
2. Support every agriculture programme:
  - a. with **digital capabilities** to create sustainable business models and opportunities;
  - b. to create a total of about **10 Million well-paying jobs** across the agriculture value chain (production, harvesting storage, processing, marketing, traceability and consumption); and
3. Ensure every farmer in Nigeria has:
  - a. access to quality inputs;
  - b. grow farm produce that of international standard and
  - c. equal access to market (local and international) for farm produce.

## Value Proposition

There is need for farmers and value chain players to take advantage of the following value propositions that would be enabled by the Government through a digital agriculture strategy:

1. **Access to agricultural information at a click**
2. **Affordable digital innovations to promote food security**
3. Connect farmers to local and global agriculture and food markets

## Guiding Principles

To meet the goals and objectives, the practice and activity in the agriculture will be guided by the following principles:

- 
1. Agriculture as a Business
  2. Ecosystem-driven
  3. Digital Inclusion
  4. Sustainability

### 3.3 The Focus of NDAS

The NDAS promotes the use of:

1. **Basic technologies:** these are tools needed to promote access to information and market. These tools include:

- 
- a. the internet;
  - b. mobile devices,
  - c. Short Message Service (SMS),
  - d. RFID Technology,
  - e. Unstructured Supplementary Service Data (USSD),
  - f. mobile apps

These technologies if used innovatively **have the** capabilities to increase productivity, help in effective farm management, reduce the cost of production, increase access to market and exportation among others.

2. **Emerging and Advanced technologies:** They are being used to create new platforms, business models and services more than ever. The innovations coming out of these technologies are attracting young talents into agriculture.

They include:

- a. Internet of Things-IoT (Sensors, Wireless sensor network, Drone etc.);
- b. Geographical Information Systems-GIS (digitized maps of farms, site specific analytics etc.);
- c. Remote sensing;
- d. Cloud computing & services;
- e. Data and Big Data Analytics;
- f. Artificial Intelligence-AI/Machine learning;
- g. Blockchain;
- h. Robotics (Agrorobot); and
- i. Biotechnology are disrupting agriculture and making the value chain more efficient.

3. **Digital Platforms:** are capable of combining basic and advanced digital technologies to create innovations, connect the ecosystem and enable new business models across the Agric value chain. The resultant effect will be a digitalized agriculture sector that create a new flavor of the digital economy capable of diversifying the economy, create jobs and wealth.

### 3.4 Strategic Initiatives

To achieve the aspirations of the Nigeria Digital Agriculture strategy, decisive actions must be taken to tackle the challenges and achieve aspirations set for digital-enabled agriculture in Nigeria. The strategic initiatives are derived through the strategic objectives set in the strategic framework.

#### 4.4.1 Strategic Objectives 1 and Initiatives

Table 5: Strategic Objectives 1 and Corresponding Initiatives

STRATEGIC OBJECTIVES 1	STRATEGIC INITIATIVES
<p>To increase R &amp; D and deployment of digital technologies and innovations across agriculture value chain for the purpose of:</p> <ol style="list-style-type: none"> <li>a. improving agriculture productivity by 50%;</li> <li>b. reducing food wastage by 50%</li> <li>c. reducing effect of climate change by 40% (yield; quality; cost reduction; appropriate use of water, chemicals, farm inputs etc.);</li> </ol>	<ol style="list-style-type: none"> <li>1. Research and Development (R&amp;D) Collaborate with research institutes, industry &amp; academia to:               <ol style="list-style-type: none"> <li>a. Collate and digitize relevant agriculture research content</li> <li>b. Carry out joint research on agriculture productivity &amp; exportation need (on agricultural content, extension services, farm management &amp; operation, climate change, food exports etc.)</li> </ol> </li> </ol>

- c. Promote open data (research findings) in agriculture by making research content available to farmers, agriculture value chain players and startup businesses through digital platforms to spur innovations
- 2. Promotion of e-Extension Services
  - a. Develop strategy for funding electronic extension services;
  - b. Make extension services lucrative to attract talented young graduates into extension and e-extension services;
  - c. Imbibe the culture of using extension workers to obtain information and develop content into digital agriculture platforms
- 3. Deployment of digital technologies and innovations
  - a. Promote the development, on-farm use and adoption of digital technology and innovation platforms in agriculture;
  - b. Empower every farmer with access to basic digital technologies and innovations that improve productivity per farmland, reduce cost of farm management, produce quality foods and increase access to local and international market;
  - c. Create enabling environment for semi-commercial and commercial farmers to have access to emerging and advanced digital technologies to accelerate improved productivity per hectare, reduce cost of farm management, produce quality and standardized foods and increase access to local and international market.

### 3.4.2 Strategic Objectives 2 and Initiatives

Table 6: Strategic Objectives 2 and Corresponding Initiatives

STRATEGIC OBJECTIVES 2	STRATEGIC INITIATIVES
<p>Support every agricultural programme:</p> <ol style="list-style-type: none"> <li>with digital capabilities to create sustainable business models and opportunities;</li> <li>to create a total of about 10 Million well-paying jobs across the agriculture value chain (production, harvesting storage, processing, marketing, traceability and consumption);</li> </ol>	<ol style="list-style-type: none"> <li>Digital Capabilities               <ol style="list-style-type: none"> <li>Embed capacity building (Good Agriculture Practice and digital agriculture skills and marketing) in every agriculture programme.</li> </ol> </li> <li>Creation of 10 Million well-paying Jobs               <ol style="list-style-type: none"> <li>Develop digital-enabled agriculture programmes that attracts graduates and young talents into agriculture;</li> <li>Empower graduate farmers to create agriculture startup businesses to employ other graduates and talents; and</li> <li>Create an ecosystem-driven digital agriculture platform that has potential to serve all farmers in Nigeria</li> </ol> </li> </ol>

### 3.4.3 Strategic Objectives 3 and Initiatives

Table 7: Strategic Objectives 2 and Corresponding Initiatives

STRATEGIC OBJECTIVES	STRATEGIC INITIATIVES
<p>Ensure every farmer in Nigeria has:</p> <ol style="list-style-type: none"> <li>access to quality inputs;</li> <li>grow farm produce that of international standard; and</li> <li>equal access to market (local and international) for farm produce.</li> </ol>	<ol style="list-style-type: none"> <li>Access to quality inputs               <ol style="list-style-type: none"> <li>Get government to accredit more inputs suppliers to promote access to quality farm inputs</li> </ol> </li> <li>Quality farm Produce for exportation               <ol style="list-style-type: none"> <li>Put mechanisms in place to monitor and ensure farmers produce at good quality</li> <li>Increase farm storage and process facilities across the country</li> </ol> </li> <li>Equal access to local and international market               <ol style="list-style-type: none"> <li>Promote policy of open markets (local and international) to agriculture products;</li> </ol> </li> <li>Core Initiative               <ol style="list-style-type: none"> <li>Develop open data initiatives in agriculture; and</li> <li>Promote the use of digital agriculture platforms to broaden access to government accredited input suppliers, monitor agriculture produce for</li> </ol> </li> </ol>

quality and increase access to local and international markets for Nigerian farm products.

## 2.5 Complementary Initiatives

Complementary initiatives are set of strategic initiatives developed to supplement identified strategic initiatives vis-à-vis strategic objectives. They are listed as follows.

### *3.5.1 Organize AgTech Entrepreneurial Training programs for Startups*

The training program will be designed for young school leavers and graduates, who are **technology driven and tech savvy** with passion for agriculture in the 36 states and FCT to acquire the requisite entrepreneurial skills. The candidates with good soft skills (team work, communications, leadership, etc) must have a desire to start and scale an agribusiness. A strong interest in technology is required as well as a readiness to give 100% commitment.

#### *Strategy*

The training should be in the form of Public Private Partnership and the organizers will be accredited by the Government.

#### *Actions*

The course contents and modality of operation will be developed and finalized through Federal Ministry of Agriculture and Rural Development (FMARD), Federal Ministry of Communications and Digital Economy (FMoCDE), Federal Ministry of Education (FMOE) and the agriculture, IT and education industries players.

### *3.5.2 Establish Digital Agriculture Strategic & Advisory Forum*

It is essentially a forum organized to enable agro stakeholders form agro ecosystem to share knowledge, insights and best practices on innovation and the use of ICT in food and agriculture.

It will facilitate the exchange of views and experiences on the deployment and development of digital technologies to deliver meaningful impact in critical areas such as food and nutrition security, environmental sustainability and climate action. It will essentially promote innovation and foster the sharing of agricultural knowledge and help agro stakeholders handle digital agriculture challenges and opportunities.

Furthermore, the forum will:

1. improve understanding of the digital farming environment;
2. enable review of new AgTech and digital agriculture solutions;
3. answer questions regarding digital agriculture practices, developments, challenges and opportunities in Nigeria;
4. improve information flows within Nigeria's digital agriculture community;
5. Highlight benefits and challenges of using technologies in agriculture;
6. enable the sharing of experiences with digital tools, digital agribusiness models; and

7. enable the sharing of opportunities for collaboration in research, development and commercial ventures

By enhancing knowledge and mutual learning through open and informal discussions, it will get all stakeholders involved in the creation and sharing of knowledge in order to create an authentic innovation ecosystem capable of achieving Nigeria's digital agriculture objectives.

The strategic and advisory forum will consist representatives from Federal Ministry of Agriculture and Rural Development (FMARD), Federal Ministry of Communications and Digital Economy (FMoCDE), Federal Ministry of Education (FMoE) and the agriculture, IT and education industries players such as farmers, agro marketing agencies; agro product vendors; agencies of government in charge of agriculture; telecommunication companies or Internet Service Provider (ISP) or other IT infrastructure service providers; agro software developers; IT agencies of government; weather agencies and AgroBanks, etc.

### *Actions*

The formation of the forum will be finalized with FMARD and FMoCDE

### *3.5.3 Establish and Promote AgTech Career Initiatives*

Technology and digital advancements in agriculture offer new careers. The initiatives provides opportunities for young people to pursue rewarding careers in agriculture and technology and to seize growth opportunities emerging in digital agriculture.

The future of agriculture will be dominated with the use of technology in all the aspects of agriculture, from production to processing and logistics. The initiatives will enable new entrants to strengthen the country's agricultural prowess by taking advantage of new technologies driving the digital transformation of agriculture. The career initiatives are in realization of the potential of this field and the sector at large which is creating new career avenues.

### *Actions*

1. Create awareness about digital agriculture career opportunities in secondary schools through career events, guidance and counseling, career discussions with agriculture leaders in academia, government and industry and organize digital agriculture career competitions and awards for secondary school students in order to position agriculture as an attractive and exciting career choice for young persons.
2. Organize National Students in Digital agriculture events organized by secondary schools throughout the country with active participation and support by Federal Ministry of Communications and Digital Economy (FMoCDE) and Federal Ministry of Agriculture and Rural Development (FMARD) as well as other members of the digital agriculture ecosystem
3. Integrate digital agriculture competencies into the learning curricula of undergraduate and postgraduate courses to enable specialization in digital agriculture through projects of the students. The upcoming change will lead to a wealth of career opportunities for skilled manpower capable of adopting new innovations and technologies.
4. Fund and encourage the development of postgraduate projects to focus and specialize in agricultural sector priorities (food security, export performance, climate change, sustainable farming and environmental sustainability) through digital agriculture

*NOTE: The implementation of AgTech career initiatives will be finalized with FMARD, FMoCDE and FMoE*

#### **3.5.4 Establish Rural Digital Literacy Initiative**

Investment in digital literacy in the rural areas will contribute significantly to fostering sustainable development and closing the digital divide between the rural and urban areas in Nigeria.

In the digital economy, investing in digital skills is of paramount importance. Closing the digital divide through digital literacy and skills will enable farmers and farming communities which are mainly located in the rural areas to participate fully and meaningfully in digital agriculture activities.

#### **Actions**

Establish a National Digital Literacy programme for rural communities

1. Government will work with stakeholders and partners to setup and run digital literacy programs in rural areas throughout the country. Stakeholders will play a major role in equipping the rural populace with digital skills.
2. Through the partnerships provide grants, funding and incentives to training organizations to run the programs to improve digital literacy and skills through education and training. Funding and partnerships will help to diffuse and scale up in the rural communities.
3. The programs will be hands-on and focused on their day to day activities and experiences. The initiative will help candidates to achieve at least a minimum level of proficiency in digital literacy skills, as proposed in the Digital Literacy Global Framework.
4. Create nationwide awareness through different media that digital literacy is a priority for sustainable national development.
5. Raise advocacy for digital literacy in the rural areas, highlighting the empowerment opportunities as well as the benefits of being digitally literate to farmers and members of rural communities.

#### **3.5.5 Establish Agricultural Digital Innovation Hubs for Research and Innovations**

Agricultural digital innovation hubs will provide agricultural tech entrepreneurs, the research community, farmers and financial institutions with opportunities to advance innovation and boost performance in the food and agriculture space.

The hubs should be launched and supported by the Government and partners and innovators in the food and agriculture sector. Specifically the hubs should aim to explore innovative approaches to empowering farmers and stakeholders in agriculture and enhancing their income and productivity. It will look at how the multitude of problems in agriculture can be addressed by digital innovation by making the farming and agricultural communities more competitive and successful.

#### **Actions**

The hubs will seek to empower passionate entrepreneurs, startups, researchers and other members of the ecosystem that can solve the problems of farming communities using innovation through a combination of matters relating to agriculture, ICT and finance. It will facilitate the experimentation, prototyping and development of new technologies to meet the actual needs of farmers and their communities.

The agricultural digital innovation hubs will

1. Build capabilities for digital innovation in agriculture
2. Support the generation of cutting-edge ideas across the whole agriculture value chain
3. Support AgTech startups at different stages of incubation and accelerator programs
4. Organize capacity development programs for AgTech startups
5. Host co-working space for food, agriculture, AgTech innovators, entrepreneurs and researchers.
6. Organize agricultural digital innovations programs
7. Develop mechanisms for funding and working with startups, private sector partners and government to accelerate the use of digital innovation to reshape and transform food and agriculture systems in Nigeria.
8. Organize agricultural digital innovations competitions

### *3.5.6 Consortium on ICT for Climate-Smart Agriculture*

The consortium will be responsible for applying Information and Communication Technology (ICT) to climate change monitoring, mitigation and adaptation in agriculture. It will be focused on increasing the application and access of farmers and the agricultural community to climate smart digital solutions. The consortium will be made of relevant MDAs, stakeholders in agriculture and ICT.

#### *Actions*

The consortium's approach to achieve the objectives will consist of using the two key elements of agriculture and ICT.

1. From the agriculture angle, it will entail identifying farms and farming communities that are being ravaged by the effects of climate change. This will be done by agriculture stakeholders and government agencies.
2. From the ICT angle, a Climate-smart digital solutions team that consists of specialists with proven expertise in practical climate-smart agriculture methodologies and technologies will be established.,

Specifically, the members of climate-smart team will have capabilities to offer innovative digital solutions that include: Precision agriculture and remote sensing technologies (Internet of Things (IoT), Global Navigation Satellite System (GNSS), Real Time Kinematic (RTK), Variable Rate Technology (VRT), Precision Livestock Farming (PLF), Unmanned Area Vehicle (UAV) and satellite imagery), Smart Devices and Sensors, Mobile applications and systems, Intelligent systems (Deep learning, Machine Learning, Artificial Intelligence (AI), robotics and autonomous systems), Big Data, cloud, analytics, Cybersecurity, Communication Technologies, Blockchain and distributed ledger technologies.

There would be assessment of climate change challenges. The key process would entail requests for digital climate-smart solutions for each selected climate change challenge and start up businesses will be required to apply to provide the solution.

The consortium will also arrange for:

1. Support and funding of the projects
2. Project reporting
3. Monitoring and evaluation mechanisms

Activities of the consortium will be carried out through transparent, accountable and resulted oriented processes.

### *3.5.7 Nigeria Digital Agriculture Platform Initiative*

The Nigeria Digital Agriculture Platform is a multistakeholder initiative that will showcase Nigeria's competitive advantages, opportunities and strengths in AgTech and Digital Agribusiness to a global audience.

Objectives include:

1. To attract more foreign investors, partners and innovators to Nigeria's digital agriculture space. It will be developed to help Nigeria reach its full potential in digital agriculture;
2. The platform will act as hub that links agriculture value chain players across vast areas of discipline for sharing information, knowledge and resources necessary for the growth and sustainability of the agriculture in Nigeria;
3. It will enable collaboration with investors and researchers who are exploring ways of working with Nigeria to develop the agricultural and food technologies of the future.
4. It will enable AgTech startups and farmers in Nigeria attract foreign interest and investment, enabling them to seize opportunities in food production and AgTech in global markets, to take advantage of the world's growing demand for food and agricultural products.
5. It will promote Nigeria's export strategy especially as it relates to digital agriculture.
6. It will establish Nigeria as a natural Africa's leading hub for food and AgTech.

The initiative should be driven by Federal Ministry of Agriculture and Rural Development, Federal Ministry of Communications and Digital Economy and National Information Technology Development Agency in collaboration with Federal Ministry of Industry Trade and Investment.

#### *Actions*

The National Adopted Village for Smart Agriculture (NAVSA) should be adopted as a national Digital Agriculture Platform. NAVSA seeks to build a platform with vision of becoming number one ecosystem and data driven agriculture platform in Nigeria. It has a value proposition of ensuring affordable and accessible digital technologies and innovations are embedded in agriculture activities to accelerate food security and economic diversification.

NITDA should ensure:

1. NAVSA is technologically robust;
2. All potential agriculture ecosystem players are consulted and given opportunities to participate on the platform;
3. Youthful population is the major driver of the platform;
4. Build a consortium of service providers to manage the operation of the platform;
5. Ensure adequate, usable across all categories of people and timely information is available on the platform.

Additional content of the digital platform will be:

1. Up to date news, insights and developments from Nigeria's digital agriculture space;
2. How farmers, innovators, exporters, researchers and investors from Nigeria and overseas are connecting together to share and explore new directions for the future of food and agriculture.

3. Innovations developed by Nigerians, specifically those in the agriculture sector, that are being used to add value in the country, boost efficiency and productivity;
4. Composition of Nigeria's AgTech sector, as well as Nigeria's Digital Agriculture initiatives;
5. Agriculture research and education in Nigeria, quality, outcomes;
6. Quality control and other standardization initiatives;
7. Testimonials and positive experiences from investors, partners and exporters who have benefited from Nigeria's Digital Agriculture Strategy

### *3.5.8 Gender Inclusion in Digital Agriculture*

The fact that women are not provided with the same access to opportunities and resources contributes in no small part to the poor performance of the agriculture sector in Nigeria. The sector and the nation lose in terms of lower agricultural productivity, weak food security and unsustainable economic growth. There is a need to drastically reduce the vulnerability of women to biases in agriculture and address the unequal gender structures in the sector. "The goal of the gender inclusion policy is to ensure equal opportunities and access to resources, services and agricultural programmes in Nigeria regardless of gender.

Though women make significant contributions to the rural economy, they face challenges of competing with men in terms of access to technology, extension services, land, credit facilities, farming infrastructures education, and farm inputs like fertilisers and seeds. Women make up about 50 per cent of Nigeria's population, and are responsible for carrying out 70 per cent of agricultural labour, 50 per cent of animal husbandry-related activities, and 60 per cent of food processing activities. But maximizing agricultural production and rural development is impeded because they only have access to less than 20 per cent of available agricultural resources.

Gender balance is essential for rural and agricultural development. A gender-balanced agricultural sector is needed and should be employed as a means of eliminating gender inequality in the sector. The Nigeria Digital Agriculture strategy is gender sensitive and inclusive.

The objectives are:

1. Development of gender-responsive ICT projects and solutions
2. Equal representation of women in the decision-making processes and policy development in digital agriculture
3. Inclusive digital capacity development for women and disadvantaged groups)

### *Actions*

The initiative should be driven by Federal Ministry of Agriculture and Rural Development, Federal Ministry of Communications and Digital Economy and National Information Technology Development Agency in collaboration with Federal Ministry of Youth and Sports and Federal Ministry of Women Affairs

Programs and initiatives should address:

1. Appropriate technology development and implementation;
2. Adoption of strategies, approaches and systems that are gender sensitive, for example in the proposed National Digital Literacy program for rural communities;

3. Access and opportunities are equally distributed among women and men; and
4. Enabling environment and growth opportunities for rural women and female farmers in AgTech, digital agribusiness, inclusive access to digital agricultural resources, education, extension, financial services and labour markets

# THE DIGITAL AGRICULTURE IMPLEMENTATION FRAMEWORK

The Nigeria Digital Agriculture Strategy (NDAS) adopts the framework for Nigeria Smart Initiatives. The framework provides structure that guides implementation of any digital agriculture initiative. It consists of digital agriculture ecosystem, architecture layers and core drivers.

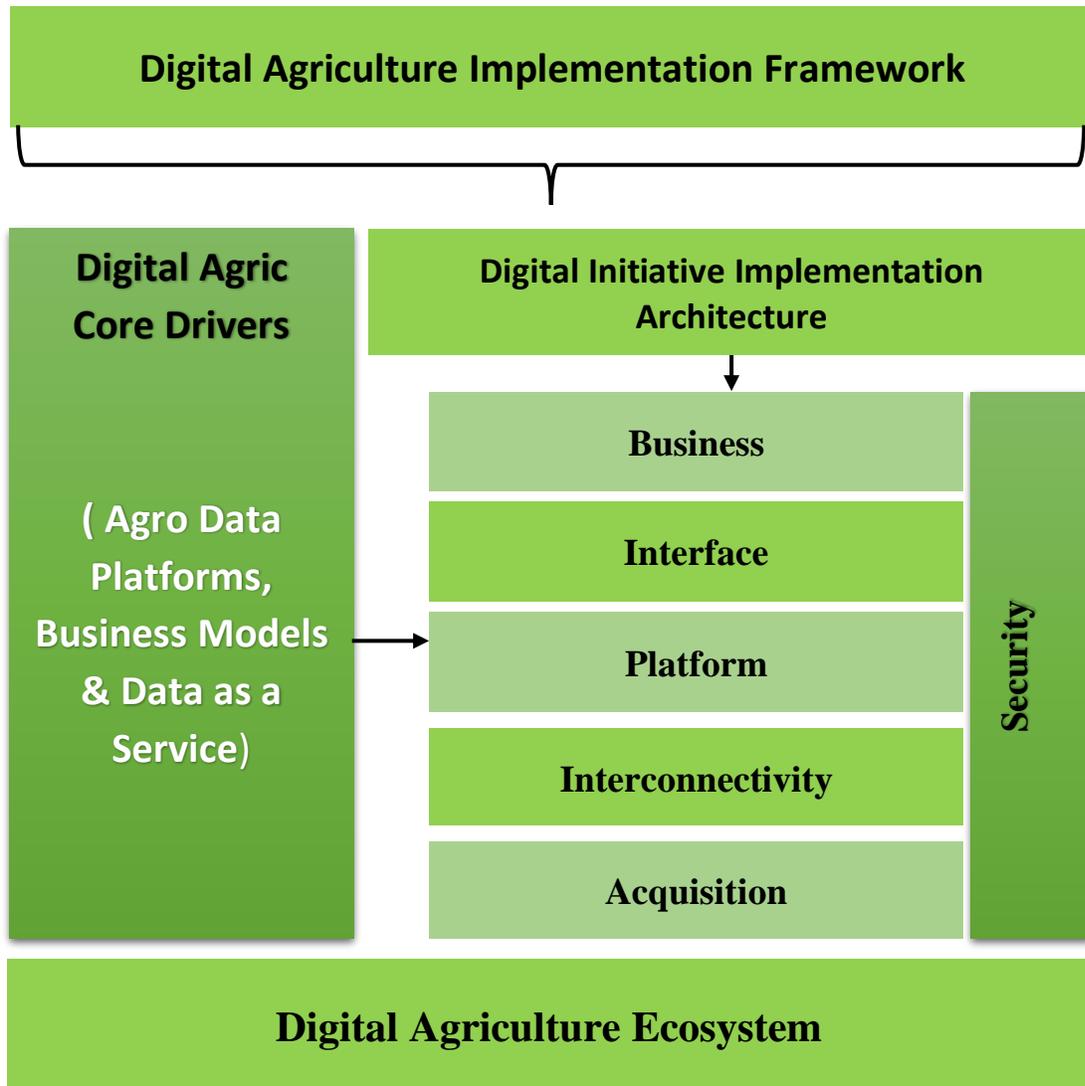


Figure 1: Digital Agriculture Initiative Architectural Framework

## 4.1 Digital Agriculture Ecosystem

The digital agriculture ecosystem is comprised of interest groups from public and private sectors. It cuts across the agriculture value chain and comprised of many providers, partners and end users of digital solutions and systems. The high-level agriculture ecosystem is presented in figure 4, 5, and 6.

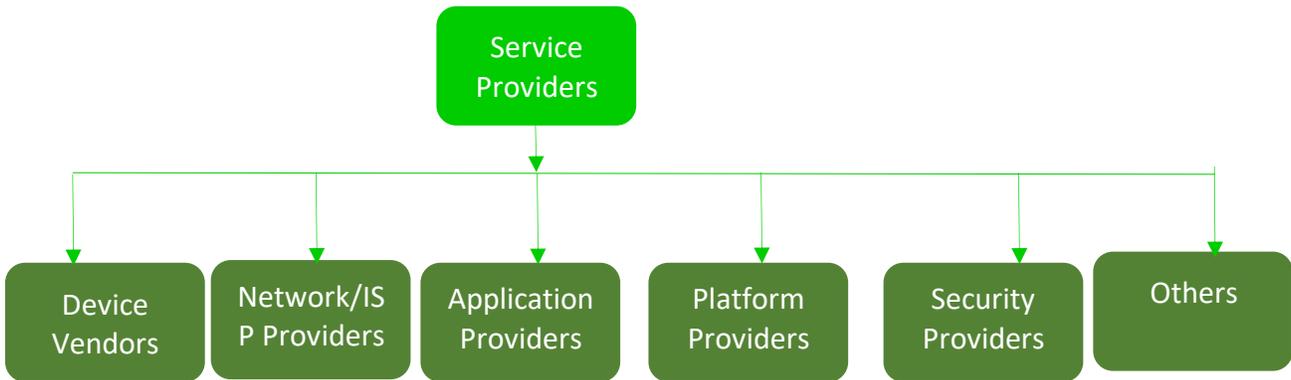


Figure 2: Agro Service Providers Ecosystem

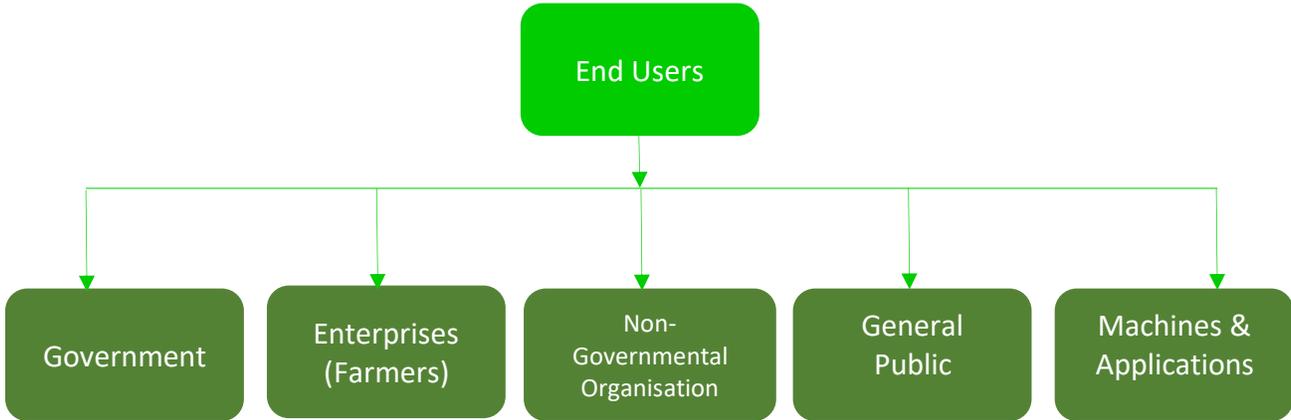


Figure 3: End Users Ecosystem

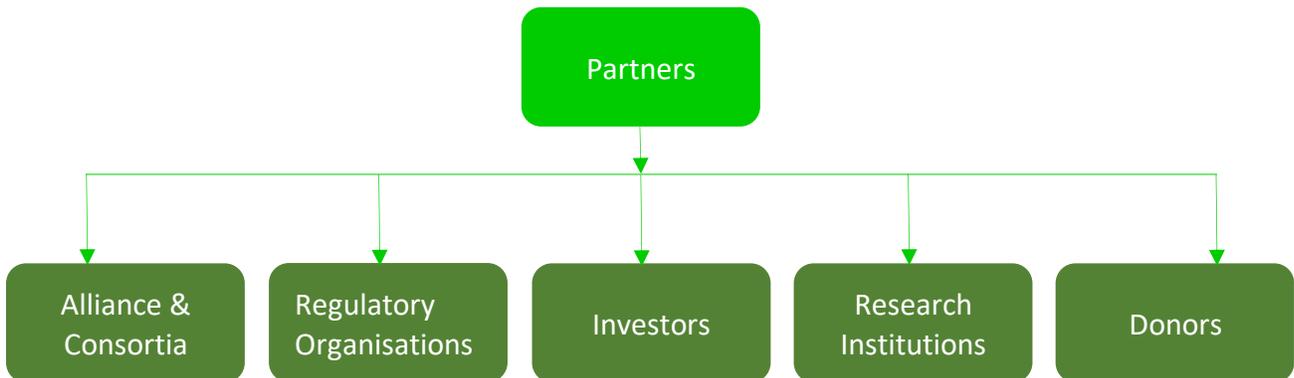


Figure 4: Partners Ecosystem

### ***5.1.1 List of Digital Agriculture Ecosystem Players***

The potential agriculture ecosystem players are:

1. Relevant agencies of Federal Government
2. States and LGAs
3. Existing agriculture platforms and companies
4. Telecommunication companies (Telcos)
5. Smart/Precision agriculture solution service providers (Sensor & Wireless sensor network, Geographical Information System, Remote Sensing, etc.)
6. Internet Service Providers
7. Farm inputs suppliers
8. Mobile Money Providers
9. Banks
10. Payment Gateway
11. Agro Processors/Off-takers/produce aggregator
12. Investors
13. Development partners
14. Corporate Companies (for Corporate Social Responsibility)
15. Farmers Associations
16. Agriculture Development Project (ADP- Extension Services)
17. Agro-based Industries (Raw Material)
18. Individual Experts
19. Marketplace/Produce aggregator
20. Tools Fabricators
21. Start-up business promoters
22. Transporters/ agro-logistics service providers

## **4.2 Digital Initiative Implementation Architecture**

The architecture layers are divided into business, interface, platform, interconnectivity, acquisition and security layers. The architecture guides agriculture ecosystem in building digital solutions or platforms that are interoperable, integrable, scalable and fit-for-purpose. This will allow digital agriculture solutions and platforms to create new values and services for social and economic development.

The architecture is developed to promote interoperability, scalability and sustainability of agriculture digital initiatives in Nigeria. The architecture clearly indicates layers how digital requirements/conditions, technological concepts and the ecosystem players are interconnected to collaborate and build sustainable digital initiatives.

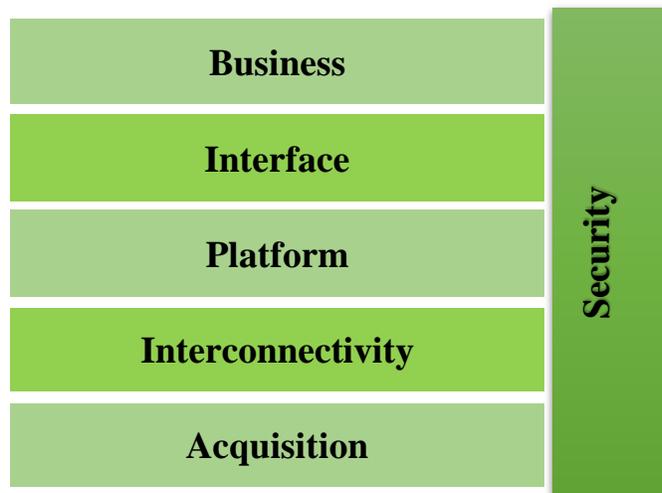


Figure 5: Digital Initiative Architecture Layers

**Business Layer:** The business layer drives the digital agriculture initiatives through sector policies, strategies and regulations that create an enabling environment for agriculture sector growth. It promotes agriculture as a business. This builds foundation for the creation and promotion of new markets and business models for different agriculture sector. The new market and business models drive investments, create the demand for appropriate smart applications and services as well as new infrastructure to either complement or replace the existing ones.

The goal of the business layer is to ensure that every digital agriculture solution and project impacts positively on **governance, economy, environment and society**. The strategic objectives for every digital agriculture projects are to:

1. Increase efficiency (cost, time and quality) of agriculture activities;
2. Add value to the economy through creation of jobs and contribution to Gross Domestic Product (GDP);
3. Protect and sustain natural environment and ensure natural resources are better managed; and
4. Improve the citizens' quality of life.

Furthermore, the business layer provides the requirements needed for the emergence of different “Digital Platforms” that promote the concept of “data market or data as a service (Daas)” in the agriculture sector. Therefore, the business layer is a justification for setting up governance structure to ensure coordination for effective implementation of every agriculture platform.

The business layer also promotes the adoption of digital standards that address issue of interoperability between different digital projects that are dispersed, existing IT infrastructure and applications. It promotes seamless access to market for all agriculture produce through adoption of digital technologies and sustainability of digital agriculture projects in Nigeria.

**Presentation Layer:** This layer includes system and user interfaces; digital applications; and digital services. The system interface defines the standards and protocols for connectivity, data/message transmission and exchange, device & service discovery and management while the user interface includes channels through which services are delivered to the users for better user experience. The digital

applications component defines set of technologies and requirements for implementing digital applications needed by the business layer. The digital service component presents set of services that drives implementation of digital solutions and projects. In addition, it provides interfaces (e.g. web portal, mobile app, chatbots interactive voice response etc.) through which those services can be accessed. It also provides interface through which interaction occurs with the Platform layer through well-defined interface specifications that support variety of technology platforms.

**Platform Layer:** Platform layer is critical to the success of the digital agriculture initiatives. It serves three major purposes. First, the platform provides resources for running digital applications developed to deliver and manage services specified at the business and interface layers respectively. Second, the platform stores agriculture data and other forms of data from all sources to the database management system and Artificial intelligence/Machine Learning (AI/ML) tools which are required to have capability to retrieve, process, compute, analyse information and automatically decide based on the computational and analysis results to help the business make the appropriate decisions. Analytics is at the heart of the platform layer. This is to ensure real time monitoring, management and/or coordination of all sources of data, enable predictive and prescriptive capabilities that provides intelligence to data analysis as well as automate internal and external operations using the right algorithm. Third, the platform provides resources (dashboards, tools, business logic etc.) for implementing Agro *Data as a Service (DaaS)*. A digital agriculture platform should support new business models, services and capabilities emanating from agriculture activities and businesses.

**Interconnecting Layer:** The interconnecting layer is responsible for secure connection between data acquisition and the platform layers. Its role is to send data in a secure manner from the smart devices, **standard digital interfaces** and/or gateway (depending on the business rules requirements) at the acquisition layer to the platform layer. It entails different network and communication protocols, standards and technologies for secure and efficient transmission of data.

**Acquisition Layer:** This is the edge layer of the architecture that enables interaction between the physical objects or other sources of data in the real world . Data is captured at this layer and this layer is sometimes responsible for processing data at the network edge. It comprises of the **smart devices** that interact with physical objects, **standard digital interfaces** that captures other sources of data; **hardware platforms** that power the smart devices; **software frameworks** that drive the hardware and enable autonomic networking; security/privacy features and device manageability; the **network edge** that connects the smart devices; **the gateways** that process data at the network edge and connects the network of heterogeneous devices with the platform layer, through the internet. The gateway and/or standard interface transmits data in a certain format and as well receives commands from the platform layer and makes responses according to the commands.

**Security Layer:** Because of the sensitive nature of digital solutions and services, privacy of physical objects and personal information, the architecture dedicates a layer for security and data protection. The security of data and inherent information cuts across other architecture layers. Security of smart devices, standard interfaces and data emanating from them and transmitted through communication links to the platform and presentation layers, is a major security concern. This means an end-to-end security must be provided in digital agriculture solutions/platforms.

Data security entails **confidentiality** (protection of information from unauthorized disclosure), **integrity** (protection of information from unauthorized modification,) and **availability** (ensuring information is available when it is required). To make information available to those who need it and who can be trusted with it, **authentication** (proving that a user is whom he or she claims to be) and **authorization** (the act of determining whether a particular user or computer system has the right to carry out a certain activity), such as reading a file or running a program, should be implemented. Thus, concepts relating to the people who use that information are authentication, authorization and **non-repudiation** (ensuring means of authentication cannot later be refuted - the user cannot later deny that he or she performed the activity).

Smart devices must also be protected against **physical and environmental damages** as well as unauthorized access.

Table 8: Architecture layers with the aspect of security & measures

S/N	Layer	Aspects & Measures
1.	Business	Information Security Policy (Confidentiality, Integrity, and Availability)
2.	Interface	Access control, authentication, user Identification, non-repudiation etc.
3.	Platform	Confidentiality, data integrity, Access control, user identification, authentication, Data encryption, non-repudiation
4.	Interconnecting	Confidentiality, access control, authentication etc.
5.	Acquisition	Physical security protection, access control, authentication, User Identification, authorization etc.

### 4.3 Core Drivers for Nigeria Digital Agriculture Strategy

**Digital Platform:** The digital platform is a combination of the agriculture value-chain, the architecture layer components and the ecosystem, which comprises of:

1. Smart devices, communication technologies and IT infrastructure;
2. Computing and data analytics resources and tools
3. Digital applications and solutions; and
4. Agriculture Ecosystem

The goal is to have and control a centralized platform for agriculture that provides data/information, services, business models and jobs needed to grow the agriculture sector.

**Business Model** is an agreement on how the digital platform will operate, generate revenue and how the revenue will be distributed across the agro value chain. It also creates customer demand for digital platform service, value for the ecosystem and develops new products or services that the ecosystem never imagined. Business model is key to the success and sustainability of the agriculture platform.

A suitable business model guarantees the sustainability of a digital platform in terms of development, operation and maintenance, as well as investment and finance requirements. It creates customer demand for digital platform services, value for the ecosystem and develop new products or services that the ecosystem never imagined.

Business model drivers are the agriculture ecosystem and data users that include the public and private sectors, interest groups, non-governmental organizations, and developmental partners.

*Data as a Service (DaaS)/Data Market* is the gold mine of the digital platform and the drivers of the business models. In any digital solution or platform, data is the most valuable element. Those in the agriculture ecosystem who aggregate and transform massive amounts of raw data into commercially useful intelligence will capture the real value.

The objective of DaaS is to make use of the intelligent tools and resources available on the digital platforms for innovative services that better the life of citizens and contribute to socio-economic development of the country by gathering agro data to tailor information on specific needs of the targeted players on the agro value chain. Ultimately, the essence of DaaS is to leverage on digital platform for digital-led growth and innovation in governance, economy, environment and society

# HIGH LEVEL IMPLEMENTATION GOVERNANCE STRUCTURE AND PLAN

This section provides high level governance structure and plan for the implementation of the strategic initiatives

## 5.1 Governance Structure

The digital agriculture governance structure adopts the proposition of the Nigeria Smart Initiatives Policy Framework (NSIPF). Therefore, the governance structure for the implementation of the Digital Agriculture Strategy is depicted in figure 8.

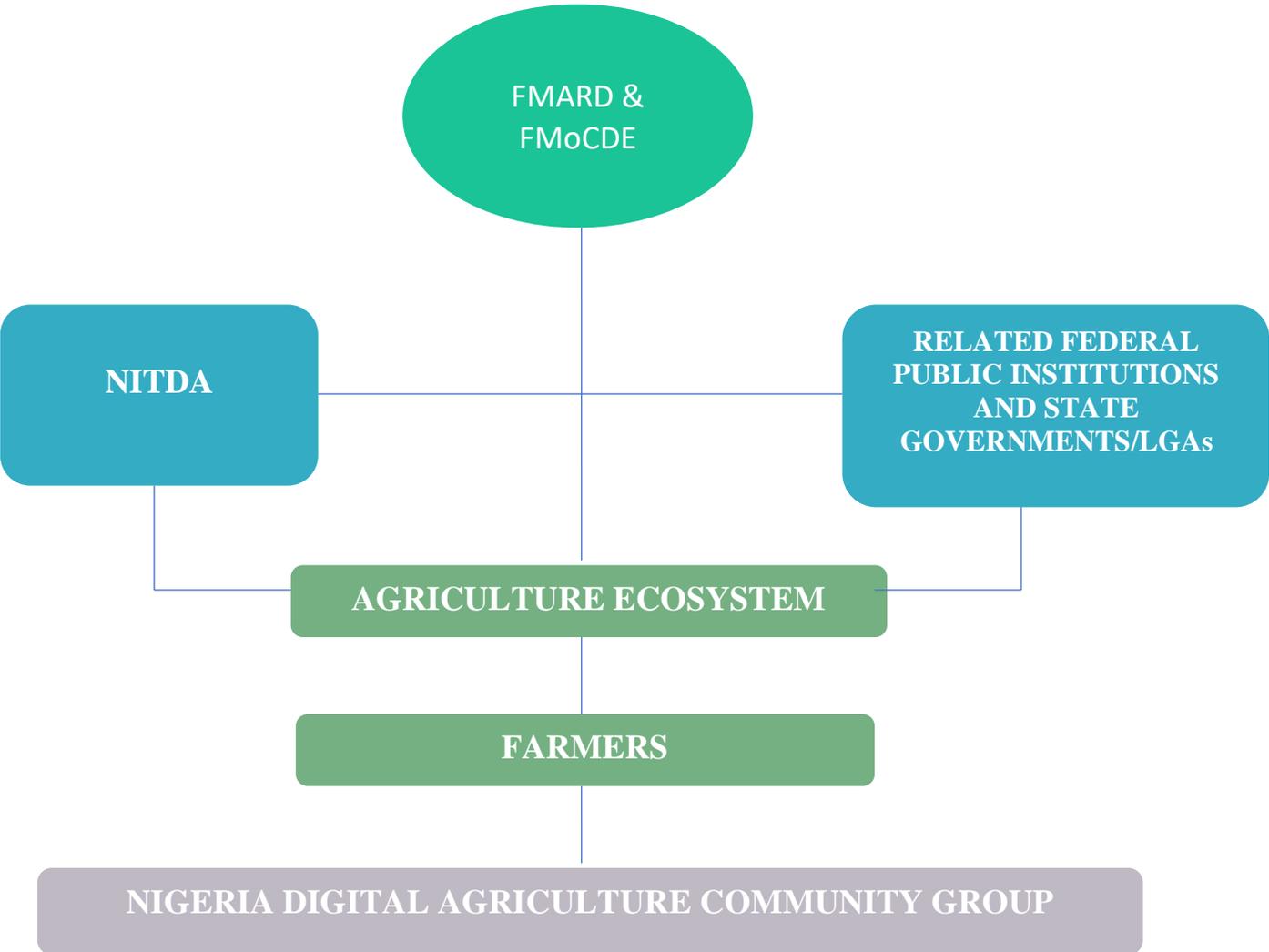


Figure 6: Digital Agriculture Governance Structure

**Federal Ministry of Agriculture and Rural Development:** Provides overall policy directions for agriculture sector

**Federal Ministry of Communications and Digital Economy:** Provides overall policy directions for implementation of digital technologies and innovations in agriculture

**State and Local Governments:** Provides the right political and business environment for digital agriculture and support the Federal Government in NDAS implementation

**National Information Technology Development Agency:** Regulate and coordinate the use of digital technologies and innovations for agriculture

**Related Federal Public Institutions:** provide support and partnership for the implementation of digital agriculture strategy at the federal level

**Agriculture Ecosystem:** comprises of the players across the agriculture value chain. They provide services and drive implementation of digital agriculture strategy

**Farmers:** They are critical members of the ecosystem and produce food for the country and exports.

**Nigeria Digital Agriculture Community Group:** The digital agriculture community group represents and presents the general interests of the agriculture stakeholders. They are digital agriculture knowledge and experience sharing body.

## 5.2 Implementation Plan

Tables 9 to 17 provide all the strategic initiatives, and who is responsible for implementation among the stakeholders.

### 5.2.1 Implementation Plan for Strategic Objectives 1 and Initiatives

To increase R & D and deployment of digital technologies and innovations across agriculture value chain for the purpose of:

1. improving agriculture productivity by 50%;
2. reducing food wastage by 50%; and
3. reducing effect of climate change by 40% (yield; quality; cost reduction; appropriate use of water, chemicals, farm inputs etc.)

Table 9: Digital Agriculture High-level Implementation Plan

Research and Development (R&D)			
Specific Output/Deliverables	Strategy	Action By	Timeline
a. Collate and digitize relevant agriculture research content	1. Research institutions in Agriculture and Universities of Agriculture	NITDA/ States & LGAs	2020 -

will collate. Tech companies with expertise commissioned and supervised by NITDA will then digitize these contents and make them digitally accessible to the relevant players.

- |   |  |                            |        |
|---|--|----------------------------|--------|
| d. Carry out joint research on agriculture productivity & exportation need (on agricultural content, extension services, farm management & operation, climate change, food exports etc.)                      | 1. Research firm will be engaged to carry out the research with Universities of Agriculture based on directives from FMARD.        | FMARD/<br>States &<br>LGAs | 2020 - |
| e. Promote open data (research findings) in agriculture by making research content available to farmers, agriculture value chain players and startup businesses through digital platforms to spur innovations | 1. Private firm with expertise should develop digital platforms for open data resources in agriculture based on stakeholder needs. | NITDA<br>/States &<br>LGAs | 2021 - |

### Promotion of e-Extension Services

<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Develop <i>strategy</i> for funding extension services;	1. Develop Extension services plan that incorporates e-extension and capacity development. Identify funding requirements from plan. Obtain funding from Bank of Agriculture	FMARD/States & LGAs (in collaboration with Bank of Agriculture)	2021 -

- |  |   |                     |        |
|--|---|---------------------|--------|
| a. Make extension services <i>lucrative</i> and attract <i>talented graduates</i> into extension and <i>e-extension services</i> ; | 1. Promote awareness about extension services, improve working conditions of extension workers and promote e-extension solutions among young people and the farming community | FMARD/States & LGAs | 2021 - |
| d. Imbibe the culture of using extension workers to obtain information and develop content into digital agriculture platforms      | 1. Exposure of extension workers on modern data collection techniques and concepts.<br>2. Capacity development of extension workers   | FMARD/States & LGAs | 2021 - |

### Deployment of digital technologies and innovations

<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Promote the development, <i>on-farm</i> use and adoption of digital technology and innovation platforms in agriculture;	1. Encourage youth and startups to develop digital tech and innovation solutions for agriculture through support, funding, competitions, incentives, patronage schemes, etc	NITDA/ States & LGAs	2022 -
b. Empower every farmer with access to <i>basic</i> digital technologies and innovations that <i>improve productivity per farmland</i> , reduce cost of farm management, produce quality foods and increase access to local and international market;	Implement <b>2.5.4:</b> <b>1. Establish Rural Digital Literacy Initiatives</b> 2. Build digital capacity of farmers through trainings prepared and presented relevant experts.	FMCoDE/ States & LGAs	2022 -
c. Create enabling environment for <i>semi-commercial</i> and <i>commercial farmers</i> to have access to <i>emerging</i> and	1. Develop schemes to support farmers' access to digital technologies for agriculture through funding, subsidized rentals, purchase plans etc.	FMARD/ States & LGAs	2022 -

- advanced* digital technologies to accelerate improved productivity per hectare, reduce cost of farm management, produce quality and standardized foods and increase access to local and international market.
2. Implement **2.5.7 Nigeria Digital Agriculture Platform Initiative**

### 5.2.2 Implementation Plan for Strategic Objectives 2 and Initiatives

Support every agriculture programme:

1. with **digital capabilities** to create sustainable business models and opportunities;
2. to create a total of about **10 Million well-paying jobs** across the agriculture value chain (production, harvesting storage, processing, marketing, traceability and consumption);

Table 10: Implementation Plan for Strategic Objectives 2 and Initiatives

<b>Digital Capabilities</b>			
<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Embed capacity building (Good Agriculture Practice and digital agriculture skills and marketing) in every agriculture programme.	<ol style="list-style-type: none"> <li>1. Implement <b>2.5.4 Establish Rural Digital Literacy Initiative</b></li> <li>2. Promote adoption of digital technologies in all agriculture programmes</li> </ol>	FMoCDE/ States & LGAs	2021 -
<b>Creation of 10 Million well-paying Jobs</b>			
<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Develop digital-enabled agriculture programmes that attract and get involved graduates and young talents into agriculture;	<ol style="list-style-type: none"> <li>1. Implement <b>2.5.3 Establish and Promote AgTech Career Initiatives</b></li> </ol>	FMARD/ States & LGAs	2022 -
b. Empower graduate farmers to create <b>agriculture startup</b>	<ol style="list-style-type: none"> <li>1. Implement <b>2.5.1 Organize AgTech Entrepreneurial</b></li> </ol>	NITDA/ States & LGAs	2022 -

<i>businesses</i> to employ other graduates and talents; and	<b>Training programs for Startups</b>		
	2. Create support schemes for agriculture startups by providing funding, competitions, business skills, incentives, patronage schemes, etc		
c. Create an <b>ecosystem-driven</b> digital agriculture platform that has potential to serve all farmers in Nigeria	1. Get stakeholder buy-in and participation in key aspects of the development of data-driven services in agriculture. 2. Involve research institutes, universities, government departments and agribusiness companies	NITDA/ States & LGAs	2022 -

### 5.2.3 Implementation Plan for Strategic Objectives 3 and Initiatives

Ensure every farmer in Nigeria has:

1. access to quality inputs;
2. grow farm produce that meets international market standards; and
3. equal access to market (local and international) for farm produce.

Table 11: Implementation Plan for Strategic Objectives 3 and Initiatives

Access to quality inputs			
<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Get government to accredit more inputs suppliers to promote access to quality farm inputs	1. Setup accreditation process for input suppliers, Promote and recognize accredited input suppliers in agriculture sector	FMARD/ States & LGAs	2021 -
Quality farm Produce for exportation			
<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
	1. Increase awareness and expose farmers to quality	Standards Organization	2022 -

- |  |   |  |
|--|---|--|
| a. Put mechanisms in place to monitor and ensure farmers produce at good quality | requirements. Using extension workers.  | of Nigeria/States & LGAs (in collaboration with Farmers association and FMARD) |
|  | 2. Develop monitoring scheme to regularly monitor farmers' progress and provide adequate support when they need it.                                     |  |
|  | 3. Promote and reward producers of good quality.  |  |
| b. Increase farm storage and process facilities across the country               | Identify the need and invest in facilities based on needs and requirements. Obtain funding from the Bank of Agriculture and other development partners. | FMARD/States & LGAs (in collaboration with Bank of Agriculture)                |

### Equal access to local and international market

<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Promote policy of open markets (local and international) to agriculture products;	1. Implement <b>2.5.7 Nigeria Agriculture Market Place.</b> under the supervision of the Federal Ministry of Industry, Trade and Investment	Federal Ministry of Industry, Trade and Investment, FMAR.  Support by NITDA	2022 -

### Core Initiative

<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Develop open data initiatives in agriculture;	1. Identify plan and implement open data initiatives in agriculture based on best practices.  2. Setup workgroups, Execute an open data pilot projects, Engage with agriculture community	FMCDE, FMARD, NITDA/ States & LGAs	2023 -
b. Promote the use of digital agriculture	1. NITDA to commission private tech firms with expertise in agro value chain. The firms	NITDA/States & LGAs	

platforms to broaden access to government accredited input suppliers, monitor agriculture produce for quality and increase access to local and international markets for Nigerian farm products.

will create and deploy digital resources to meet the needs of the agriculture community and stakeholders in Nigeria.

2. Implement ***2.5.7 Nigeria Digital Agriculture Platform Initiative***

### 5.2.4 Organize AgTech Entrepreneurial Training programs for Startups

#### Objectives:

1. attract young school leavers and graduates to the agriculture sector
2. enable the incorporation of innovation from startups in the agriculture sector
3. foster the creation of profitable and sustainable AgTech startups and agribusinesses

Table 12: Implementation Plan for Strategic Objectives 3 and Initiatives

<b>AgTech Entrepreneurial Capacity Building</b>			
<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Build capacity of AgTech startups	<ol style="list-style-type: none"> <li>1. Encourage young people who are technology driven and tech savvy entrepreneurs with a passion for agriculture in the 36 states and FCT to acquire skills and participate in the sector.</li> <li>2. Build capacity and provide incentive and support schemes.</li> </ol>	NITDA (private resource persons and firms commissioned and supervised by NITDA) CBN/ Bank of Industry	2022 -

### 5.2.5 Establish Digital Agriculture Strategic & Advisory Forum

#### Objectives

1. Enable the forming of the agro ecosystem comprising stakeholders and communities
2. Share knowledge, insights and best practices on innovation, research and the use of ICT in food and agriculture
3. Ensure all relevant stakeholders in the agriculture and ICT sectors are on the same page with regard to the Digital Agriculture strategy

Table 13: Establish Digital Agriculture Strategic & Advisory Forum

<b>Digital Agriculture Ecosystem Forum</b>			
<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Creation of Digital agro ecosystem	<ol style="list-style-type: none"> <li>1. Enhancing knowledge, direction and mutual learning through regular engagement / discussions (open and informal and formal).</li> <li>2. Foster the sharing of agricultural knowledge and help agro</li> </ol>	FMARD in collaboration with FMoCDE Supported by NITDA	2022 -

stakeholders handle digital agriculture challenges and opportunities.

3. The strategic and advisory forum will consist of representatives from government, agriculture sector, ICT providers and community.

### 5.2.6 Establish and Promote AgTech Career Initiatives

#### Objectives

1. create awareness of new careers created through technology and digital advancements in agriculture
2. provide opportunities for young people to pursue rewarding careers in agriculture and technology
3. enable young people seize growth opportunities emerging in digital agriculture.

Table 14: Establish and Promote AgTech Career Initiatives

AgTech Careers			
<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Create awareness about digital agriculture career opportunities	1. Use secondary schools and universities through career events, guidance and counseling, career discussions with agriculture leaders in academia, government and industry.	FMARD (in collaboration with the Federal Ministry of Education)	2022 -
	2. Organize digital agriculture career competitions and awards for secondary school students and university undergraduates. Position agriculture as an attractive and exciting career choice for young persons	FMCDE & NITDA	
b. Organize National Students Digital agriculture events in	1. Organize events in secondary schools and universities throughout the country with active participation and support by Federal Ministry of Communications and Digital Economy (FMoCDE) and Federal Ministry of Agriculture and Rural	NITDA	

	Development (FMARD) as well as other members of the digital agriculture ecosystem.	
c. Integrate digital agriculture competencies into the learning curricula of undergraduate and postgraduate courses	<ol style="list-style-type: none"> <li>1. Enable specialization in digital agriculture</li> <li>2. FMARD to work with Federal Ministry of Education.</li> </ol>	FMARD (in collaboration with Federal Ministry of Education)
d. Digital Agriculture specialization in postgraduate studies and projects	<ol style="list-style-type: none"> <li>1. Fund and encourage postgraduate projects that focus and specialise in agricultural sector priorities (food security, export performance, climate change, sustainable farming and environmental sustainability) through digital agriculture</li> </ol>	FMARD (in collaboration with Federal Ministry of Education) Supported by NITDA

### 5.2.7 Establish Rural Digital Literacy Initiative

#### Objectives

1. boost digital literacy in the rural areas
2. close the digital divide between the rural and urban areas in Nigeria
3. empower rural citizens with digital literacy

Table 15: Establish Rural Digital Literacy Initiative

Establish a National Digital Literacy programme for rural communities			
<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Setup and run digital literacy programs in	<ol style="list-style-type: none"> <li>1. Government to work with stakeholders and partners. Stakeholders with ICT skills to</li> </ol>	NITDA (in collaboration with the Nigeria Computer	

rural areas throughout the country.	play a major role in equipping the rural populace with digital skills.	Society (NCS), umbrella organization for ICT)
b. Fund the Rural Digital Literacy Initiative.	<ol style="list-style-type: none"> <li>1. Provide grants, funding and incentives for training organizations to run the programs to improve digital literacy and skills through education and training.</li> <li>2. Funding and partnerships will help to diffuse and scale up in the rural communities.</li> </ol>	USPF
c. Participants achieve minimum level of proficiency in digital literacy skills, as proposed in the Digital Literacy Global Framework.	<ol style="list-style-type: none"> <li>1. The programs will be hands-on and focused on day to day activities and experiences of trainees.</li> </ol>	NITDA (in collaboration with the Nigeria Computer Society (NCS), umbrella organization for ICT)
d. Create National Digital Literacy awareness	<ol style="list-style-type: none"> <li>1. Create awareness nationwide using various media on the importance of ensuring that every citizen is a fully digital literate person, stressing that it is a national priority for sustainable development of the nation.</li> </ol>	FMCDE, NITDA (in collaboration with the Nigeria Computer Society (NCS), umbrella organization for ICT)
e. Digital Literacy advocacy for	<ol style="list-style-type: none"> <li>1. Raise advocacy for digital literacy in the rural areas, highlighting the empowerment opportunities as well as the benefits of being</li> </ol>	FMARD (in collaboration Federal Ministry of Information

digital literacy in the rural areas. digitally literate to farmers and members of rural communities. and media organizations)

### 5.2.8 Establish Agricultural Digital Innovation Hubs for Research and Innovations

#### Objectives

1. provide agricultural tech entrepreneurs, the research community, farmers and financial institutions with opportunities to advance innovation and boost performance in the food and agriculture space.
2. address the problems in agriculture through digital innovation
3. explore innovative approaches to empowering farmers and stakeholders in agriculture and enhancing their income and productivity.

Table 16: Establish Agricultural Digital Innovation Hubs for Research and Innovations

Agricultural Digital Innovation Hubs			
<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Establish Agricultural digital innovation hubs throughout the country	1. Government, partners and innovators to launch and support Hubs in the food and agriculture sector. The hubs will facilitate the experimentation, prototyping and development of new applications to meet the actual needs of farmers and their communities.	NITDA	2022 -

### 5.2.9 Consortium on ICT for Climate Smart Agriculture

#### Objectives

1. join forces in applying ICT to climate change monitoring, mitigation and adaptation in agriculture
2. increase the application and access of farmers and the agricultural community to climate smart digital solutions

Table 17: Consortium on ICT for Climate Smart Agriculture

ICT for Climate Smart Agriculture			
<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Establish ICT for Climate Smart	1. FMARD, NITDA & NCS to establish a Climate-smart digital solutions team to	Nigeria FMARD, NITDA &	2022 -

Agriculture Consortium address identified climate challenges in agriculture. The consortium will be made of relevant MDAs and stakeholders in agriculture and ICT, as well as the Nigeria Computer Society (NCS), the umbrella body of ICT professionals and stakeholders in Nigeria.

### 5.2.10 Nigeria Digital Agriculture Platform Initiative

#### Objectives

1. showcase Nigeria’s competitive advantages, opportunities and strengths in AgTech and Digital Agribusiness to a global audience.
2. attract more foreign investors, partners and innovators to Nigeria’s digital agriculture space.
3. enable collaboration with investors and researchers in digital agriculture
4. promote Nigeria’s export strategy especially as it relates to digital agriculture.
5. establish Nigeria as a natural global hub Africa’s leading hub for food and AgTech.

Table 18: Nigeria Digital Agriculture Platform Initiative

Nigeria Digital Agriculture Platform			
Specific Output/Deliverables	Strategy	Action By	Timeline
1. Establish and run the Nigeria Digital Agriculture Platform	1. A tech firm with expertise to be engaged to develop and maintain the platform. The initiative should be driven by the 2.	FMCDE, FMARD, Federal Ministry of Industry Trade and Investment & NITDA	2021 -

### 5.2.11 Gender Inclusion in Digital Agriculture

#### Objectives

1. close the gender gap in agriculture
2. ensure equal opportunities and access to digital agriculture resources, services and programmes in Nigeria regardless of gender

Table 19: Gender Inclusion in Digital Agriculture

## 1. Gender Inclusion Initiatives in Digital Agriculture

<i>Specific Output/Deliverables</i>	<i>Strategy</i>	<i>Action By</i>	<i>Timeline</i>
a. Ensure Digital Agriculture activities are gender sensitive and participatory	<ol style="list-style-type: none"> <li>1. Federal Ministry of Women affairs to collaborate with FMARD to make sure all Digital Agriculture projects and solutions are gender-responsive.</li> <li>2. Ensure equal representation of women and men in the decision-making processes and policy development in digital agriculture as well as inclusive digital capacity development.</li> </ol>	Federal Ministry of Women Affairs and Social Development	2022 -

## 6.0 MONITORING AND EVALUATION

### 6.1 Monitoring and Evaluation (M&E)

M&E will greatly assist performance measurement of each strategic initiative. M&E should be carried out by all implementing stakeholders and report be prepared for decision making. The FMARD and FMCDE will supervise implementation and ensure corrective measures are put in place to address recommendations of the evaluation report.

### 6.2 Monitoring and Evaluation Template

For a better monitoring and evaluation of the strategic initiatives and implementation plan, the table – provides a monitoring and evaluation template for measuring the performance of each strategic initiative.

<b>OBJECTIVE</b>	<b>KPI</b>	<b>BASELINE</b>	<b>TARGET</b>	<b>FREQUENCY</b>	<b>RESPONSIBLE</b>	<b>PERFORMANCE</b>	<b>REPORT</b>
What is the purpose of the strategic initiative	What is/are the performance indicators	What is the current value?	What is the target value?	How often will it be measured?	Who will measure it?	What is the actual performance	Where will it be reported?
<b>Strategic Initiative 1</b>							
<b>Strategic Initiative 2</b>							
<b>Strategic Initiative n</b>							

### 6.3 Review and Reporting

At the end of each year, evaluation reports are reviewed and progress report are published. The aim of this is identify what works, what does not and reason why.

### 6.4 Corrective Actions

Once there is proven and insightful data on what works, what doesn't work and the reason why, then implementing stakeholders must take correct measures/actions.

## APPENDIX

### Conditions for Accelerating Digital Agriculture

The use and adoption of digital technologies and innovations has its own inherent challenges which must be tackled. The potential benefits of digitalizing the agriculture sector in Nigeria are convincing but it will require major transformations of farming systems, rural economies, communities and natural resource management. This will be a challenge and requires a systematic and holistic approach to achieve the full potential benefits.

Strategies for digital agricultural transformation in developing countries must *combine digital infrastructure with social, organizational and policy change*. There is strong indication that digital agriculture might create *Digital Divide*.

*Digital Divide*: Digitalization of the agriculture sector and its value chain involves the risk that the potential benefits will be unequally distributed between rural and urban areas, gender, youth population. Urban areas often have better developed ‘digital ecosystems’ (resources, skills, networks) compared with rural areas. Combined with global trends of urbanization and middle and rich classes settling in cities, there is potential for digitalization to exacerbate existing rural urban disparities (UN DESA, 2018a). Therefore, there is a need for orchestrated plan and strategy for digital transformation of the agriculture sector to ensure that such multidisciplinary digital divides are bridged for everyone to benefit from the emerging digital society.

Hence, requirements and conditions for digital transformation in the agriculture sector must be defined and adhered to.

As defined in a publication and briefing paper by FAO on “Digital Technologies in Agriculture and Rural Areas”, there are two conditions to consider for digital transformation in agriculture:

*Basic conditions*: are the minimum conditions required to use technology include:

1. Availability;
2. Connectivity;
3. Affordability;
4. ICT in education;
5. Supportive policies and programmes for digital strategies.

Governments at various levels in partnership with private sector, non-governmental organisations and development partners should ensure these basic conditions are always considered in the design of any agriculture programme or solutions.

NOTE: These basic conditions must be considered for rural and urban population alike. Each environment has its peculiar cases. Therefore, programmes and solutions for each environment must be designed specifically to avoid digital divides that could worsen the challenges.

*Enabling conditions (‘enablers’)* :are factors that further facilitate the adoption of technologies:

1. Use of internet;

2. Mobile phones and social media,
3. Digital literacy and skills; and
4. Support for agripreneurial and innovation culture (talent development).

In addition to the enabling conditions, Governments and the private sector counterpart should leverage these technological and policy conditions to create platforms that would disrupt the agriculture sector to enable economic diversification and growth, job and wealth creation with the ultimate goal of sustainable national development.

## **Principles of digital development in agriculture**

The “Digital Impact Alliance” has defined some principles to guide the design, deployment, use and adoption of digital solutions in every sector of the economy. Effective digitalization of the agriculture sector will largely dependent of these principles. The principles include:

1. Design with Users
2. Understand the Ecosystem
3. Design for Scale
4. Build for Sustainability
5. Be Data Driven
6. Use Open Standards, Open Data, Open Source, and Open Innovation
7. Reuse and Improve
8. Address Privacy and Security
9. Be Collaborative

Detail of the principles can be found on Digital Impact Alliance web page (web address is need)