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# ASSESSMENT OF DIGITAL AGRICULTURAL PRACTICES AMONG COMMERCIAL ARABLE CROP FARMERS IN SOUTHWEST, NIGERIA

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***Abstract***

*Smart agriculture has the potential for economic benefits through increased agricultural productivity, cost efficiency and market opportunities through increased communication; and environmental benefits as this will in turn, lead to greater food security, profitability and sustainability. This article presents the practices and challenges to smart agriculture among commercial arable crop farmers in Southwest, Nigeria considering the forms of digitalization in use, as well as the frequency of usage, period of usage, and challenges to the usage. We randomly sampled 45 commercial arable crop farmers across the southwest states in Nigeria. We made use of Structured questionnaire to extract needed information from the respondents. The data obtained were analysed with descriptive statistics. Our findings showed that the forms of digitalization used by agricultural firms include mobile phone (100%), cloud computing (56%), software (58%), remote sensing (40%), digital marketing (52%), and GIS (35%) while the average period of usage of digitalization was 10years. Our findings also revealed that the main challenges to the use of digitalization are high cost of procurement and installation (93%), low awareness of current state of digitalization in agriculture (84%), limited technical knowhow (78%), poor power supply (67%), and high cost of energy (62%). Although evidence at short-term revealed that smart agriculture has the potential of tackling key development issues such as food insecurity, poor output, poverty, and unemployment; the study showed that there is a need to enlighten agricultural firms of the benefits of smart agriculture, as well as plan and invest on sustainability of digitalization in agriculture to harness its full benefits/potentials.*

***Key words*****:** *digitalization, practices, agricultural production growth, food security, sustainability*

## INTRODUCTION

Agriculture is a crucial tool for promoting growth and sustainable development, eradicating poverty, and improving the food security of the thronging populace in most emerging countries (Trading Economics, 2018) [8]. Base on the findings of Food and Agriculture Organization of the United Nations FAO (2016), Sub-Saharan Africa population could double by 2050, increasing annual agricultural consumption by 2.8% until 2030, and by 2.0% from 2030 to 2050. This rapid population growth and urbanization imply that food production will grow more slowly than demand resulting to food scarcity and increased malnutrition. Therefore, sustaining food security of this teeming population in the face of the changing climate and urbanization is a major challenge (Van Etten et al., 2019) [10]. In order to overcome these challenges and ultimately attain food security. There is need for technological adoption to incentivize large scale farming in urban areas, facilitate access to irrigation systems, improving digital farming practices and infrastructure; and implement favorable policies to support digitalization of agriculture for transformative adaptation to climate change in farming (OECD-FAO, 2016) [4].

Digitalization could help farmers to optimize their costs and achieve a greater profitability, to increase production and profitability and farmers' living standard [7].

Digital innovation in agriculture has a great opportunity to eradicate poverty and hunger.

It can also mitigate the effects of climate change. Through digitalization, all parts of the agri-food production chain will be modified, since connectivity and the processing of massive amounts of data quickly allows for more efficient work, greater economic return, greater environmental benefits, and better working conditions in the field, this development appears to hold great promise for advancing farm productivity and profitability in this primary sector (USAID, 2018) [9].

Although digital agriculture also referred to as smart agriculture is being implemented in advance world like North America, and Asia but empirical evidence on the extent of it usage in developing countries like Nigeria is thin.

Nigerian agriculture needs digitalization for better outcomes as affirmed Ferkun (2015), [1], Okafor, 2022 [5].

The National Information Technology Development Agency with the help of Nigeria's Federal Ministry of Communications and Digital Economy has launched the National Adopted Village for Smart Agriculture Program which will help 130 farmers to build digital skills and innovations across agriculture value chains and this will create new jobs, increase agricultural production, income and wealth of every ecosystem player (Opali, 2020) [6].

Photo 1. Femi Adekoya - The Nigerian farmer transforming agriculture with drone technology
Source: Ventures Africa (2022) [11].

Nigeria Digital Agriculture Strategy 2020-2030 has the goal to adopt digital technologies in agriculture. A digital platform will be put at the disposal of the beneficiaries in order to enable them to communicate, exchange ideas, efficient practices, find jobs, markets for products delivery, to develop agri-business (Nigeria Digital Agriculture Strategy 2020-2030) [3].

Therefore, this study aimed to fill the gap by assessing digital agricultural practices among commercial arable crop farmers in Southwest, Nigeria.

The specific objectives are to:

(i)describe the socio-economic characteristics of the respondents;

(ii)consider the forms of digitalization in use among commercial arable crop farmers;

(iii)examine the frequency of usage and period of usage of digitalization and;

(iv)highlight the challenges to the usage of digitalization.

## MATERIALS AND METHODS

### Study Area, Source of Data and Sampling Procedure

The study was conducted in Southwestern states, Nigeria. Primary data used for the study was obtained through structured questionnaire. The population for the study comprised all commercial arable crop farmers. A three-stage sampling technique was used. The first stage involved choosing at random three of the six states in the area; the second stage involved choosing at random three ecological zones in each state; while the third stage involved random selection of five commercial arable crop farmers in each zones. In all, a total of forty-five (45) commercial arable crop farmers were used for the study.

### Analytical Tools

The tool of analysis that was used was descriptive statistics which include mean, median, frequency and percentages.

## RESULTS AND DISCUSSIONS

### Socio-economic Characteristics of Farmers

Table 1 revealed that 68.7% of the respondents are younger than 44 years old. This shows that the majority of those who own and manages agricultural firms are still in

their middle years and employ some sort of digitalization in their business. Younger farmers typically absorb innovations more quickly than elderly farmers since the latter tend to stick to their traditional methods of production and are frequently resistant to change.

The data also showed that men made up 75.6% of the respondents while women made up 24.4%. This demonstrates that men are more prevalent in agriculture. The majority of respondents had tertiary education, which made it simple for them to incorporate digital skills into their production activities (Kamilu and Oyeyinka, 2011) [2].

tertiary education, which made it easy to adopt digital skills in their production activities.

Voh (2002) [12] reported that there is a positive and significant relationship between formal education and adoption of technologies.

Table 1. Socio-economic Characteristics of Respondents

| Characteristics | Frequency | Percentage (%) |
|---|---|---|
| **Age (Years)** | | |
| ≤30 | 2 | 4.4 |
| 31 – 40 | 25 | 55.6 |
| 41 – 50 | 13 | 28.9 |
| 51 – 60 | 5 | 11.1 |
| **Sex** | | |
| Male | 34 | 75.6 |
| Female | 11 | 24.4 |
| **Education level** | | |
| Secondary education | 2 | 4.4 |
| Tertiary education | 43 | 95.6 |
| **Marital status** | | |
| Single | 4 | 8.8 |
| Married | 36 | 80.0 |
| Divorced | 3 | 6.7 |
| Widowed | 2 | 4.5 |
| **Total** | **45** | **100.0** |

Source: Field survey, 2020.

The result further revealed that about 80.0%, 8.8%, 6.7% and 4.5% of the farmers are married, single, divorced and widowed respectively. This indicates that most of the people involved in agricultural activities in the area are married.

**Forms of digitalization adopted in farms**

All the agricultural firms under study use mobile telephone to deliver services to farmers throughout Nigeria. They equally partner with GSM operators for special tariffs to enable them carry out their agricultural production and Consultancy Services efficiently.

Fifty-six percent (56%) of the agricultural firms provide their products and services to farmers through the cloud. This helps them to instantly store and analyze farmers' fields and crop data efficiently by keeping all their systems on the cloud. It ensures that services can be offered over all devices that can be connected to the Internet irrespective of the location.

Fifty-eight percent (58%) of the firms employ software like Matlab, Sas and E-views for their big data analysis for efficient delivery of services. Twelve percent (12%) of the agricultural firms can interpret and make use of measurements made from meteorological stations for their planting activities. Such climatic information includes information on rainfall, temperature, relative humidity etc.

Eight percent (8%) use drones for their herbicide and pesticide application. Twenty five (25%) also make use of soil sensing device for their planting activities.

While none of the agricultural firms under study uses robotic machines for their agricultural enterprise (Figure 1).

**Frequency of Usage Digitalization**

Table 2 presents the frequency of usage of digitalization by the firms under study. Mobile Phone, GIS and Digital Marketing were used very frequently by the firms; Software and Cloud Computing were used frequently; Drones, Remote sensing and Soil Sensing were used occasionally; while Robotic machines are not used by any of the firms.

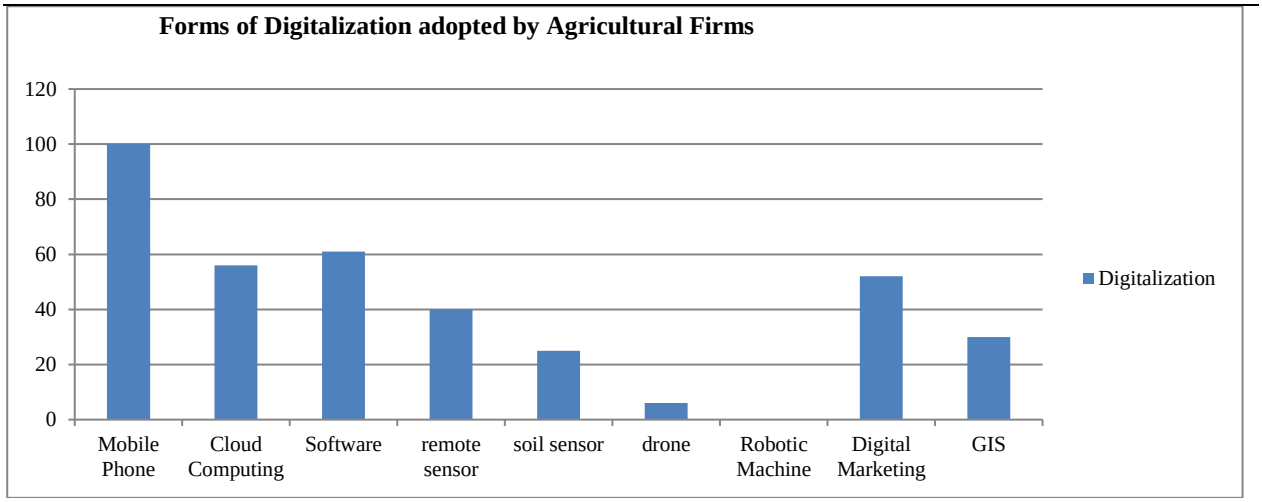


Fig. 1. Forms of Digitalization used by Agricultural Firms
Source: Field survey, 2020.

Table 2. Frequency of usage digitalization (n = 45)

| S/N | List of ICTs | VF (%) | F (%) | O (%) | R (%) |
|---|---|---|---|---|---|
| **1** | Drones | 14.0 | 15.2 | 45.8 | 25.0 |
| **2** | Software | 23.4 | 62.5 | 9.0 | 5.1 |
| **3** | Mobile phone | 85.0 | 12.3 | 2.7 | 0.0 |
| **4** | Remote sensing | 4.5 | 10.5 | 52.8 | 32.2 |
| **5** | GIS | 72.6 | 11.4 | 10.0 | 6.0 |
| **6** | Digital Marketing | 65.8 | 23.5 | 7.5 | 3.2 |
| **7** | Cloud computing | 12.2 | 58.6 | 15.2 | 14.0 |
| **8** | Soil sensor | 10.0 | 25.8 | 56.0 | 8.2 |
| **9** | Robotic machine | 0.0 | 0.0 | 0.0 | 0.0 |

N.B: Very Frequently (VF), Frequently (F), Occasionally (O), Rarely (R)
Source: Field survey, 2020.

## Period of Usage

Table 3 shows the period of usage of digitalization by the agricultural firms. The modal period of usage by the agricultural firms is between 5-10years while the average period of usage is 10.15years which shows the use of digitalization is still in it early stage.

Table 3. Period of Usage of Digitalization

| Years | Frequency | Percentage |
|---|---|---|
| < 5 | 03 | 4.4 |
| 5-10 | 21 | 46.7 |
| 10-15 | 19 | 42.2 |
| >15 | 03 | 6.7 |
| Total | 45 | 100.0 |

Source: Field survey, 2020.

## Challenges to Digital Agriculture in Nigeria

Table 4 shows the constraints facing digital agriculture in Nigeria. The constraints include: High Cost of procurement and installation, Low awareness of current state of digitalization in agriculture, Limited Technical Knowhow, Poor Power Supply, High Cost of Energy, Inaccessibility to small scale farmers and Fear of operational risk associated with digital agriculture.

Table 4. Challenges to digital agriculture in Nigeria

| Challenges | Freq. | % |
|---|---|---|
| Limited Technical Knowhow | 35 | 77.8 |
| Poor Power Supply | 30 | 66.7 |
| High Cost of procurement and installation | 42 | 93.3 |
| Inaccessibility to small scale farmers | 25 | 55.6 |
| Low awareness of current state of digitalization in agriculture | 38 | 84.4 |
| Fear of operational risk associated with digital agriculture | 21 | 46.7 |
| High cost of energy (fuel) | 28 | 62.2 |
| N- Multiresponse | | |

Source: Field survey, 2020.

## CONCLUSIONS

The study concludes that smart agriculture has the potential of tackling key development issues such as food insecurity, poor output, poverty, and unemployment. The study that there is a need to enlighten agricultural firms of the benefits of smart agriculture and

adequate infrastructures should be put in place to tackle the challenges to the usage of digital agriculture.

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