# **CHAPTER TWO: LITERATURE REVIEW**

## 2.0 Overview

This chapter reviews related works of other who have worked on literatures involving the use of ICT in agriculture and in some cases farming in particular.

## 2.1 Introduction to Digital Tools in Agriculture

The agricultural sector worldwide is experiencing a digital revolution driven by advancements in information and communication technologies (ICT). This transformation is evident in both developed and developing countries, including Nigeria, where digital tools have become vital in improving farm management practices, labour management, and overall agricultural productivity. Digital tools, ranging from simple mobile applications to complex decision support systems, are increasingly being adopted to address critical challenges in agriculture, such as labour shortages, market access, and climate variability.

In Nigeria, where over 70% of the rural population depends on agriculture for livelihood, the adoption of digital tools is crucial for achieving sustainable development goals (SDGs), particularly in the context of food security, economic growth, and poverty reduction. A study by Ayandokun (2023) emphasized the need for leveraging digital technologies for indigenous knowledge management, underscoring the potential of these tools to support socioeconomic development in the post COVID-19 era (Ayandokun et al., 2023).

## 2.2 Impact of Digital Technologies on Agricultural Practices in Nigeria

Digital technologies have significantly impacted agricultural practices in Nigeria, especially in enhancing decision-making and productivity. ICT tools such as mobile phones, GPS, and remote sensing have revolutionized how farmers access information, manage crops, and monitor market trends. Studies by Oluwaseun et al. (2024) highlight the positive correlation between ICT adoption and improved agricultural output. These tools enable real-time information sharing, helping farmers make informed decisions about crop management and pest control (Oluwaseun et al., 2024).

For example, mobile platforms that provide weather forecasts, pest alerts, and market prices have empowered farmers in rural areas, leading to better productivity and profitability. However, the adoption rate varies significantly across regions, often influenced by factors such as digital literacy, infrastructure availability, and socioeconomic status.

## 2.3 ICT Adoption in Agricultural Extension Services

Agricultural extension services are crucial in disseminating knowledge, skills, and innovations to farmers. The integration of ICTs into extension services has transformed these interactions, making them more efficient and accessible. In Kwara State, Nigeria, the use of ICTs has been reported to enhance the effectiveness of agricultural extension services, according to a study by Oluwaseun et al. (2024). The study indicates that ICT tools, including mobile phones and digital media, facilitate better communication between extension agents and farmers, thereby improving service delivery and information dissemination. Agricultural extension is a method of communication and education that seeks to share the latest knowledge, techniques and innovation with farmers, with the purpose of imparting novel information and technology that can enhance agricultural productivity, profitability, and sustainability. So, extension agents are expected to well inform so as to meet the needs of the farmers.

Extension agents are expected to provide information on new farming techniques to the farmers. Agricultural extension is a platform that provides services that enhance the productivity, income and livelihoods of farmers and other rural people through educational and communication methods. Extension service links the farmers and rural people to innovation. Therefore, it is important that the extension agents have access to Information and Communication Technologies (ICTs) in information gathering and dissemination to the farmers and other end users. The use of ICTs and digital devices are fast gaining grounds in developing countries, and is being applied in several fields of human endeavour including agricultural extension services. The use of ICTs has helped in solving several agricultural related problems such as site measurement and

access to electronic information on production practices. Information communication technologies (ICTs) are set of activities that enable the capturing, storage, processing, transmission and display of information by electronic means.

The ICTs for agricultural extension services have made information/data gathering and dissemination easier for the extension personnel.

Application of modern communication technologies and digital devices to agricultural extension service deliveries could enhance the productivity of the extension agents through provision of accurate, timely and relevant information to the farmers. This will result in enhancing the output and livelihoods of farmers.

Despite the benefits, challenges such as limited access to digital devices, inadequate training for extension workers, and poor internet connectivity still hinder the full potential of ICTs in agricultural extension. To overcome these barriers, there is a need for targeted policies and programs that promote digital literacy and infrastructure development in rural areas.

## 2.4 Mobile Applications and Digital Platforms for Agriculture

Mobile applications have emerged as a key digital tool in the agricultural sector, providing platforms for various functions, including market access, weather forecasting, and farm management. Adesiji et al. (2024) analysed the usability and adoption of agricultural mobile apps in Nigeria, revealing that while these tools offer significant benefits, their adoption is often limited by usability challenges and farmers' digital literacy levels (Adesiji et al., 2024). The study emphasized the need for designing user-friendly applications that cater to the specific needs of smallholder farmers. The study also looked into the gap between farmers and developers of mobile apps, and it shows there are communication gap between users (farmers) and developers and thus the developers could not get feedback from the farmers which can be used to improve the app.

## 2.5 Challenges in Implementing Digital Tools in Rural Farming Communities

The adoption of digital tools in rural farming communities, such as Yobe State, faces several challenges. These include poor digital infrastructure, limited access to the internet, low digital literacy, and socioeconomic barriers. Studies have shown that while digital tools hold promise for transforming agriculture, their implementation in rural areas requires overcoming significant hurdles. For instance, the study by Mugabi (2024) on social innovations for mobile agricultural extension in Uganda provides insights that are also applicable to Nigeria. The study highlights the need for community based approaches to increase the adoption of digital tools among rural farmers.

## 2.6 Digital Innovations in Agricultural Cooperatives and Value Chains

Digital tools are also transforming agricultural cooperatives and value chains by improving coordination, transparency, and efficiency. Uneze et al. (2024) explored the role of digital tools in rice value chains in Anambra State, Nigeria, and found that digital innovations significantly enhance productivity and market access. These findings suggest that digital platforms can play a pivotal role in labour management by streamlining recruitment, payroll, and communication between farmers and labourers. Agriculture is a sector crucial to the growth of the Nigerian economy. In the past few years, its contribution to gross domestic product (GDP) has averaged at about 25 percent. Smallholders pool their resources in collective action to form agricultural cooperatives in order to increase farm productivity and income. These cooperatives account significantly for the development of the agriculture sector. Digitalization, on the other hand, has gained currency as a transformative strategy for agriculture. This study aimed to examine in broad terms the perspectives of digitalization in the rice value chain created by members of cooperative societies in Anambra State. A total of 180 members of cooperative societies across the four agricultural zones of the state who participate in the rice value chain were selected for the study using a multistage sampling technique. A structured and validated questionnaire was used to elicit information from the respondents. The data were consequently analyzed using descriptive statistics (frequency, percentage & ranking) and inferential statistics (chisquare & cramer’s v). The study identified rudimentary digital tools and that technologies enabled members to use mobile phones for the purposes of financial services, input delivery, and market access and weather prediction. However, technologies requiring high-level skills for their implementation were obviously lacking among these co-operators. Also, the ways in which individual, institutional and technological factors limit adoption of these technologies were empirically identified.

However, members generally welcomed the use and application of digital tools to improve their value chain activities. There was the perception among members that though digitalization was necessary, its unguarded use in the processes of cooperatives could erode their participation in the governance of the cooperative, thereby compromising the principle of democratic member control. The study identified an urgent need for a strong digital infrastructure backbone, encouraging the formation of agricultural digital solution cooperatives, digital literacy programs support from companies providing special skill agricultural digitalization solutions, and instituting government grants to support the high cost of investments required for digitalization.

## 2.7 Case Studies: Precision Agriculture and Market Participation

Precision agriculture, enabled by digital tools, is gaining traction in Nigeria as a means to increase ‎agricultural productivity and efficiency. The study by Nwangwu et al. (2024) focused on ICT ‎tools promoting market participation among smallholder farmers, emphasizing that digital ‎technology can significantly reduce transaction costs and enhance market access. These tools can ‎also improve labour management by optimizing the allocation and monitoring of farm labour. While existing literature explored the transformative potential of digital technology in agriculture, this study focused on understanding the impact on market participation among smallholder farmers in developing economies. ‎Moreover, while previous ‎studies have largely overlooked the marketing of staple crops, ‎this study fills this gap by ‎examining the potential of mobile phones in enhancing the ‎marketing of staple crops in ‎Nigeria.‎ This study believes that despite the upward trend in mobile phone ownership across Nigeria, research focusing on how mobile phones influence farmer’s decisions to participate in staple crop market is scarce as also in the use of apps intended for farmers, this is looked into in another study. Previous studies looked only at the production level and not the marketing level. The relationship with my own study is in that this particular study focuses on the labour aspect as one of the factors of production and in this case the agricultural sector, farming in particular.

## 2.8 The Role of Digital Platforms in Labour Outsourcing and Management

Digital platforms for labour management are a growing trend in agriculture, particularly for addressing labour shortages and improving efficiency. Developing a web based farm labourer outsourcing tool in Yobe State can potentially address key challenges faced by both farmers and labourers, such as labour shortages, mismatch in labour supply and demand, and lack of transparency in payment systems. This section will explore how digital platforms can revolutionize labour management by providing a centralized platform for recruiting, managing, and compensating farm labourers.

## 2.9 Policy Implications and Recommendations for Adoption

For successful adoption of digital tools in agriculture, particularly in the context of farm labour management, supportive policy frameworks are essential. Policies should focus on promoting digital literacy, enhancing digital infrastructure, and providing incentives for the adoption of digital platforms among smallholder farmers.

## 2.10 Conclusion

The literature reviewed highlights the potential of digital tools to transform agriculture in Nigeria by improving productivity, market access, and labour management. However, challenges such as digital literacy, infrastructure, and socioeconomic barriers need to be addressed to fully harness these tools' benefits various devices. The prevalence of the use of mobile phones is a welcome development as it will help in contacting the intended labourers directly whether they are on the internet on not.